U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1437, Supplement 38,
Vol. 3

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 38

Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3

Final Report Public Comments Continued, Appendices

Office of Nuclear Reactor Regulation

AVAILABILITY OF REFERENCE MATERIALS IN NRC PUBLICATIONS

NRC Reference Material

As of November 1999, you may electronically access NUREG-series publications and other NRC records at NRC's Public Electronic Reading Room at http://www.nrc.gov/reading-rm.html.
Publicly released records include, to name a few, NUREG-series publications; *Federal Register* notices; applicant, licensee, and vendor documents and correspondence; NRC correspondence and internal memoranda; bulletins and information notices; inspection and investigative reports; licensee event reports; and Commission papers and their attachments.

NRC publications in the NUREG series, NRC regulations, and *Title 10, Energy*, in the Code of *Federal Regulations* may also be purchased from one of these two sources.

1. The Superintendent of Documents
   U.S. Government Printing Office
   Mail Stop SSOP
   Washington, DC 20402–0001
   Internet: bookstore.gpo.gov
   Telephone: 202-512-1800
   Fax: 202-512-2250
2. The National Technical Information Service
   Springfield, VA 22161–0002
   www.ntis.gov
   1–800–553–6847 or, locally, 703–605–6000

A single copy of each NRC draft report for comment is available free, to the extent of supply, upon written request as follows:
Address: U.S. Nuclear Regulatory Commission
Office of Administration
Mail, Distribution and Messenger Team
Washington, DC 20555-0001
E-mail: DISTRIBUTION@nrc.gov
Facsimile: 301–415–2289

Some publications in the NUREG series that are posted at NRC's Web site address http://www.nrc.gov/reading-rm/doc-collections/nuregs are updated periodically and may differ from the last printed version. Although references to material found on a Web site bear the date the material was accessed, the material available on the date cited may subsequently be removed from the site.

Non-NRC Reference Material

Documents available from public and special technical libraries include all open literature items, such as books, journal articles, and transactions, *Federal Register* notices, Federal and State legislation, and congressional reports. Such documents as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings may be purchased from their sponsoring organization.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at—
The NRC Technical Library
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852–2738

These standards are available in the library for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from—
American National Standards Institute
11 West 42nd Street
New York, NY 10036–8002
www.ansi.org
212–642–4900

Legally binding regulatory requirements are stated only in laws; NRC regulations; licenses, including technical specifications; or orders, not in NUREG-series publications. The views expressed in contractor-prepared publications in this series are not necessarily those of the NRC.

The NUREG series comprises (1) technical and administrative reports and books prepared by the staff (NUREG–XXXX) or agency contractors (NUREG/CR–XXXX), (2) proceedings of conferences (NUREG/CP–XXXX), (3) reports resulting from international agreements (NUREG/IA–XXXX), (4) brochures (NUREG/BR–XXXX), and (5) compilations of legal decisions and orders of the Commission and Atomic and Safety Licensing Boards and of Directors' decisions under Section 2.206 of NRC's regulations (NUREG–0750).

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1437, Supplement 38,
Vol. 3

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 38

Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3

Final Report
Public Comments Continued, Appendices

Manuscript Completed: November 2010
Date Published: December 2010

Office of Nuclear Reactor Regulation

ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses for a 20-year period in NUREG-1437, Volumes 1 and 2, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants” (hereafter referred to as the GEIS),[1] and codified the results in Title 10, Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” of the *Code of Federal Regulations* (10 CFR Part 51). In the GEIS (and its Addendum 1), the NRC staff identified 92 environmental issues and reached generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by Entergy Nuclear Operations, Inc. (Entergy), Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC (all applicants will be jointly referred to as Entergy) to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) for an additional 20 years under 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.” This SEIS includes the NRC staff’s analysis which considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the NRC staff’s recommendation regarding the proposed action.

Regarding the 69 issues for which the GEIS reached generic conclusions, neither Entergy nor the NRC staff has identified information that is both new and significant for any issues that apply to IP2 and/or IP3. In addition, the NRC staff determined that information provided during the scoping process was not new and significant with respect to the conclusions in the GEIS. Therefore, the NRC staff concludes that the impacts of renewing the operating licenses for IP2 and IP3 will not be greater than the impacts identified for these issues in the GEIS. For each of these issues, the NRC staff’s conclusion in the GEIS is that the impact is of SMALL[2] significance (except for the collective offsite radiological impacts from the fuel cycle and high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to IP2 and IP3 are addressed in this SEIS. The NRC staff determined that several of these issues were not applicable because of the type of facility cooling system or other reasons detailed within this SEIS. For the remaining applicable issues, the NRC staff concludes that the significance of potential environmental impacts related to operating license renewal is SMALL, with three exceptions—entrainment, impingement, and heat shock from the facility’s heated discharge. Overall effects from entrainment and impingement are likely to be MODERATE. Impacts from heat shock potentially

---

(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the “GEIS” include the GEIS and its Addendum 1.

(2) Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

range from SMALL to LARGE depending on the conclusions of thermal studies proposed by the New York State Department of Environmental Conservation (NYSDEC). Based on corrected data received since completing the draft SEIS, NRC staff concludes that impacts to the endangered shortnose sturgeon – which ranged from SMALL to LARGE in the draft SEIS – are likely to be SMALL.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewals for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS, (2) the environmental report and other information submitted by Entergy, (3) consultation with other Federal, State, Tribal, and local agencies, (4) the NRC staff's own independent review, and (5) the NRC staff's consideration of public comments received during the scoping process and in response to the draft SEIS.

Paperwork Reduction Act Statement

This NUREG does not contain information collection requirements and, therefore, is not subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). These information collections were approved by the Office of Management and Budget (OMB), approval numbers 3150-0004, 3150-0155, 3150-0014, 3150-0011, 3150-0021, 3150-0132, and 3150-0151.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

Table of Contents

Appendices

Table of Contents

Figures

Tables

Tables

EXECUTIVE SUMMARY

By letter dated April 30, 2007, Entergy Nuclear Operations, Inc. (Entergy) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) for an additional 20-year period. If the operating licenses are renewed, State regulatory agencies and Entergy will ultimately decide whether the plant will continue to operate based on factors such as the need for power, issues falling under the purview of the owners, or other matters within the State's jurisdiction, including acceptability of water withdrawal. Two state-level issues (consistency with State water quality standards, and consistency with State coastal zone management plans) need to be resolved. On April 2, 2010, the New York State Department of Environmental Conservation (NYSDEC) issued a Notice of Denial regarding the Clean Water Act Section 401 Water Quality Certification. Entergy has since requested a hearing on the issue, and the matter will be decided through NYSDEC's hearing process. If the operating licenses are not renewed, then IP2 and IP3 must be shut down at or before the expiration date of their current operating licenses which expire September 28, 2013, and December 12, 2015, respectively.

The NRC has implemented Section 102 of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321), in Title 10, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the *Code of Federal Regulations* (10 CFR Part 51). In 10 CFR 51.20(b)(2), the Commission requires preparation of an environmental impact statement (EIS) or a supplement to an EIS for renewal of a reactor operating license. In addition, 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (hereafter referred to as the GEIS).[1]

Upon acceptance of the IP2 and IP3 application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping. The NRC staff visited the IP2 and IP3 site in September 2007, held two public scoping meetings on September 19, 2007, and conducted two site audits on September 10–14, 2007, and September 24–27, 2007. In the preparation of this supplemental environmental impact statement (SEIS) for IP2 and IP3, the NRC staff reviewed the IP2 and IP3 environmental report (ER) and compared it to the GEIS; consulted with other agencies; conducted an independent review of the issues following the guidance in NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal," issued October 1999; and considered the public comments received during the scoping process and in response to the draft SEIS. The public comments received during the scoping process that were considered to be within the scope of the environmental review are contained in the Scoping Summary Report for Indian Point Nuclear Generating Unit Nos. 2 and 3, issued by NRC staff in December 2008. In Appendix A of this SEIS, the NRC staff adopts, by reference, the comments and responses in the Scoping Summary Report and provides information on how to electronically access the scoping summary or view a hard copy.

[1] The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

The NRC staff held public meetings in Cortlandt Manor, New York, on February 12, 2009 and described the preliminary results of the NRC environmental review, answered questions, and provided members of the public with information to assist them in formulating comments on the draft SEIS. The NRC staff considered and addressed all of the comments received. These comments are reflected in the SEIS or addressed in Appendix A, Part 2, to this SEIS.

This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the NRC staff's recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.

The purpose of the NRC staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine the following:

> …whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current operating license (or licenses).

NRC regulations (10 CFR 51.95(c)(2)) contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in 10 CFR 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation–generic determination of no significant environmental impact"] and in accordance with 10 CFR 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality (CEQ) guidelines.

The following definitions of the three significance levels are set forth in footnotes to Table B-1 of Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to 10 CFR Part 51, Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)":

> SMALL—Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS reached the following conclusions:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (that is, SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions in the GEIS for issues designated as Category 1 in Table B-1 of Appendix B to 10 CFR Part 51, Subpart A.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This SEIS documents the NRC staff's consideration of all 92 environmental issues identified in the GEIS. The NRC staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the operating licenses for IP2 and IP3), alternative methods of power generation, and conservation. The NRC staff also considered an alternative that included continued operation of IP2 and IP3 with a closed-cycle cooling system. This alternative is considered for several reasons. First, the New York State Department of Environmental Conservation (NYSDEC) issued a preliminary determination in its 2003 draft and 2004 revised draft State Pollutant Discharge Elimination System (SPDES) permits that closed cycle cooling is the site-specific best technology available (BTA) to reduce impacts on fish and shellfish;

currently the revised draft SPDES permit is the subject of NYSDEC proceedings, and the existing SPDES permit continues in effect at this time. Second, NYSDEC affirmed this view in its April 2, 2010, Notice of Denial of Entergy's Clean Water Act Section 401 Water Quality Certification, indicating that closed cycle cooling would minimize aquatic impacts; that determination is currently subject to further State-level adjudication. Third, NYSDEC has published a draft policy on BTA indicating that "Wet closed-cycle cooling or its equivalent" is the "minimum performance goal for existing industrial facilities that operate a CWIS [cooling water intake system] in connection with a point source thermal discharge." Public comments on that draft policy were submitted through July 9, 2010.

Entergy and the NRC staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Entergy nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the scoping process nor the NRC staff has identified any new issue applicable to IP2 and IP3 that has a significant environmental impact. Therefore, the NRC staff relies on the conclusions of the GEIS for all of the Category 1 issues that are applicable to IP2 and IP3.

Entergy's license renewal application presents an analysis of the 21 Category 2 issues that are applicable to IP2 and IP3, plus environmental justice and chronic effects from electromagnetic fields, for a total of 23 issues. The NRC staff has reviewed the Entergy analysis and has conducted an independent assessment of each issue. Six of the Category 2 issues are not applicable because they are related to a type of existing cooling system, water use conflicts, and ground water use not found at IP2 and IP3. Entergy has stated that its evaluation of structures and components, as required by 10 CFR 54.21, "Contents of Application—Technical Information," did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of IP2 and IP3 for the license renewal period. Entergy did, however, indicate that it plans to replace reactor vessel heads and control rod drive mechanisms at IP2 and IP3. The NRC staff has evaluated the potential impacts of these activities using the framework provided by the GEIS for addressing refurbishment issues.

Seventeen environmental issues related to operational impacts and postulated accidents during the renewal term are discussed in detail in this SEIS. These include 15 Category 2 issues and 2 uncategorized issues, environmental justice and chronic effects of electromagnetic fields. The NRC staff also discusses in detail the potential impacts related to the 10 Category 2 issues that apply to refurbishment activities. The NRC staff concludes that the potential environmental effects for most of these issues are of SMALL significance in the context of the standards set forth in the GEIS with three exceptions—entrainment, impingement, and heat shock from the facility's heated discharge. The NRC staff jointly assessed the impacts of entrainment and impingement to be MODERATE based on NRC's analysis of representative important species. Impacts from heat shock potentially range from SMALL to LARGE depending on the conclusions of thermal studies proposed by the NYSDEC. Based on corrected data received since completing the draft SEIS, the NRC staff concludes that impacts to the endangered shortnose sturgeon – which ranged from SMALL to LARGE in the draft SEIS – are likely to be SMALL.

The NRC staff also determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required.

For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for IP2 and IP3 and the plant improvements already made, the NRC staff concludes that several SAMAs may be cost-beneficial. However, these SAMAs do not relate to adequate management of the effects of aging during the period of extended operation. Therefore, they do not need to be implemented as part of license renewal pursuant to 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Cumulative impacts of past, present, and reasonably foreseeable future actions were considered, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. For purposes of this analysis, the NRC staff determined that the cumulative impacts to terrestrial and aquatic resources in the IP2 and IP3 environs would be LARGE, due primarily to past development and pollution, much of which preceded IP2 and IP3 or occurred as a result of other actions (for example, suburban development and hardening of the Hudson River shoreline).

The NRC staff's analysis indicates that the adverse impacts of potential alternatives will differ from those of the proposed action. Most alternatives result in smaller impacts to aquatic life, while creating greater impacts in other resource areas. Often, the most significant environmental impacts of alternatives result from constructing new facilities or infrastructure.

The recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewals for IP2 and IP3 are not so great that not preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS, (2) the ER and other information submitted by Entergy, (3) consultation with other Federal, State, Tribal, and local agencies, (4) the staff's own independent review, and (5) the staff's consideration of public comments received during the scoping process and in response to the draft SEIS.

Abbreviations/Acronyms

°	degree(s)
μm	micron(s)
3D	three dimensional
ACAA	American Coal Ash Association
ac	acre(s)
AC	alternating current
ACC	averted cleanup and decontamination
ADAMS	Agencywide Documents Access and Management System
ADAPT	Atmospheric Data Assimilation and Parameterization Technique
ACEEE	American Council for an Energy Efficient Economy
AEC	Atomic Energy Commission
AFW	auxiliary feed water
AGTC	Algonquin Gas Transmission Company
ALARA	as low as reasonably achievable
ANOVA	analysis of variance
AOC	averted off-site property damage costs
AOE	averted occupational exposure costs
AOSC	averted on-site costs
APE	averted public exposure
ASA	Applied Science Associates
ASME	American Society of Mechanical Engineers
ASMFC	Atlantic States Marine Fisheries Commission
ASSS	alternate safe shutdown system
ATWS	anticipated transient without scram
AUTOSAM	Automated Abundance Sampler
BA	biological assessment
BO	Biological Opinion
Board	Atomic Safety and Licensing Board
Bq/L	becquerel per liter
Bq/kg	becquerel per kilogram
BSS	Beach Seine Survey
BTA	best technology available
BTU	British thermal unit(s)
C	Celsius
CAA	Clean Air Act
CAFTA	computer aided fault-tree analysis code
CAIR	Clean Air Interstate Rule
CAMR	Clean Air Mercury Rule
CCF	common cause failure
CCMP	Comprehensive Conservation and Management Plan
CCW	component cooling water

CCWD	Cortlandt Consolidated Water District
CDF	core damage frequency
CDM	Clean Development Mechanism
CET	Containment Event Tree
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cfs	cubic foot (feet) per second
CHGEC	Central Hudson Gas & Electric Corporation
Ci	curie(s)
CI	confidence interval
cm	centimeter(s)
CMP	Coastal Management Plan
CMR	conditional mortality rate
CNP	Cook Nuclear Plant
CO	carbon monoxide
CO_2	carbon dioxide
COE	cost of enhancement
COL	Combined License
Con Edison	Consolidated Edison Company of New York
CORMIX	Cornell University Mixing Zone Model
CPUE	catch-per-unit-effort
CRDM	control rod drive mechanism
CST	condensate storage tank
CV	coefficient of variation
CWA	Clean Water Act
CWIS	Circulating Water Intake System
CZMA	Coastal Zone Management Act
dB(A)	decibel(s)
DBA	Design-basis accident
DC	direct current
DDT	dichloro-diphenyl-trichloroethane
DEIS	Draft Environmental Impact Statement
DF	Decontamination Factor
DNA	deoxyribonucleic acid
DNR	Department of Natural Resources
DO	dissolved oxygen
DOC	dissolved organic carbon
DOE	U.S. Department of Energy
DOS	Department of State
DOT	U.S. Department of Transportation
DPS	Distinct Population Segment
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
ECL	Environmental Conservation Law
EDG	emergency diesel generator

EIA	Energy Information Administration
EIS	environmental impact statement
EFH	Essential Fish Habitat
ELF-EMF	extremely low frequency-electromagnetic field
EMR	entrainment mortality rate
Entergy	Entergy Nuclear Operations, Inc.
EOP	emergency operating procedure
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ER	Environmental Report
ER-M	effects-range-median
ESA	Endangered Species Act
F	Fahrenheit
F&O	Facts and Observations
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FES	Final Environmental Statement
FJS	Fall Juvenile Survey
FPC	Federal Power Commission
fps	feet per second
FPS	fire protection system
FR	*Federal Register*
FSAR	Final Safety Analysis Report
FSS	Fall Shoals Survey
ft	foot (feet)
ft^2	square feet
ft^3	cubic feet
FWS	U.S. Fish and Wildlife Service
g	gram(s)
gal	gallon(s)
gC_{eq}/kWh	gram(s) of carbon dioxide equivalents per kilowatt-hour
GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437*
GHG	greenhouse gas
GL	Generic Letter
gpm	gallon(s) per minute
GW	gigawatt
ha	hectare(s)
HAP	hazardous air pollutant
HLW	high-level waste
hr	hour(s)
HRA	Human Reliability Analysis

HRERF	Hudson River Estuary Restoration Fund
HRFI	Hudson River Fisheries Investigation
HRPC	Hudson River Policy Committee
HRSA	Hudson River Settlement Agreement
IAEA	International Atomic Energy Agency
IMR	impingement mortality rate
in.	inch(es)
INEEL	Idaho National Energy and Environmental Laboratory
IP1	Indian Point Nuclear Generating Unit No. 1
IP2	Indian Point Nuclear Generating Unit No. 2
IP3	Indian Point Nuclear Generating Unit No. 3
IPE	individual plant examination
IPEEE	individual plant examination of external events
ISFSI	Independent Fuel Storage Installation
ISLOCA	Interfacing Systems Loss of Coolant Accidents
IWSA	Integrated Waste Services Association
kg	kilogram(s)
km	kilometer(s)
km^2	square kilometer(s)
kV	kilovolt(s)
kWh	kilowatt hour(s)
lb	pound(s)
L	liter(s)
LERF	Large Early Release Frequency
LLMW	low-level mixed waste
LLNL	Lawrence Livermore National Library
LOCA	loss of coolant accident
LODI	Lagrangian Operational Dispersion Integrator
LOE	Line(s) of Evidence
lpm	liters per minute
LRA	license renewal application
LR	linear regression
LRS	Long River Survey
LSE	load serving entities
m	meter(s)
mm	millimeter(s)
m^2	square meter(s)
m^3	cubic meter(s)
m^3/sec	cubic meter(s) per second
MAAP	Modular Accident Analysis Program
MACCS2	MELCOR Accident Consequence Code System 2
MBq	megabecquerel
mg	milligram(s)

mgd	million gallons per day
mg/L	milligram(s) per liter
mGy	milligray
mi	mile(s)
min	minute(s)
MIT	Massachusetts Institute of Technology
mL	milliliter(s)
MLES	Marine Life Exclusion System
MMBtu	million British thermal unit(s)
mps	meter(s) per second
mrad	millirad(s)
mrem	millirem(s)
mRNA	messenger ribonucleic acid
MSE	mean squared error
MSL	mean sea level
MSPI	Mitigating Systems Performance Indicator
mSv	millisievert
MT	metric ton(s)
MTU	metric ton of uranium
MW	megawatt
MWd	megawatt-days
MW(e)	megawatt(s) electric
MW(h)	megawatt hour(s)
MW(t)	megawatt(s) thermal
MWSF	Mixed Waste Storage Facility
NAAQS	National Ambient Air Quality Standards
NARAC	National Atmospheric Release Advisory Center
NAS	National Academy of Sciences
NEA	Nuclear Energy Agency
NEPA	National Environmental Policy Act of 1969, as amended
NESC	National Electric Safety Code
NGO	Nongovernmental Organization
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NIRS	Nuclear Information and Resource Service
NMFS	National Marine Fisheries Service
NJDEP	New Jersey Department of Environmental Protection
NO_2	nitrogen dioxide
NO_x	nitrogen oxide(s)
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSSS	nuclear steam supply system
NWJWW	Northern Westchester Joint Water Works
NY/NJ/PHL	New York/New Jersey/Philadelphia

NYCA	New York Control Area
NYCDEP	New York City Department of Environmental Protection
NYCRR	New York Code of Rules and Regulations
NYISO	New York Independent System Operator
NYPA	New York Power Authority
NYPSC	New York Public Service Commission
NYRI	New York Regional Interconnect, Inc.
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSERDA	New York State Energy Research and Development Authority
NYSHPO	New York State Historic Preservation Office
O_3	ozone 8-hour standard
OCNGS	Oyster Creek Nuclear Generating Station
ODCM	Offsite Dose Calculation Manual
OMB	Office of Management and Budget
OPR	Office of Protected Resources
PAB	primary auxiliary building
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
pCi/L	picoCuries per liter
pCi/kg	picoCuries per kilogram
PDS	plant damage state
PILOT	payment-in-lieu-of-taxes
PM	particulate matter
$PM_{2.5}$	particulate matter, 2.5 microns or less in diameter
PM_{10}	particulate matter, 10 microns or less in diameter
POC	particulate organic carbon
PORV	power operated relief valve
POST	Parliamentary Office of Science and Technology
ppm	parts per million
ppt	parts per thousand
PRA	probabilistic risk assessment
PSA	probabilistic safety assessment
PV	photovoltaic
PWR	pressurized water reactor
PWW	Poughkeepsie Water Works
PYSL	post yolk-sac larvae
REMP	Radiological Environmental Monitoring Program
R-EMAP	regional environmental monitoring and assessment program
RAI	request for additional information
RCP	reactor coolant pump
RCRA	Resource Conservation and Recovery Act
RCS	reactor cooling system
REMP	radiological environmental monitoring program

RHR	residual heat removal
Riverkeeper	Hudson River Fishermen’s Association
RIS	Representative Important Species
RKM	river kilometer(s)
RM	river mile(s)
RMP	Risk Management Plan
ROD	Record of Decision
ROI	region of influence
ROW	right-of-way
RPC	long-term replacement power costs
rpm	revolutions per minute
RRW	risk reduction worth
RWST	refueling water storage tank
s	second(s)
SAFSTOR	safe storage condition
SAMA	severe accident mitigation alternative
SAR	Safety Analysis Report
SAV	submerged aquatic vegetation
SBO	station blackout
Scenic Hudson	Scenic Hudson Preservation Conference
SCR	selective catalytic reduction
SECPOP	sector population, land fraction and economic estimation program
SEIS	Supplemental Environmental Impact Statement
SFP	Spent Fuel Pool
SGTR	Steam Generator Tube Ruptures
SI	Safety Injection
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
SPDES	State Pollutant Discharge Elimination System
SPU	stretch power uprate
sq mi	square mile(s)
SR	segmented regression
SRP	Standard Review Plan
SRT	Status Review Team
SSBR	spawning stock biomass per-recruit
SSE	safe shutdown earthquake
Sv	person-sievert
SWS	service water system
t	ton(s)
TDEC	Tennessee Department of Environment and Conservation
TI-SGTR	thermally-induced Steam Generator Tube Ruptures
TLD	Thermoluminescent dosimeter
TOC	total organic carbon
TRC	TRC Environmental Corporation

Abbreviations and Acronyms

U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Atomic Energy Commission
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UWNY	United Water New York
V	volt(s)
VALWNF	value of non-farm wealth
VOC	volatile organic compound
WCDOH	Westchester County Department of Health
WISE	World Information Service on Energy
WJWW	Westchester Joint Water Works
WOE	weight of evidence
WOG	Westinghouse Owner’s Group
YSL	yolk-sac larvae
YOY	young of year
yr	year(s)

Appendix A

Comments Received on the Environmental Review

Continued from Volume 2

MR.OROS: Mine’s easy. It's Soros without the `S` or the billions. My name is George Oros. I'm a member of the Westchester County Board of Legislators. I represent the people that live in the shadow of Indian Point. The people of Buchanan, Cortland, Northern Yorktown and Peekskill. And it's ironic to me, as I often argue at my colleagues down-county how those of us who live closest to the plant have the least amount of alarm and concern. And that's probably because those of us that live closest, know the most about the plant and how it operates. One of the things I think has to be brought into mind, in addition to how this plant curbs the carbon emissions, how it's clean energy, how it provides the energy for about 21% of the region's needs. Beyond all of that there's another factor. This plant is a major employer of the people that live in my legislative district. In addition, it is the largest taxpayer to the school district, to the village of Buchanan, and believe it or not, this plant pays 1% of Westchester Counties property taxes. At a time when the economy is hurting, when the people I represent are hurting, we cannot afford to overlook that. You know, a few years ago there was a resolution passed by our Board of Legislators about Indian Point and the relicensing. But I would hope that those that want to use that as some sort of hammer to try to what prevent the relicensing read it carefully. Because that resolution is conditioned, very

130-a-AQ/SR

specifically, upon three things happening. 130-a-AQ/SR contd.

One of them is someone's going to have to replace the amount of tax dollars that this plant pays before it could close or not be relicensed. Secondly, hire the 900 people. Find them good meaningful jobs that are going to support their families and third replace all of the energy that this plant produces. I don't believe any of those three criteria can be met in the next decade and therefore I don't see how, if you just consider those factors and all the other factors, this plant cannot be relicensed. I'm sure the NRC, I'm sure the operators of this plant, I'm sure the State of New York, the local officials here in the county will do all they can to make sure that this plant is safe. That it is operated properly. I think that with all of those safeguards in place, the relicensing is something that we would all support here locally. So with that, I want to thank you for the opportunity to address you. I've never done this before, by the way, but I get a little tired of hearing the people out there who don't live in our community and they come to this community. We are in a community here, where we live very peacefully with Indian Point and appreciate what it does for our community. Thank you. 130-b-OP/SO/SR

MR. OTIS: Hi. My name is Mike Otis. I'm an electrical and computer engineering professor at a local university in New York State. I teach a variety of engineering courses as well as a non-engineering course entitled "Renewable Energy". This course looks at several of energy providing solutions for the future by exploring different technologies and uses a scientific approach in doing so. Nuclear energy plays a very important role in this course is an excellent topic to study when discussing viable solutions as well as public policy. It really makes for a great debate. I am pleasantly surprised by the open-mindedness of my students when they explore such controversial and interesting topic using research and math and science as their tools. At the beginning of this course, many of them had already drawn conclusions about nuclear energy that were based on fear rather than fact. For most, the fear is gone and their conclusions have changed. Now shifting gears to my engineering department. Our primary goal of the engineering department is to engage our engineering students in the learning process through hands-on experiences. So the intertwined roles of both conducting student research and acquiring scholarship funds are both seen as critical components in educating this nations next generation of scientists, mathematicians and engineers. This investment is exactly why I hear today. 131-a-OS

I want to make sure that you understand the important 131-b-SE

partnership my university has forged with Entergy and the Indian
Point Energy Center in seeding the development of our students.
Together with Entergy, we have created an excellent internship
program at Indian Point for both electrical and computer
engineering students. This site serves as one of the key
locations for students. For the past three summers, young men
and women have gained invaluable experiences in their focus of
study. This has far exceeded all my expectations. Entergy is 131-b-SE contd.
an investor in our students' futures, as well as the nation's
future. We are developing the next generation of engineers that
this country so desperately needs. Yet we have come to the
realization that their education cannot be confined within the
four walls of the classroom. So field experience, working side-
by-side with experienced engineers and technicians has enhanced
our students chances for success and invaluable for those
entering the workforce. The re-licensing of Indian Point is
critical to the future of our students, the future of the state
economy and the future of nuclear power in the United States.
Entergy exemplifies the best of corporate philanthropy and
they're providing the leadership and investment in education 131-c-SE/SR
while others are cutting and slashing their commitments to
educate today's and tomorrow's youth. That is why I strongly
support the re-licensing of Indian Point for an additional 20
years. Thank you.

Testimony of Michael Otis

Hello, my name is Michael Otis, and I am an Electrical/Computer Engineering Professor at a local (New York) university. I teach a variety of engineering courses as well as a non-engineering course for the masses titled "Renewable Energy." This course looks at several energy-providing solutions for the future by exploring different technologies and using a scientific approach.

Nuclear energy plays a very important role in this course and is an excellent topic to study when discussing viable solutions as well as public policy – it makes for great debate! I am pleasantly surprised by the open-mindedness of my students when they explore such a controversial (and interesting) topic using research (and math/science) as their tools.

At the beginning of this course many of them had already drawn conclusions (about nuclear energy) that were based on fear rather than fact. For most, that fear is gone, and their conclusions have changed.

A primary goal of our Engineering department is to engage our (engineering) students in the learning process through hands-on experiences, so the intertwined roles of both conducting student research and acquiring scholarship funds are both seen as critical components in educating this nation's next generation of scientists, mathematicians and engineers.

This investment is exactly why I am here today, before this distinguished panel of fellow men and women of science. I want to make sure that you understand the 131-d-SE important partnership my university has forged with Entergy and the Indian Point Energy Center in seeding the development of our students.

Together with Entergy, we have created an excellent internship program at Indian Point for both Electrical and Computer Engineering students. This site serves as one of the key locations for students in the School of Engineering, and for the past 3 summers, young men and women have gained invaluable experiences in their focus areas of study – far exceeding my expectations.

The reason this program works so well is because Entergy employees share the school's passion for science, and learning more about how we can continue harnessing nuclear power for a cleaner energy future for the country, if not the world.

131-d-SE contd.

Entergy is an investor in our students' futures, as well as this nation's future. We are developing the next generation of engineers that this country so desperately needs. Yet, we have come to the realization that their education cannot be confined to staying within the four walls of a classroom, and so field experience – working side-by-side with experienced engineers and technicians – has enhanced our students' chances for success and invaluable for those entering the workforce.

However, the benefit of Indian Point to our students and faculty runs deeper than just their investment in education. Indian Point provides affordable, clean energy to the New York Power Authority through long-term contracts, and that NYPA power flows through the heart of school systems just like ours throughout New York State. Therefore, during this time of great economic need, when our students are being asked to pay more for their education, I am frightened to think

131-e-AQ/EC/SR

of the impact much-higher electricity prices would have on the public education system of this state.

How can we afford to both lose 2,000 megawatts of much-need power, and lose our capabilities to attract and educate those New York residents seeking a quality and affordable education – especially in those important areas of math and science we so desperately need in this state?

Equally CRITICAL and certainly overlooked is the simple fact that Indian Point generates electricity without producing virtually any greenhouse gas emissions, unlike natural gas or coal facilities. Annually, nuclear power in New York avoids 42,000 tons of nitrous oxide, which is the equivalent of 22 million passenger cars on our roads.

The relicensing of Indian Point is critical to the future of our students, the future of the state economy, and the future of nuclear power in the United States. Entergy exemplifies the best of corporate philanthropy, and they are providing the leadership and investment in education, while others are cutting and slashing their commitments to educate today's and tomorrow's youth.

That is why I strongly support the relicensing of Indian Point for an additional 20 years.

Thank you.

131-e-AQ/EC/SR contd.

MR. PARKER: Thank you, Lance. Good afternoon everyone. My name is John Parker and I am the regional attorney for the Department of Environmental Conservation Region 3. I'm here today in my official capacity representing the executive agencies of the State of New York. I wanted to welcome the NRC, NRC staff, the applicant, local residents and others to our wonderful lower Hudson Valley region. We appreciate the opportunity to present to the NRC our comments on Supplement-38 to the Generic Environmental Impact Statement. We will submit more detailed written comments by the close of the comment period on March 18th.

There has never been a complete and thorough environmental review of Indian Point, even though environmental reviews are routinely done on applications like this one. The State of New York has and will continue to participate in this process, but the draft is inadequate, incomplete and reaches the wrong conclusion preliminarily. There's a commitment by New York to bring renewable energy and energy conservation measures to the forefront of a sustainable energy future. These efforts are part of the state's action to reduce climate change impacts. Yet this review today remains in many ways isolated from all of the change going on around it. 132-a-AL

We call upon NRC to do a full and thorough environmental review required by law as this process moves from 132-b-NE a draft to a final stage. On balance, the state is convinced that a full and complete record will lead to only one conclusion about the environmental impacts of this facility. The Draft Supplemental EIS, which has been issued by NRC ostensibly to fulfill its obligations underneath NEPA, which is the National Environmental Policy Act, that requires the government to look at the environmental impact of the decisions before it makes them. Now, Indian Point is a nuclear generating facility, as we all know. The license is for an additional 20 years. But let's look at the environmental impacts.

132-b-NE contd.

In the process of generating electricity, Indian Point consumes 2.5 billion gallons of Hudson River water each day. This process has significant impacts and kills billions of fish and other aquatic organisms each year in addition to numerous other impacts. The Draft Supplemental EIS, as we've learned, concludes preliminarily that the environmental impacts would not preclude a 20-year extension.

132-c-AE

This Supplemental EIS accepts significant environmental impacts as quote unavoidable. We do not accept this premise nor that they are inevitable.

132-d-GI/LR

The Department of Environmental Conservation, or DEC, commented on the scope in the fall of 2007, and we submitted detailed written comments in October of 2007 as well. These comments raised several environmental issues that are not addressed in a December 2008 draft that we are to talk about

132-e-AE

today. Turning to some of those issues. New York raised the category of aquatic ecology. As you've heard: entrainment, impingement and thermal impacts to the Hudson River. The NRC's analyses of these impacts undermines its conclusions. We have many questions regarding these analyses, including whether the data reviewed were analyzed correctly. Whether the data support the conclusions reached. Whether the conclusions that the NRC reached our consistent with state and federal standards for the Hudson. And importantly, whether these conclusions are consistent with parallel proceedings before our agency, DEC. 132-f-AE

MR. RAKOVAN: Mr. Parker, if you can summarize, please. I'm sorry.

MR. PARKER: Okay. I do show -- it's difficult for multiple agencies.

MR. RAKOVAN: I understand, but I've got a lot of people who want to speak.

MR. PARKER: I have about -- OK. Additional issues which we have a concern with are endangered species, the socioeconomic impacts, historical impacts, impacts of the coastal zone, which we feel are not adequately addressed. We also have concerns about the generic nature of the review and the failure to address site specific issues such as the evacuation planning, seismic earthquake hazards, possibility of terrorist attacks and long-term storage of spent nuclear fuel. 132-g-GI/LR

In conclusion, there is nothing inevitable or unavoidable about the environmental impacts of the operation of Indian Point.

The Draft SEIS review inadequately addresses many of the environmental issues that the NRC is obligated to analyze and assess. Yet despite these shortcomings, or perhaps because of them, the Supplement concludes that the current level of environmental impacts do not need to be altered or changed and that these impacts should not serve as impediment to license renewal. We disagree and note that the NRC's conclusions do not address issues raised by the State of New York in its scoping process. Thank you.

132-g-GI/LR contd.

MS. PERRY: Okay, I just want to make a correction. Good afternoon, my name is Sharonee Perry. I am a community activist and consultant. As a former chairperson of community Board 3 in Brooklyn, I would like to take this time to discuss the many reasons I believe that Indian Point Energy Center should receive a new license valid for 20 years. In this time of financial crisis, we much carefully examine any proposal that would cause costs to rise for New York City families. Currently Indian Point helps to stabilize energy costs in Brooklyn. While the cost of oil and gas energy can change dramatically based on factors beyond our control, nuclear energy costs are relatively consistent. Many of the lower income communities of Brooklyn, rising costs are making it increasingly difficult for families to survive in order to heat their homes. 133-a-EC/SO/SR

Independent studies show that closing Indian Point can raise energy costs for families by thousands of dollars per year. 133-b-EC Stabilizing energy costs isn't the only reason to keep Indian Point open for our communities. The quality of air that we breathe decreases as more and more people move into Brooklyn, increasing the number of cars that are being used. New York City's air is already harmful. It violates federal safety standards. Because of the poor air quality, our children suffer from asthma. I am a witness to that who has a grandson who is a 133-c-AQ chronic asthmatic, who I almost lost twice. The poor air quality in our community is particularly caused by the same dirty power plants that would replace Indian Point if it closed.

133-c-AQ contd.

Brooklyn cannot afford to have more of these dirty plants pumping toxic fumes into the air, putting our families in more danger. Unlike dirty plants, Indian Point provides clean and affordable energy to New York City. Re-licensing Indian Point would keep Brooklyn's air-quality from becoming more harmful and pave the way for New York to develop clean energy sources throughout the city. As Chair of Community Board 3, I've worked with many people, businesses and institutions that keeps Brooklyn strong. Indian Point is part of the larger community affecting Brooklyn that we cannot afford to lose. Thank you.

133-d-AL/AQ/SR

MS. PERRY: Good evening. I'm Donzella Perry. I am a Brooklyn resident in support of re-licensing Indian Point. New York City's air quality is so dangerous that it falls far below already lax federal standards. Yet, opponents to Indian Point want to close the Center forcing the construction of dirty power plants that will cause our air quality to plummet even further. Indian Point offers clean, affordable energy to New York City and reduces the overall carbon footprint of the city. I along with the members of my community support relicensing Indian Point because it reduces the amount of greenhouse gas emissions and pollution and sets a precedent for the rest of the city to offer clean energy sources throughout New York. 134-a-AL/AQ/GI

The dangers air-quality in Brooklyn is particularly to the most vulnerable of our society, children in low-income families. Our children have breathed dirty city air for their entire lives and have asthma rates that are four times the national average.

Parents in low income families cannot afford to pay for proper care and medication to keep their children’s asthma under control. As a result, low income children miss school days and must depend on emergency care to respond to preventable asthma attacks. The cause for the high incidence of asthma, poor air-quality, is man-made and preventable. Closing Indian Point will only make matters worse. New York should be moving 134-b-AL/AQ/EJ towards making all of its power plants cleaner, more efficient and more affordable for our communities. Closing Indian Point and relying on dirty power plants to pick up the slack is not only dangerous for our families, it is irresponsible for the future of our city. Our children that are severely asthmatic are our endangered species.

134-b-AL/AQ/EJ contd.

1 **IPRenewalCEmails** ML 090640206

2

From: Leslie Pilder [lpilder@optonline.net]
Sent: Thursday, February 26, 2009 8:31 PM
To: IndianPointEIS Resource
Subject: Indian Point

Dear Sir or Madam:

I oppose the license renewal of Indian Point, and am most disturbed by the most recent leak. We have been lucky so far; are we really going to wait until people die before we shut down this plant? 135-a-LE/OR

I am particularly concerned about the following environmental impacts:

•**The continuing leak of radioactive water** from the Indian Point 2 spent fuel pool into the groundwater and Hudson River, and the residual contamination caused by the plumes of contaminated groundwater that slowly leach toxic strontium-90 and cesium-137 into the Hudson River. 135-b-LE

•**The long term storage of thousands of tons of highly toxic nuclear waste** on the banks of the Hudson River, currently housed in poorly maintained spent fuel pools and "dry casks" that are vulnerable to terrorist attack. 135-c-RW/ST

Thank you for your time.
Sincerely,

Leslie Pilder
Nyack, NY 10960

MR. POCKRISS: Good afternoon. I'm Peter Pockriss, Director of Development for Historic Hudson Valley. And I appreciate the opportunity to say a few words to you today. We're a non-profit organization that operates six historic sites along the Hudson River, including Van Cortlandt Manor, which is not too far from here and is the site of the great Jack-o-lantern Blaze which many of you may be familiar with. Our museum properties are treasured community resources. They're tourist destinations that attract thousands of visitors from across the world. They are learning laboratories that serves some 35,000 school children a year. Many from disadvantaged backgrounds. Entergy has been a longtime philanthropic investor in our mission. The companies partnership has enabled us to launch the great Jack-o-lantern Blaze and Winter Wonderlights. These family events have become cherished holiday traditions for the people of our communities. These heritage tourism events are also important engines of the local economy. 136-a-CR/SO/SR

Many of the 85,000 people who attended last year stayed in area hotels, dined in restaurants and shopped on our main streets. Blaze and Wonderlights have also had a tremendous impact on Historic Hudson Valley's own work, boosting revenue, our membership base and awareness about our 136-b-SO/SR sites and educational programs. Entergy truly represents the gold standard for corporate philanthropy here in Westchester County. Historic Hudson Valley and other non-profits across the county and across the nation have benefited from millions of dollars in philanthropic support from Entergy.

136-b-SO/SR contd.

But beyond contributed dollars, we also benefit in a variety of other meaningful ways. From the guidance and expertise of the leadership team at Entergy's regional headquarters. From the volunteer hours donated by Indian Point employees. From Entergy sponsored workshops and seminars, which empower our staffs. From networking opportunities, which foster greater cooperation among those of us in the non-profit sector. And from promotional initiatives that drive people to our programs and our events. All of us at Historic Hudson Valley are proud to call Entergy a friend, a committed neighbor and a partner in our efforts to enrich the quality of life along the Hudson. It's our great hope to continue to work side-by-side with Entergy for many years to come. Thank you.

136-c-SE

MS. PUGLISI: Hi everybody, welcome to the Town of Cortlandt. As he said, my name is Linda Puglisi. I've been supervisor of our lovely town for a several years now. Entergy/Indian Point is in our great village of Buchanan, in our town of Cortlandt. Our role over the years has been to monitor the safety, security of the facility prior to Entergy owning it. And of course now that Entergy owns it, and if I say so myself, Entergy has done a better job. I was here for many years before, so I can tell you other stories, but that's not the point for this evening. Our town board and I have not said close the plant. We have said consistently, keep it safe. Please keep it safe for our residents. 137-a-SA/SR

As I said before, this has been our role. To go all the meetings. We've gone to many meetings, public hearings. Raised our questions. Asked the pertinent questions, which we have the right to know to disseminate the information to our citizens. We realize this forum tonight is not to address the safety and security of the facility, but to address the environmental issues, so if I just may raise some things that I would like the NRC to please consider as they proceed in this process. Please address the storage of the spent nuclear waste on-site in the DSEIS. Consider all feasible alternatives regarding severe accident mitigation alternatives are important. Thank you. Take a hard look at releases of radiological 137-b-GW/RW/PA/SF contaminants into groundwater and into the atmosphere of course. In the year 2000, I think it was, there was a release that we had to monitor and be on concerned about as you all recall. And address the storage of the spent nuclear waste on the site.

137-b-GW/RW/PA/SF contd.

Under NEPA, an agency must take a hard look at the consequences of its proposed actions and provide important information to the public. Under an EIS, an EIS cannot rely solely on unsubstantiated assertions. We have a whole list, which I've submitted to the NRC. I won't go through all the list, I promise you, but there are many points that we would like the NRC to consider as they review the environmental aspects of this secret process.

137-c-NE

One thing that was really upsetting to us on the town board, as I said in my opening remarks that it's in the town of Cortlandt, we had passed a resolution sent it onto the NRC wanting to be an intervener. Which means that we wanted to have a chair at the table, a seat at the table, to raise our questions and be there as the process goes on. But we were denied and so I just have a little point to make about that that I think that the host community should've been seated at the table. Then the gentleman brought up before about, bring back the National Guard. We wrote a letter to the governor saying, please return the National Guard, Coast Guard cutters, no-fly zone. I've been saying for a decade, let's keep them. Let's

137-d-LR/ST

bring them back. These are things that we need. Safety and security is what I monitor. That's what our town board monitors. I thank you very much for listening to me tonight. 137-d-LR/ST

LINDA D. PUGLISI
TOWN SUPERVISOR

TOWN OF CORTLANDT

OFFICE OF THE SUPERVISOR
TOWN HALL
1 HEADY STREET
CORTLANDT MANOR, N.Y. 10567-1254
(914) 734-1002
(914) 734-1003 fax
www.townofcortlandt.com

TOWN BOARD

RICHARD H. BECKER
FRANCIS X. FARRELL
ANN LINDAU
JOHN E. SLOAN

February 12, 2009

Nuclear Regulatory Commission
Region I 475 Allendale Road
King of Prussia, Pennsylvania 19406

To Whom It May Concern,

Enclosed please find the recommendations regarding the Indian Point Entergy Nuclear Facility's license renewal, from the Cortlandt Town Board and Supervisor. As you are aware, the Indian Point Entergy Facility is located in the Town of Cortlandt, New York. Please review the recommendations and contact me if you should have any questions.

Sincerely,

Linda D. Puglisi
Town Supervisor

LDP/jp

TOWN OF CORTLANDT

OFFICE OF THE SUPERVISOR
TOWN HALL
1 HEADY STREET
CORTLANDT MANOR, N.Y. 10567-1254
(914) 734-1002
(914) 734-1003 fax
www.townofcortlandt.com

LINDA D. PUGLISI
TOWN SUPERVISOR

TOWN BOARD
RICHARD H. BECKER
FRANCIS X. FARRELL
ANN LINDAU
JOHN E. SLOAN

February 12, 2009

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop TWB-05-B01
Washington, D.C. 20555-0001

Re: Comments to Draft Supplemental Environmental Impact Statement Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3

Dear Sir or Madam:

The Town of Cortlandt ("Cortlandt") surrounds the Indian Point Nuclear Reactor, and its residents would be amongst the hardest hit if there was any leak or other malfunction at Indian Point. Nevertheless, Cortlandt is cognizant of the country's need for alternate energy sources and the suggestion by many that nuclear energy is part of the solution to our energy and related national security problem.

We realize that this forum is concerned about the adequacy of the Draft Supplemental Environmental Impact Statement ("DSEIS") as it relates to the relicensing of Indian Point, and therefore the competing issues of safety and national security cannot be resolved in this proceeding. However, the competing issues cause us to focus on what must be the central concern of these proceedings, the ongoing safety of Indian Point and the potential harm to human health and the environment. The Nuclear Regulatory Commission ("NRC") must put aside procedural technicalities about what should be studied outside of the re-licensing process and address to the satisfaction of Cortlandt and the people of America that if Indian Point Units 2 and 3 are re-licensed, there will be no threat to human health, no adverse impact on the environment, and that Entergy, the applicant, under the watchful eye of a diligent government, will take all the necessary steps to insure that these goals are met. 137-e-LR

1

To this end, we must be assured that the requirements of the National Environmental Policy Act ("NEPA") are carried out with the utmost diligence and dispatch. However, the substantial inadequacies found in the DSEIS demonstrate that the NRC Staff has not satisfied its responsibilities under NEPA or the regulations implementing it. We address, in detail, the following issues:

- The DSEIS does not adequately address the storage of spent nuclear waste on-site;
- The DSEIS fails to adequately assess the impacts of cooling towers on transportation, aesthetics, and historic resources;
- The DSEIS fails to consider all feasible alternatives regarding Severe Accident Mitigation Alternatives ("SAMAs");
- The DSEIS fails to take a "hard look" at releases of radiological contaminants into groundwater;
- The DSEIS unlawfully defers discussion and analysis of the potential replacement of reactor vessel heads and control rod drive mechanisms ("CRDMs"); and
- The DSEIS unlawfully defers discussion of decommissioning of Indian Point.

137-f-AL/LE/PA/RF/SF

A. The DSEIS does not adequately address the storage of spent nuclear waste on-site

Entergy has not adequately addressed the facility's capability to store spent nuclear waste on-site if Indian Point is re-licensed for an additional twenty years. Until July 2008, Entergy shipped a portion of its radioactive waste to facilities in Tennessee, Utah, and South Carolina. In July of last year, the State of South Carolina closed access to its radioactive waste generators to states that are not part of the Atlantic Low-Level Waste Compact, thus prohibiting Entergy from shipping any of its radioactive waste to facilities in South Carolina. Although Entergy claims that they will be able to safely store the additional low-level waste on site, they have not even completed their comprehensive plan to address these long-term storage needs. Neither Entergy nor NRC Staff explain how this extra waste will be safely stored on-site nor does the DSEIS discuss the environmental impacts of storing this extra waste. Under NEPA, an agency must take a "hard look" at the consequences of its proposed actions and provide important information to the public. Further, an EIS cannot rely on unsubstantiated assertions. By failing to provide the public with Entergy's comprehensive plan to address its storage needs, NRC Staff has not provided important information to foster informed public participation, and therefore does not ensure that the public and the environment will be protected from the impacts of storing this additional waste.

137-g-NE/RW

1

B. Closed-Cycle Cooling Tower

The New York State Department of Environmental Conservation has determined that it will most likely require a closed-cycle cooling system at Indian Point instead of the existing once-through cooling system if the facility is re-licensed. The DSEIS fails to adequately assess the impacts of a cooling tower system on transportation, land use, and historic resources and does not study the logistics for constructing the cooling towers.

The DSEIS states that although "some adverse transportation impacts are likely" such impacts would occur during site excavation and construction of the towers and "would return to current levels following construction" and states that "the closed-cycle cooling system would have little to no effect on transportation, and . . . [a]s noted previously, fogging and icing is not expected to be significant." However, the DSEIS does not state that fogging and icing effects will be insignificant. Rather, it states that the towers will produce a visible fog. The DSEIS in one breath says that there will be no effect, and in the next states that there will be an effect. Such inconsistencies, without any justification, demonstrate NRC Staff's failure to comply with the requirements of NEPA and the inadequacy of this EIS.

Additionally, the DSEIS fails to analyze the impacts of cooling towers on numerous historically and culturally significant resources in previously undisturbed areas. Even more egregious is the fact that Entergy admits that it must conduct such a survey but has not yet done so. An EIS may not defer assessment of impacts to historical and cultural resources until some point after the NEPA process is complete. Nor may an EIS allege that the impacts of an action are "SMALL" before conducting the necessary studies.

137-h-AL

C. Severe Accident Mitigation Alternatives (SAMAs)

The DSEIS states that areas exist "in which risk can be further reduced in a cost-beneficial manner through the implementation of . . . cost-beneficial SAMAs" and that "further evaluation . . . is warranted." However, the DSEIS improperly defers further analysis of these SAMAs, claiming that because they do not "relate to adequately managing the effects of aging" during the re-licensing period, Entergy does not have to conduct such analysis now. An EIS must rigorously explore and objectively evaluate all reasonable alternatives, the heart of an EIS, and not defer their analysis to some undetermined point in the future. The cost-beneficial SAMAs are feasible alternatives which must be analyzed in this DSEIS.

137-i-PA

D. Radiological Releases

The DSEIS describes the radiological releases from Indian Point's spent fuel pools as new but not significant information, thereby enabling Entergy to hide behind the GEIS and not conduct any site-specific analysis. Release of radiological contaminants into groundwater is both new and significant. By not sufficiently addressing radiological releases, NRC Staff has failed to take the requisite "hard look."

137-j-RI

1

Entergy admits that consumption of fish and invertebrates from the Hudson River is a "noteworthy dose pathway" for human exposure to radionuclides released from Indian Point's spent fuel pools, but that the calculated dose to the public is below the federal limits. The DSEIS also states that no radioactivity above background levels was detected during NRC Staff's "most recent sampling and analysis of fish and crabs taken from the affected portions of the Hudson River." However, the sampling results are not included in the DSEIS, and thus, hidden from public scrutiny. Other than taking Entergy at its word, which Cortlandt is not willing to do, there is no way to justify this statement. 137-j-RI contd.

E. Potential replacement of reactor vessel heads and control rod drive mechanisms (CRDMs)

Entergy stated that it may replace the reactor vessel heads and CRDMs if Indian Point's license is renewed. However, neither the Environmental Report nor the DSEIS discuss the impacts of replacing this equipment or any mitigation measures that may be necessary. It is settled law that an EIS cannot defer the identification and assessment of mitigation measures to some future date, thus denying the public the opportunity to review and comment on proposed mitigation. Nor can this DSEIS defer its discussion of the impacts of replacing the reactor vessel heads and CRDMs.

Because the NRC Staff refuses to analyze the impacts of replacing this equipment, the DSEIS does not provide a cost-benefit analysis for their replacement – information that is essential for the public to be able to adequately comment on this EIS. The DSEIS must include a cost-benefit analysis because it is essential for determining the alternatives considered and is relevant to mitigation. 137-k-RF

F. Decommissioning

NRC Staff claims that decommissioning is not a site-specific issue, and therefore does not have to be addressed in this DSEIS. However, South Carolina's recent legislation prohibiting Entergy from disposing Indian Point's radioactive waste at its repositories is both new and significant information. As a result, Entergy will have to store more waste on-site, and thus manage a greater amount of waste during decommissioning.[1] However, the DSEIS fails to discuss the environmental impacts of this new and significant information. Impacts of this storage, alternatives to storing on-site, and mitigation measures to storing additional radioactive waste must be addressed in the DSEIS. 137-l-DC/RW

G. Conclusion

For the reasons stated above, both individually and in the aggregate, NRC Staff must address the following issues: (1) storage of additional radioactive nuclear waste on-site; (2) impacts of a closed-cycle cooling tower on transportation and historic resources; (3) feasible alternatives regarding SAMAs; (4) impacts of radiological releases from spent fuel pools into groundwater and the Hudson River; (5) impacts, alternatives, and mitigation measures for the

[1] If NRC does not renew Indian Point's license, the facility must still manage and store five (5) years additional waste for Indian Point Unit 2 and seven (7) years additional waste for Indian Point Unit 3.

2

potential replacement of reactor vessel heads and CRDMs; and (6) impacts of decommissioning on the surrounding environment.

Very truly yours,

Linda D. Puglisi
Supervisor, Town of Cortlandt

TOWN OF CORTLANDT

OFFICE OF THE SUPERVISOR
TOWN HALL
1 HEADY STREET
CORTLANDT MANOR, N.Y. 10567-1254
(914) 734-1002
(914) 734-1003 fax
www.townofcortlandt.com

LINDA D. PUGLISI
TOWN SUPERVISOR

TOWN BOARD
RICHARD H. BECKER
FRANCIS X. FARRELL
ANN LINDAU
JOHN E. SLOAN

A PRACTICAL PLAN for: Indian Points Entergy Nuclear Facility License Renewal

Recommendations by
Town of Cortlandt Supervisor
Linda D. Puglisi and Town Board
To the NRC
August 1, 2007

---

1. Re-licensing decisions of Indian Point 2 and Indian Point 3 nuclear reactors should not be made or progressed in the time line schedule proposed until all of the environmental issues and problems have been adequately addressed, studied and corrected. (e.g.: recently discovered storage unit of radiological matters found due to the comprehensive baseline evaluation by the NRC; conclusive findings of the groundwater leaks discovered during the construction of dry cask storage units for the radioactive spent fuel rods; in-depth air and soil testing.) 137-m-LR

   Note: *The Town Board and I have supported Congressional bills for independent audits of these issues. Yes, we are aware that there are other tests underway by Entergy, NRC and the NYS DEC. However, we support a total independent audit be completed, as well.*

2. The sixty (60) days, with the clock ticking, is **not** sufficient amount of time for **all** interested parties, entities and individuals to prepare their comments and submit reports to be entered into the record. July and August, of which the sixty days include, are summer vacation months and therefore, many groups or individuals may not have ample time to put together their opinions and documents. An extension of the sixty (60) days is needed and necessary. A decision of this importance deserves more time for commentary. 137-n-LR

3. If the NRC, after the three-year period and review of all comments decides to grant a re-licensing of Entergy Nuclear facilities, a twenty (20) year extension is too great. It would allow the owner, Entergy, even though they would state all good intentions, to relax to some degree. It's human nature. Therefore, I suggest consideration of a shorter interval for an extension, perhaps five years and then thorough baseline studies should again be completed due to the age of these plants before another five- year extension is considered and granted by the NRC. Also, an increase in betterments/benefits for the community. 137-n-LR contd.

4. If the NRC **decides not** to grant re-licensing of the Entergy Nuclear facilities at Indian Point then there has to be strong consideration given to address the economics, reclamation, security, and safety at this site.

   The workers cannot lose their jobs. Many individuals have spent their entire professional careers working diligently at these plants. Tax revenue and now a P.I.L.O.T. agreement (payment in lieu of taxes) are distributed amongst three levels of government; a school district, a library system and a fire district. All entities depend on these monies to offset their annual budgets and therefore assist the local taxpayers.

   Therefore, these critical issues must be resolved similar to what occurred with the closure of the General Motors Plant (3,000 jobs) in the Village of Sleepy Hollow, Westchester County in the late 1980's. Individuals were retrained and relocated to other General Motors plants and the revenue issue was also spread over several years in an agreement. Entergy would need to keep a workforce at this location for various current and future tasks. Security and safety of this facility would always be a factor, since the radiological spent fuel rods are and will remain for many years at this location, if not permanently. 137-o-SO

5. Safety and security issues lead me to my ongoing request and plea to have a total **no-fly zone** over these nuclear plants. I've been publicly calling for this action since the tragedy of 9/11/01. I had a press release a few days after this terrible incident and sent it to our Federal and State officials. I have been told that there are fewer flights, however, this is not satisfactory, especially since we recently learned that re-routing of flights could increase activity in our area. This FAA decision is not acceptable and must be challenged. Once again, we need a no fly zone over Indian Point. 137-p-ST

6. The Town of Cortlandt retained a consultant to assist the Town Board and I with local planning in case of an emergency at Indian Point. The recommendations can also be utilized for other emergencies (e.g. hurricane, tornado, earthquake, severe flooding etc.) This report will be submitted to the public in September 2007 and its goal is to partner with and enhance the existing Evacuation Plan with more specific recommendations for the local level 137-q-EP

7. **Finally:** I have publicly stated many times that a Blue Ribbon Commission/task force needs to be appointed by the Governor once again similar to what was established with the General Motors Plant in the late 1980's. At the federal level, a Commission was put in place to evaluate 9/11 and the Iraq War. Findings and recommendations are results of these studies and commissions to benefit all parties involved. This Commission needs to begin immediately whether or not the NRC decides to grant a re-licensing or not so that there can be an ongoing dialogue implemented in an orderly and objective manner. 137-r-LR

Submitted by:

Supervisor Linda D. Puglisi
and
Cortlandt Town Board Members

Drew Stuyvenberg

Project Manager

U.S. Regulatory Commission

andrew.stuyvenberg@nrc.gov

Re: Application for license renewal at Indian Point

I am a student at Ramapo College of New Jersey in the environmental program and I have been evaluating the DEIS for the re-licensing of Indian Point Nuclear Power Plant. When reviewing the Environmental Justice sections in the DEIS I noticed in section **3.1.10. Environmental Justice—Refurbishment** it is stated "Since IP2 and IP3 are located in a high-population area, the small, short duration change in employment associated with the potential replacement activities would likely have no noticeable effect on minority and/or low-income populations in the region. Because of the short duration of the replacement activity for each unit's reactor vessel head and CRDMs, and based on the analysis of impacts for the other resource areas discussed in Section 3.1, there would be no disproportionately high and adverse impacts to minority and low-income populations in the immediate vicinity of IP2 and IP3." According to the United States EPA Office of Environmental Justice defines EJ as follows:

"Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."

138-a-EJ/HH/LE

From my understanding the EIS only addresses the issues of impacts on minority and low-income populations in the immediate vicinity of IP2 and IP3. When defined EJ also covers protection from health hazards for the right to live, work and learn in a safe healthy environment. According to a current study in Human Breast milk and goat milk near Indian Point shows elevated levels of Strontium-90 which is a fission product of nuclear testing. Strontium-90 is known to cause bone cancer, leukemia and other diseases of the immune system. This product is associated with nuclear power sources as a decay product and is known to be produced naturally in minute doses and does not occur in large amounts in nature.

I feel further testing needs to be done in the area of IP2 and IP3 to determine the effects of the Strontium-90 on human and animal health. The Strontium can be carried by the river and disbursed further away from the site so all areas that can come in contact should be studied to determine if the area is in fact a safe and healthy place to live, work and learn.

Thank You,

Kira Race

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
408 Atlantic Avenue – Room 142
Boston, Massachusetts 02210-3334

TAKE PRIDE IN AMERICA

March 17, 2009

9043.1
ER 09/81

Chief, Rules Review and Directives Branch
Division of Administrative Services
Office of Administration, MS TWB-05-BOI
U.S. Nuclear Regulatory Commission
Washington, DC 20555

RE: COMMENTS
Generic Environmental Impact Statement
Supplement 38, NUREG-1437
Indian Point Nuclear Generating Unit 2 & 3
Westchester County, New York

Dear Chief, Rules Review and Directives Branch:

The U.S. Department of the Interior (Department) has reviewed the December 2008, "Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Power Plants, Supplement 38", regarding the relicensing of Indian Point Nuclear Generating Unit Nos. 2 and 3. The Nuclear Regulatory Commission (NRC) has requested comments on the GEIS Supplement 38 which evaluates potential impacts from the relicensing of the Indian Point Nuclear Plants for an additional 20-year period.

This report of the Department is submitted for project planning purposes under the National Environmental Policy Act. Additional comments may be provided in the future pursuant to, and in accordance with, provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), as well as other legislation.

BACKGROUND

Indian Point Nuclear Generating Units 2 and 3 are operated by Entergy Nuclear Operations, Inc., and are located along the Hudson River in the Town of Buchanan, Westchester County, New York. Indian Point Unit 2 has operated since August 1974 and Indian Point Unit 3 has operated since August 1976. The operating licenses will expire in 2013 and 2015, respectively. Both units use Westinghouse pressurized water reactors and nuclear steam supply systems, with cooling provided by a once-through (open) cooling system that uses water from the Hudson River.

1

Supplement 38 (or the Supplemental Environmental Impact Statement – SEIS) for Indian Point Nuclear Units 2 and 3 serves as an addendum to the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants {GEIS}" that evaluated the environmental impacts of nuclear power generation. The GEIS identified 92 environmental issues and reached generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. The NRC has determined that information provided during the scoping process was not new and significant with respect to conclusions in the GEIS. Therefore, the NRC concluded that the impacts of renewing licenses for Indian Point Units 2 and 3 will not be greater than the impacts identified for these 69 issues in the GEIS. Plant-specific review is required for the remaining 23 issues. Of the remaining 23 issues, those that apply to Indian Point Units 2 and 3 are addressed in the SEIS.

The NRC has established a three-level standard of significance for evaluating the environmental impact of nuclear power plants – SMALL, MODERATE, or LARGE. Essentially, "SMALL" environmental impacts are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. "LARGE" impacts are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The NRC has determined that the significance of potential environmental impacts related to operating license renewal for Indian Point Units 2 and 3 is "SMALL", with four exceptions:

- Impingement of aquatic organisms
- Entrainment of aquatic organisms
- Heat shock from the facility's heated discharge
- Impacts to aquatic endangered species

SPDES PERMIT HISTORY

Since project licensing, there have been issues relating to significant impacts to aquatic resources as a result of entrainment, impingement, and heat shock from Indian Point operations. In 1975, the U.S. Environmental Protection Agency (EPA), issued permits for Indian Point Units 2 and 3 that required the construction of cooling towers. The utility company contested the permits and requested adjudicatory hearings. As a result of subsequent hearings, the Hudson River Settlement Agreement was reached between the owners of Indian Point Units 2 and 3, Roseton, and Bowline plants, as well as a number of parties, including the EPA, New York State Department of Environmental Conservation (NYSDEC), Scenic Hudson, and the Hudson River Fisherman's Association. This agreement required mitigation to reduce fish mortality. Mitigation included seasonal outages during sensitive aquatic life stages, installation of variable speed pumps, and a biological monitoring program.

The NYSDEC, under authority from EPA, issued State Pollution Discharge Elimination System (SPDES) permits to Indian Point Units 2 and 3 in 1982, requiring the implementation of these mitigative measures. The SPDES permit expired in 1987 and the mitigative measures required under the settlement agreement have continued under consent orders as the NYSDEC and project operator strive to resolve issues.

The NYSDEC prepared an environmental impact statement in 2003 concerning SPDES permit applications from Indian Point Units 2 and 3 (and Roseton and Bowline). The NYSDEC issued a preliminary determination, in their 2003 draft SPDES permit, that closed cycle cooling is the site-specific best technology to reduce impacts on fish and shellfish.

Aquatic Resources

The Hudson River, in the project vicinity, supports a diverse assemblage of aquatic organisms. The National Marine Fisheries Service has designated the Hudson River as Essential Fish Habitat, due to its value for maintaining 34 commercially important fish species. Piermont Marsh, Iona Island, Tivoli Bays, and Stockport Flats are National Estuarine Research Reserves located within the lower Hudson River. The U.S. Fish and Wildlife Service (Service) has designated 41 sections of the Hudson River as significant habitats, including Iona Marsh and Haverstraw Bay, located in the vicinity of Indian Point (USFWS 1997). The Hudson River, in the project vicinity, supports a diversity of estuarine, freshwater, and diadromous species, including the American shad (*Alosa sapidissima*), American eel (*Anguilla rostrata*), striped bass (*Morone saxatilis*), white catfish (*Ameiurus catus*), Atlantic sturgeon (*Acipenser brevirostrum*), and Atlantic tomcod (*Microgadus tomcod*).

Endangered Species Act Comments

The GEIS (pp 3-8 dated) states that the NRC identified four Federally-listed species; the shortnose sturgeon (*Acipenser brevirostrum*), the bog turtle (*Clemmys [=Glyptemys] muhlenbergii*), the New England Cottontail (*Sylvilagus transitionalis*), and the Indiana bat (*Myotis sodalis)*. Terrestrial listed species are under the jurisdiction of the Service. The shortnose sturgeon is under the jurisdiction of the National Oceanic and Atmospheric Administration – Fisheries (NOAA-F). For additional information, the applicant should contact Mr. Stanley Gorski, Habitat and Protected Resources Division, Area Coordinator, NOAA-F, James J. Howard Marine Sciences Laboratory, 74 Magruder Road, Highlands, NJ 07732 (telephone: 908-872-3037).

The NRC has determined that the terrestrial refurbishment activities will be conducted on previously disturbed land within a short period of time, and that the proposed activities are not likely to adversely affect the continued existence of listed species or modify critical habitat.

The NRC determined that Indiana bats may use the project site for summer habitat (roosting and foraging habitat), especially the forested area at the north end of the site. However, the NRC states that the expansion project will not disturb the forested area of the site and, therefore, the project would not adversely affect the Indiana bat. 139-a-TS

The Service agrees with the NRC, that if the forested area is not disturbed, that direct take of an Indiana bat is unlikely; however, we are unable to concur with the determination of not likely to adversely affect as the NRC has not provided information on the how the project may indirectly affect Indiana bats and possible foraging areas. Additional information on indirect effects should be included in the Final EIS and provided to Ms. Sandra Doran, U.S. Fish and Wildlife Service, New York Field Office, 3817Luker Road, Cortland, New York 13045 (telephone: 607-753-9334).

The NRC also determined that the site does not support suitable habitat for the bog turtle or New England cottontail. Therefore, no further consultation/coordination with the Service is required for these species. 139-b-TS

On August 8, 2007, the bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal Endangered Species list and is no longer protected under Section 7 of the Federal Endangered Species Act; however, bald eagles remain on the New York State list as a State-listed threatened species. Bald eagles are also protected under the Migratory Bird Treaty Act (16 U.S.C. 703-712;

Ch. 128; July 13, 1918; 40 Stat. 755) and the Bald and Golden Eagle Protection Act (16 U.S.C. 668–668d). Bald eagles are known to occur in the project area. Please visit the website of the U.S. Fish and Wildlife Service, New York Field Office, http://www.fws.gov/northeast/nyfo/es/section7.htm and follow the Bald Eagle Management Guidelines prior to commencement of work. 139-b-RS contd.

Evaluation of Project Impacts

Entrainment and Impingement

The SEIS describes the impacts to aquatic organisms caused by entrainment, impingement, and heat shock. These impacts are highly significant. According to NYSDEC (2003), over 1 billion fish are entrained at Indian Point annually (based on data through 1987), including 158 million striped bass, 13.4 million American shad, 243 million white perch (*Morone Americana*), and 467 million river herring [includes blueback herring (*Alosa aestivalis*) and alewife (*A. pseudoharengus*)]. The SEIS, in Figure 4-3, illustrates that 5 trillion fish were entrained at Indian Point in 1987 (the last year for which entrainment data are available). Historical records presented in the SEIS indicate that between 1.5 and 6 million fish are impinged annually at Indian Point.

We disagree with the criteria used by the NRC to evaluate impacts to aquatic resources. These criteria, "small, moderate and large", are subjectively defined and lack metrics. In modeling entrainment and impingement effects from Indian Point, the NRC used these criteria to determine whether population-level impacts were small, moderate, or large for individual species of fish and blue crabs. Data from several studies (1974 – 2005) of the lower Hudson River were evaluated to assess population trends for 18 representative important species (RIS). Based on population trends in River Segment 4 of the lower Hudson River, 13 of the 18 RIS were determined to be experiencing potentially large population declines. These species included American shad, bluefish (*Pomatomus saltatrix)*, rainbow smelt (*Osmerus mordax*), Atlantic sturgeon, Atlantic tomcod, and white perch. The SEIS then evaluated Indian Point impingement and entrainment data to determine whether Indian Point was removing the species or its prey at levels that were proportionally higher than levels found in the river studies. The combined analysis of these data was used to estimate whether Indian Point was having a small, medium, or large population-level impact. The NRC concluded that the Indian Point plants were having moderate to large impacts on fish species such as hogchoker (*Trinectec maculates*), rainbow smelt, white perch, and bluefish. 139-c-AE

We find that this analysis is insufficiently protective of fishery resources and underestimates the potential effect of the Indian Point intakes on these fish. Although population-level impacts are an appropriate measure of ecological effects, populations are difficult to sample and population trends may be difficult to measure. We note that no pre-Indian Point data were used to perform this analysis, further clouding data interpretation. If population level impacts are measurable, it is an indication that the species is experiencing significant ecological impacts. The goal of resource agencies should be to minimize all significant stressors contributing to the declining population. It appears that the mortality associated with entrainment and impingement at Indian Point is a significant stressor. For example, we regard the annual entrainment and impingement of 13.4 million American shad at Indian Point as substantial, regardless of whether the proportion of American shad entrained or impinged is less than the proportion of American shad found in Hudson River studies. 139-d-AE

1

The NYSDEC (2003) indicated that Indian Point has significant adverse impacts on Hudson River fish and that current losses of various life stages of fish are substantial. Although mortality from other stressors, such as habitat loss, fishing, and predation is also acknowledged by NYSDEC, power plant associated impacts are considered a potentially significant contributor to the decline of a number of fish species. The NYSDEC has further asserted that significant impacts to aquatic resources are not an inevitable result of electric power generation.

139-d-AE contd.

Thermal Impacts

According to the SEIS, the discharge of heated water to the Hudson River can cause lethal or sublethal effects on fish, influence food web characteristics and structure, and create barriers to migratory fish. The NYSDEC (2003) indicated that discharges from Indian Point could raise water temperatures to a level greater than that permitted by water quality criteria, and the NRC, based on that determination, concluded that adverse heat related impacts are possible. The NRC further determined that since they did not find evidence of adverse effects on aquatic life that are "clearly noticeable and sufficient to destabilize important attributes of an aquatic resource", impacts cannot be large, but may be "small to moderate." We disagree with this conclusion, since it is based on an absence of data and is not supported by scientific evidence, such as on-site studies to objectively evaluate plant-related thermal stress to aquatic organisms.

Certain cold water fish species may be particularly vulnerable to temperature changes caused by thermal discharges from electrical plants like Indian Point. These species include Atlantic tomcod and rainbow smelt. According to the NYSDEC (2003), rainbow smelt may be disappearing from some reaches of the Hudson River, in part because of thermal discharges from electrical generating stations.

139-e-AE

Comparison of Alternatives

The NRC compared a range of alternatives, including the proposed action (license renewal), no-action (license denial), new closed-cycle cooling, once through cooling with restoration, and development of a coal-fired power plant at an alternate site. The NRC concluded in the SEIS that, "the adverse environmental impacts of license renewal for Indian Point Units 2 and 3 are not so great that preserving the option of license renewal for energy planning decision-makers would be unreasonable."

We disagree with how the NRC compared the alternatives, in that they used the "low, moderate and large" evaluation criteria discussed elsewhere in this letter and compared dissimilar impacts between alternatives. Because these evaluation criteria are subjectively defined, it is difficult to objectively evaluate impacts for any alternative. It is also difficult to objectively compare dissimilar impact categories (e.g., air quality, terrestrial ecology, aquatic ecology, and land use). Many of the impacts evaluated for other alternatives were described as moderate or large, although they did not pose as significant an ecological impact as the moderate to large impacts described for aquatic resources as a result of entrainment, impingement, and heat shock. For example, land use impacts associated with the development of a coal-fired power plant were assessed as moderate to large, even though the impact of a 3,700 acre facility would not be likely to cause population level impacts, as was determined for a number of fish species as a result of open cycle cooling.

139-f-AL/LR

1

Conclusions and Recommendations

The Department recommends that the NRC reconsider its evaluation of alternatives to more objectively compare the environmental impacts of various alternatives. We regard the development of a closed cycle cooling system as the most environmentally protective alternative and we urge the NRC to reconsider selecting this alternative. Closed cycle cooling, according to the SEIS, would result in a 93-95% reduction in water use compared to the existing Indian Point open cycle units. This alternative would be estimated to result in an equivalent reduction in the numbers of aquatic organisms entrained and impinged. 139-f-AL/LR contd.

In the event that Indian Point Units 2 and 3 continue to operate with open cycle cooling, the NRC should strive to avoid, minimize and mitigate for environmental impacts. Significant measures should be taken to minimize entrainment and impingement of aquatic organisms and heat shock-related effects. The NRC should consider issuing a license contingent on Entergy significantly reducing impacts to aquatic organisms (potentially by a combination of barrier/deterrent systems and flow reductions or shutdowns). A comprehensive monitoring plan should be implemented to assess the effects of mitigative measures. In the event that these measures do not significantly reduce impacts to aquatic organisms, the NRC should re-evaluate the option of requiring a closed cooling system. Regardless of the alternative selected, mitigation should be required as compensation for the considerable impacts to aquatic resources. 139-g-LR

Thank you for the opportunity to review and comment on this SEIS. We hope these comments are useful during your project review. Please contact Anne L. Secord at the Service's New York Field Office, at 607-753-9334 if there are any questions regarding this letter. Please contact me at (617) 223-8565 if I can be of assistance.

Sincerely,

Andrew L. Raddant
Regional Environmental Officer

Literature Cited

NYSDEC. 2003. Final Environmental Impact Statement by the NYSDEC Concerning the Applications to Renew New York State Pollutant Discharge Elimination System Permits for the Roseton 1 & 2, Bowline 1 & 2, and Indian Point 2 & 3 Steam Electric Generating Stations, Orange, Rockland, and Westchester Counties.

RIVERKEEPER.

VIA E-MAIL AND FIRST-CLASS MAIL

March 18, 2009

Chief, Rulemaking, Directives and Editing Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
IndianPoint.EIS@nrc.gov

Re: Riverkeeper, Inc.'s Comments on the U.S. Nuclear Regulatory Commission's Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Draft Report for Comment, Docket Nos. 50–247 and 50–286

Dear Rulemaking, Directives and Editing Branch Chief:

Riverkeeper, Inc. ("Riverkeeper") hereby respectfully submits the following comments on the U.S. Nuclear Regulatory Commission Staff's ("NRC Staff") Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3, Draft Report for Comment (also known as the Draft Supplemental Environmental Impact Statement, and hereinafter referred to as "DSEIS"). Notice of availability of and opportunity to comment on the DSEIS was published in the Federal Register on December 22, 2008.[1]

Introduction

Riverkeeper has been actively involved in the Indian Point relicensing proceeding due to the serious concerns relating to the continued operation of the facility, including the environmental damage caused by its antiquated once-through cooling system and leaking spent fuel pools, the vulnerability of the plant's spent fuel pools to terrorist attacks and serious accidents, and the failure of any long-term solution for permanent nuclear waste disposal. As the NRC Staff is well aware, Riverkeeper filed a successful petition to intervene in Indian Point's relicensing

[1] Nuclear Regulatory Commission, Indian Point Nuclear Generating Unit Nos. 2 and 3; Notice of Availability of the Draft Supplement 38 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants and Public Meeting for the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, Docket Nos. 50–247 and 50–286, 73 Fed. Reg. 80,440 (2008).

1

828 South Broadway, Tarrytown, NY 10591 • 914.478.4527 • f: 914.478.4527 • www.riverkeeper.org

WATERKEEPER ALLIANCE FOUNDING MEMBER

1

proceeding, and is currently litigating three contentions which have been admitted for an adjudicatory hearing.[2] On October 17, 2007, Riverkeeper submitted Scoping Comments to inform the NRC Staff's environmental review pursuant to NEPA in the license renewal proceeding.[3] Disappointingly, the NRC Staff has failed to meaningfully address any of the issues raised by Riverkeeper's comments.

An exhaustive review of the DSEIS reveals glaring deficiencies which wholly undermine the NRC Staff's initial conclusion that the environmental impacts of Indian Point's operation are not severe enough to preclude renewing its operating license.[4] Riverkeeper absolutely disagrees with this determination and submits that if the NRC Staff had performed the proper assessments as outlined in the following comments, then they would have reached the opposite conclusion. Riverkeeper urges the NRC Staff to fully consider and address the following comments prior to issuing the Final Supplemental Environmental Impact Statement for License Renewal of Indian Point ("FSEIS"), in order to come to a more accurate recommendation to the Commission.

DSEIS Section 1.0

1. Improper Reliance on Outdated GEIS

In Section 1.0 of the DSEIS, the NRC Staff explains its use of the 1996 License Renewal Generic Environmental Impact Statement, NUREG-1437 ("GEIS").[5] However, as Riverkeeper's Scoping Comments explained at length, such reliance is misplaced. The GEIS is inadequate if evidence exists of material changes affecting the baseline environment since the GEIS was written.[6] It has been 13 years since the GEIS was written. Since that time, various new circumstances have arisen that have materially changed the baseline environment, including heightened risks of terrorism, the failure of a permanent nuclear waste disposal solution, changes in population density, and progress in the viability of renewable energy technologies. Accordingly, the GEIS is no longer adequate to dispose of such issues, and they must be specifically assessed in the environmental review process for Indian Point. Unfortunately, as discussed in further detail where applicable in the comments herein, the NRC Staff has ignored such new information and continues to rely on the outdated GEIS. The NRC's refusal to consider such material changes violates the fundamental requirements of NEPA. 140-a-AE

As explained in Riverkeeper's Scoping Comments, the NRC has failed to update the GEIS in a timely fashion as required by law.[7] The law requires the GEIS to be updated every 10 years.

---

[2] Riverkeeper, Inc.'s Request for Hearing and Petition to Intervene in Indian Point License Renewal Proceeding, November 30, 2007 (hereinafter "Riverkeeper Petition for Hearing"); *See Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC __ (slip op. July 31, 2008) ("July 31, 2008 ASLB Order").
[3] Riverkeeper Comments on Environmental Scoping for the Indian Point License Renewal Proceeding, Docket Nos. 50-247, 50-286 (Oct. 12, 2007), *available at* http://www.riverkeeper.org/document.php/642/101207_Scoping_.pdf (hereinafter "Riverkeeper Scoping Comments).
[4] DSEIS, Main Report § 9.3, at 9-8.
[5] *Id.* § 1.2.1.
[6] Blanco v. Burton, Slip Copy, 2006 WL 2366046 (E.D. La.); League of Wilderness Defenders v. Marquis-Brong, 259 F.Supp.2d 1115 (U.S. Dist. Ct. Or. Apr. 2003).
[7] *See* Riverkeeper's Scoping Comments at 1-2; 10 C.F.R. Part 51, Subpart A, Appendix B.

2

1

The schedule explained in Riverkeeper's Scoping Comments projected a final GEIS by February 2009. That deadline has obviously passed, without any public notice or mention by the NRC of any pending review or update of the GEIS. Internal communications between DEC and NRC Staff indicates that NRC Staff have thus far failed to complete even a draft for public notice and comment by this coming summer. At this time, the required deadline for the GEIS review is three years overdue, and counting. It is ridiculous that the environmental review process for Indian Point's license renewal relies upon a document which has not been updated as legally required. Accordingly, the NRC Staff should not rely on the GEIS until the NRC has completed "10-year review" and determined whether or not the GEIS will be updated.

140-a-AEC ontd.

Moreover, as discussed in Riverkeeper's Scoping Comments, the mandates of the National Environmental Policy Act ("NEPA") require that federal agencies take a "hard look" at the environmental impacts of a proposed action.[8] This includes assessing "significant new circumstances or information relevant to the environmental concerns that bear on the proposed action or its impacts."[9]

2. Failure to Assess Deficient Emergency Planning Anywhere in the DSEIS

The deficiencies of the DSEIS comes starkly into focus when it comes to the issue of emergency planning. Indeed, the NRC Staff has classified emergency planning issues as outside the realm of license review, and no mention whatsoever of the serious concerns with Indian Point's emergency plan is made in the DSEIS.[10] This flies in the face of logic given the changes in population density and traffic pattern in the area surrounding the facility since the plant started operating. In particular, since Indian Point's initial licensing, the population around the facility has nearly doubled, resulting in significant traffic congestion that would prevent authorities from evacuating the residents living within the ten-mile Emergency Planning Zone ("EPZ") in the event of an accident or terrorist attack. Roads and bridges would not be able to handle the amount of traffic leaving the 10-mile radius and beyond in the event of an accident or attack.[11] Clearly the environmental impacts on public health will be far greater if the population within the 10-mile emergency planning zone cannot be evacuated in a timely manner.

140-b-EP

According to an independent analysis of Indian Point's emergency plans commissioned by former New York Governor George Pataki in 2003 and authored by former FEMA director James Lee Witt found, the radiological emergency plan for Indian Point is badly flawed, unworkable and key components are unfixable. Witt found that ". . . the current radiological response system and capabilities are not adequate to . . . protect the people from an unacceptable dose of radiation in the event of a release from Indian Point . . . ."[12]

[8] *See generally* 42 U.S.C. § 4332; Riverkeeper Scoping Comments at 2-4.
[9] 40 C.F.R. § 1502.9(c)(1)(ii); Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 18036.
[10] Environmental Impact Statement Scoping Process, Summary Report, Indian Point Nuclear Generating Station Unit Nos. 2 and 3 Village of Buchanan, New York, December 2008 ("NRC Staff Scoping Summary Report"), at 260 (finding that "offsite emergency planning is not within the scope of the NRC's environmental review" since the NRC "monitors emergency planning under requirements of the current operating license.").
[11] *See* Riverkeeper Scoping Comments at 5 n.11.
[12] Review of Emergency Preparedness of Areas Adjacent to Indian Point and Millstone, p. viii, James Lee Witt Associates, 2003.

3

1

In 2003 KLD Associates conducted a traffic study for Entergy and determined that evacuation times for the Emergency Planning Zone around Indian Point doubled since 1994. The original estimate was 2.5 hours for people to proceed with evacuation, with a total of 5.5 hours for complete evacuation. KLD estimates increased mobilization time to four hours, while complete evacuation of the region in good weather conditions could take up to 9.5 hours and in snow conditions up to 12 hours.[13] Shadow evacuation would increase this time.

The NRC itself has recognized the concerns associated with the location of Indian Point and increased population density, even prior to the September 11th terrorist attacks.[14] Were Entergy applying for a license to build a new nuclear power plant where Indian Point is now located, it is unlikely they would be allowed to do so, based on its proximity to such a highly populated area.[15] In fact, in the evaluation factors for stationary power reactor site applications before January 1997 the regulations state that residences within the exclusion area shall normally be prohibited.[16] In exclusion areas with residents, the regulations recommend low population zones - the total number and density of which are such that there is a reasonable probability that appropriate protective measures could be taken in their behalf in the event of a serious accident.[17] The regulations state where very large cities are involved, the regulations find that a greater distance may be necessary because of total integrated population dose consideration.[18]

The regulations for reactors built after 1997 require that every site must have an exclusion area and a low population zone.[19] These regulations define low population zone as "the area immediately surrounding the exclusion area which contains residents, the total number and density of which are such that there is a reasonable probability that appropriate protective measures could be taken in their behalf in the event of a serious accident."[20] There are 300,000 people living within the ten-mile EPZ of Indian point and the only means of evacuation are primarily one and two lane roads. The regulations do not specify a permissible population density or total population within this zone because the situation may vary from case to case.[21] The regulations go on to say whether a specific number of people can, for example, be evacuated from a specific area, or instructed to take shelter, on a timely basis will depend on many factors such as location, number and size of highways, scope and extent of advance planning, and actual distribution of residents within the area.[22] As far as Indian Point is concerned, there is no low population zone, therefore if Entergy were applying to build a new nuclear power plant as opposed to a relicensing it would likely not be permitted.

140-b-EP contd.

---

[13] Indian Point Energy Center Evacuation Time Estimate, Tbl. 1-1, p. 1-12, KLD Associates, Inc., 2003.
[14] Report of the Office of the Chief Counsel on Emergency Preparedness to the President's Commission on the Accident at Three Mile Island, October 31, 1979, p. 5 (Robert Ryan, the NRC's Director of the Office of State programs, stating "I think it is insane to have a three-unit reactor on the Hudson River in Westchester County, 40 miles from Times Square, 20 miles from the Bronx . . . [Indian Point is] one of the most inappropriate sites in existence.")
[15] *See* 10 C.F.R. Pts. 100.3, 100.10(b), 100.11, & 100.21(h).
[16] 10 C.F.R. § 100.3.
[17] 10 C.F.R. § 100.10(b).
[18] *Id.*
[19] 10 C.F.R. § 100.21(h).
[20] 10 C.F.R. § 50.2.
[21] *Id.*
[22] *Id.*

4

1

Based on the foregoing, it is absurd to exclude emergency planning from review during the license renewal process. The NRC Staff must assess the changes to population density and traffic concerns during its environmental review process in the context of assessing the environmental impacts of an accident or attack on Indian Point that results in a radiological release.[23] Failing to do so leaves the DSEIS fundamentally flawed. 140-b-EP contd.

DSEIS Section 4.0

After "objectively" describing how Indian Point interacts with the environment in Section 2.0 of the DSEIS, Section 4.0 presents the NRC Staff's assessment of the environmental impacts of continued operation of the facility. This section of the NRC Staff's review is riddled with deficiencies, as follows: (1) improper analysis of the environmental impacts of Indian Point's once-through-cooling system, (2) improper analysis of the impacts to endangered or threatened species, (3) improper analysis of groundwater contamination caused by spent fuel pool leaks, (4) failure to consider the Rockland County Desalination Project, (5) failure to properly consider impacts to the communities utilizing Hudson River water as a supply source, and (6) improper conclusions regarding the cumulative environmental impacts of continued operation.

1. Improper Analysis of Environmental Impacts of Once-Through Cooling System

NRC regulations implementing NEPA classify the effects of entrainment, impingement, and heat shock on the protection and propagation of fish and shellfish as "Category 2" environmental issues which must be assessed in the site-specific SEIS. 10 C.F.R. Part 51, Appendix B to Subpart A. The DSEIS "must contain an analysis of those issues identified as Category 2" in Appendix B to subpart A. 10 C.F.R. 51.71(d). The DSEIS is NRC Staff's independent evaluation of such Category 2 issues. 10 C.F.R. § 51.70. Despite this mandate, as demonstrated below herein, NRC Staff has failed to adequately analyze the adverse impacts on aquatic resources by impingement, entrainment, and heat shock caused by Indian Point's once-through cooling system. As a result, the DSEIS violates NEPA and NRC implementing regulations at 10 C.F.R. §§ 51.70, 51.71. 140-c-AE

Riverkeeper's comments regarding NRC Staff's analysis of Indian Point's once-through cooling system were prepared with the expert assistance of Drs. Peter Henderson and Richard Seaby of Pisces Conservation Ltd. ("Pisces"). Pisces' expert report in support of these comments – "Comments Relating to the Indian Point NRC draft EIS on the Cooling System" (herein the "Pisces Report") – is attached as Exhibit A.[24] In short, Pisces concludes that the NRC Staff's assessment of impingement and entrainment – undertaken on the representative important species ("RIS") of 17 fish species and the blue crab – is based on a scoring system that initially appears objective and quantitative. However, detailed examination of the method shows that it

[23] For details regarding how the NRC Staff incorrectly excluded terrorism and certain accidents from review, see comments on DSEIS Section 5.0 below.

[24] In 2007, Pisces prepared a report entitled "Entrainment, Impingement and Thermal Impacts at Indian Point Power Station" ("2007 Pisces Report"); a copy of the 2007 Pisces Report was provided to NRC Staff in November of 2007 as an attachment to Riverkeeper's Request for a Hearing and Petition to Intervene with respect to the license renewal proceeding for the Indian Point Nuclear Power Station (Attachment 4 to the Declaration of Peter Henderson).

1

1

makes assumptions about the statistical properties of populations, the impact of cooling water systems on invertebrates prey species, and the relative importance of local and larger-scale changes in population number, which are unjustified and arbitrary.

Although impingement and entrainment effects are considered together by NRC Staff – an approach that has merit – the impact of Indian Point's cooling system is assessed using a flawed scoring system that takes into account changes in species abundance (the trend) and strength of connection (connection), and which attempts to measure the relationship between abundance in the environment and Indian Point's direct fish mortality. This approach differs significantly from the New York State Department of Environmental Conservation ("NYSDEC") evaluation and overall conclusion regarding these impacts, which focuses on fish mortality rather than fish populations, and has determined that the cooling system results in significant adverse environmental impacts. The NRC Staff should defer to NYSDEC's evaluation pursuant to NRC precedent.

A particular problem with NRC Staff's assessment is the distinction between '*Large*' and '*Small*' population impacts, which is hard to support from an examination of the overall population trend data. The use of both river-wide and river segment 4 data (where Indian Point is located), and the use of population decline criteria that include a measure of the deviation from the mean of a normal distribution produce results that do not necessarily reflect the actual population trends, and have the potential to understate the importance of recent changes in abundance.

Another concern is the scoring method used to assess the strength of connection line of evidence to determine whether operation of the Indian Point cooling system has the potential to influence RIS populations near the facility or within the lower Hudson River; this is a poor measure of the impact of the power plant on the species. The strength of connection is a flawed measure because it is based on rank abundance. Furthermore, the lack of importance given to impacts on invertebrates makes low to moderate levels of impact for many species almost inevitable.

140-c-AE contd.

NRC Staff's comparison of species' proportional rank abundance in the power station kill with that living in the river results in potentially misleading conclusions. For example, the fish that contributes the highest proportion of the number of individuals killed by the power plant, and which is also the commonest in the river, only has a medium strength of connection. In Pisces' opinion, such a situation where a fish is killed in high numbers and is locally common would suggest a high degree of linkage. A number of the RIS species have a prey score for impingement and entrainment of 1, and thus are unlikely to score highly for the strength of connection. This feature of the scoring protocol is thus central to the final outcome. Another key underlying point to note about NRC Staff's analysis of impingement and entrainment is the reliance on data collected between 1981 and 1990. These data are old and may not reflect current conditions. In fact, many populations have shown marked changes since that period. This calls into question the reliability of the conclusions when applied to the future.

NRC staff also concludes that thermal impacts associated with the discharge are small to moderate, principally on the grounds that there is no evidence for the scale of the impact. The assertion that, because no appropriate evidence has been collected, there is therefore only a small to moderate impact, is not logical and contrary to NEPA. In addition, NRC staff state that they

6

2

cannot determine the effects of climate change, particularly in relation to thermal issues. We believe they should have, at the very least, concluded that they needed more data on thermal issues before reaching a conclusion.

140-c-AE contd.

a. NRC Staff's Flawed Assessment of Impingement and Entrainment

As noted above, impingement and entrainment effects are considered together by NRC Staff, which is an approach that has merit because the goal is to measure the well-being of all fish stages. However, the impact of Indian Point's cooling system is assessed using a faulty scoring system which attempts to measure the relationship between abundance in the environment and Indian Point's direct fish mortality.

NRC Staff's methodology has many problems, which are explained in detail in the Pisces Report. With respect to the trend (the so-called "Assessment of Population Trends–The First Line of Evidence"), the Pisces Report demonstrates that the NRC Staff's distinction between '*Large*' and '*Small*' impingement and entrainment impacts is hard to support.[25] Indeed, the weight of evidence ("WOE") scoring system to measure such impacts, which uses both river-wide and river segment 4 data (where Indian Point is located), and uses population decline criteria that include deviation from the mean of a normal distribution, produces results that do not necessarily reflect the actual population trends, and have the potential to understate the importance of recent changes in abundance.[26] For instance, examination of the river-wide abundance trends for white fish and weakfish indicates that both species have, since 1990, appreciably declined in abundance. Yet while the decline in white catfish is classified as 'Large', that in weakfish is 'Small'.[27] Such differences are more a reflection of the arbitrary nature of the statistical and quantitative approach taken, than a real difference in the state and health of the populations.

140-d-AE

Turning to the strength of connection (the so-called "Assessment of Strength of Connection–The Second Line of Evidence"), to determine whether operation of the Indian Point cooling system has the potential to influence RIS populations near the facility or within the lower Hudson River, the Pisces Report also unveils serious problems.[28] NRC Staff's describes how strength of connection is measured, as follows:

> Impingement and/or entrainment can also remove and reintroduce RIS prey into the aquatic system in a manner that alters food web dynamics and produces indirect effects that may result in decreased recruitment, changes in predator-prey relationships, changes in population feeding strategies, or movements of populations closer to or farther away from the cooling system intakes or discharges. Staff based the analysis of impingement on the concordance of two ranked proportions. The first proportion was the ratio of the number of YOY and yearling fish of each

[25] Pisces Report at 2-5.
[26] *Id.* at 4-5.
[27] *Id.* at 2 (citing to DSEIS' Table 4-4).
[28] *Id.* at 5-9.

7

1

> species impinged in relation to the sum of all fish impinged. The second proportion was the ratio of each species abundance in the river near IP2 and IP3 relative to the total abundance of all 18 RIS. A large rank for both proportions would mean that the proportion impinged for the given RIS and the proportion abundance in the river were both large. The ratio of these two ranks would then be close to 1, suggesting that the stationary sampler was sampling proportionately to the abundance in the river (a medium strength of connection).[29]

The first point to note is that the analysis is undertaken by comparing a species' proportional rank abundance in Indian Point's actual kill with that living in the river. Rather oddly, a fish that contributes the highest proportion to the number of individuals killed by the power plant, and which is also the commonest in the river, only has a medium strength of connection.[30] In Pisces' opinion, such a situation where a fish is killed in high numbers and is locally common would suggest a high linkage.[31] This is a point that needs reconsideration and critical appraisal. The effect is to reduce the assessment of the power plant's impact on abundant, commonly-caught fish.

140-d-AE contd.

The second point to note is that a species which is ranked less common in Indian Point's kill than in the river will be scored small to moderate.[32] The key point is that the power plant kill may actually reflect the abundance in the Hudson River, however the rank could decline if other species are killed in unusually high numbers.[33] Thus, each species is not being fairly assessed on its own merits.

To illustrate the weaknesses in NRC Staff's approach, Pisces points to Juvenile rainbow smelt, a species that has disappeared from fish surveys since the mid 1990s.[34] This species is assessed in the trends (the population line of evidence) as '*Large*'.[35] However, NRC Staff considers the impact of Indian Point on this species to be moderate because the strength of connection is assessed as '*Medium*'.[36] The strength of connection is only medium because both the impingement and entrainment prey scores are 1. The example demonstrates that an unsubstantiated and unproven assumption by NRC Staff, that invertebrate prey species are not affected by the cooling water system, leads in turn to the conclusion that the rainbow smelt, a species which has effectively disappeared from the data in recent years and has been assessed as potentially highly impacted by entrainment, is only given a moderate impact. The Atlantic tomcod makes another telling example.[37] The tomcod population shows long-term decline, thus the population line of evidence is large, however, NRC Staff assigns a low-to medium strength of connection and the final conclusion is an impact small to moderate.

140-e-AE

[29] DSEIS, Appendix H, at H-29.
[30] Pisces Report at 6.
[31] *Id.*
[32] *Id.*
[33] *Id.*
[34] *Id.* at 7-8.
[35] *Id.* at 7 (citing to DSEIS' Table 4-4).
[36] *Id.*
[37] *Id.* at 8.

8

1

The Pisces Report observes that before conclusions of this nature can be justified, the assertion that the cooling water system has no impact on invertebrate prey species needs to be demonstrated.[38] There is considerable evidence that large numbers of invertebrates are entrained and potentially killed by the cooling water system. There is therefore no reason to believe that invertebrate prey species are not adversely affected. This impact may extend beyond entrainment effects as the heated discharge water may also adversely affect them. 140-e-AE contd.

Another problem with NRC Staff impingement and entrainment assessment is the age of the data.[39] NRC Staff is relying on data collected between 1981 and 1990. These data are old, and may not reflect current conditions. Further, there are hints that the NRC staff did wonder if the data reflected present conditions. If impinged data were available for 2008 would we find that entrained and impinged fish had changed even more? The risks inherent with the use of old data are not addressed. In addition, it is worth noting that, although the impingement and entrainment data are over 17 years old, the population data that shows the decline in so many of these species is current. The differences in the population of fish between the 1990s and the present are great. 140-f-AE

b. *NRC Staff's Improper Analysis of Thermal Impacts*

The NRC Staff conclude that thermal impacts associated with the discharge are small to moderate, principally on the grounds that there is no evidence for the scale of the impact:

> In the absence of specific studies, and in the absence of effects sufficient to make a determination of a LARGE impacts, the NRC staff concludes that thermal impacts from IP2 and IP# [sic] could thus range from SMALL to MODERATE depending on the extent and magnitude of the thermal plume, the sensitivity of various aquatic species and lifestages likely to encounter the thermal plume, and the probability of an encounter occurring that could result in lethal or sublethal effects.[40]

The assertion that, because no appropriate evidence has been collected, therefore there is only a small to moderate impact is not logical and contrary to NEPA.[41] 140-g-AE

Linked to thermal impacts must be a consideration of climate change impacts. The following conclusion is reached in the DSEIS:

> Thus, the NRC staff has concluded that the cumulative effects of climate change cannot be determined.[42]

Therefore, NRC Staff is willing to conclude that thermal effects are small to moderate and can therefore be dismissed, but Staff cannot determine the effects of climate change. We believe that

[38] *Id.*
[39] *Id.* at 9.
[40] DEIS, Main Report at 4-27.
[41] Pisces Report at 11.
[42] DSEIS, Appendix H, at H-60.

9

1

NRC Staff should have, at the very least, acknowledged that they needed more data on thermal issues before reaching a conclusion.[43]

140-g-AE contd.

c. NRC Staff has Failed to Defer to the New York Department of Environmental Conservation

The NRC Staff has failed to defer to, and coordinate with the responsible state agency in charge of protecting aquatic impacts under federal delegation and state law – the New York State Department of Environmental Conservation ("NYSDEC") – as required by NRC regulations and precedent. NRC regulations implementing NEPA require that the NRC cooperate "to the fullest extent possible" with State and local agencies to reduce duplication and inconsistencies.[44] Despite this mandate, however, NRC Staff has largely ignored NYSDEC's environmental review and permitting of Indian Point's cooling system under the federal Clean Water Act ("CWA"). NYSDEC's review and re-permitting of Indian Point's cooling system has been ongoing since 1992, and is currently in the final adjudicatory phase. Following the NRC's instructions in the *Seabrook* case, the NRC Staff must defer to NYSDEC's assessment of entrainment and impingement, and its permitting determinations.[45]

Indian Point is operating a once-through cooling system under an administratively extended State Pollutant Discharge Elimination System ("SPDES") permit issued by the NYSDEC for the period 1987-1992.[46] In July 31, 2008, the Atomic Safety and Licensing Board ("ASLB") ruled that Entergy can rely on this permit for purposes of satisfying 10 C.F.R. § 51.53(c)(3)(ii)(B); thus, it need not assess the impacts of impingement, entrainment, and heat shock in the Environmental Report.[47] Indian Point's 1987 SPDES permit has been administratively continued, however, pending issuance of a final SPDES permit currently subject to adjudication by the NYSDEC.

140-h-AE

Beginning in 1992, the NYSDEC has required a specific environmental impact statement ("EIS") under the State's Environmental Quality Review Act[48] ("SEQRA") to consider Indian Point's entrainment, impingement, and thermal impacts, as well as mitigation alternatives. As a result, the prior owners of Indian Point and other Hudson River power plant generators prepared the 1999 Draft Environmental Impact Statement for permit renewal.[49] The final environmental impact statement ("SPDES FEIS") was prepared and released by the NYSDEC in 2003, after Hudson River advocates filed an action against the NYSDEC in New York State Supreme Court.[50]

---

[43] Pisces Report at 11.
[44] 10 C.F.R. § 51.70 (c); 40 C.F.R. § 1506.2 (b) and (c).
[45] *See Public Service Co. of N.H.* (Seabrook Station, Units 1 and 2), *Seabrook*, CLI-78-1, 7 NRC at 26 (1978); *Entergy Nuclear Vt. Yankee* (Vermont Yankee Nuclear Power Station), CLI-07-16, 65 NRC 371, 389 (2007).
[46] NYSDEC, 1987, State Pollutant Discharge Elimination System ("SPDES") Discharge Permit NY-000-4472, Indian Point Generating Stations (NYSDEC, 1987 SPDES Permit.
[47] July 31, 2008 ASLB Order, *supra*.
[48] New York State Environmental Conservation Law, Article 17.
[49] 1999 Draft Environmental Impact Statement Concerning the Applications to Renew SPDES Permits for the Roseton 1 and 2, Bowline 1 and 2 and Indian Point 2 and 3 Electric Generating Stations (1999 DEIS).
[50] *See Matter of Brodsky v. Crotty, Sup. Ct., Albany County*, Keegan, J., Index No. 7136-02.

10

1

In the SPDES FEIS, the NYSDEC determined that Indian Point's dramatic intake and use of Hudson River water has significant adverse environmental impacts and must be mitigated.[51] Consequently, NYSDEC prepared a draft SPDES permit requiring closed cycle cooling at Indian Point.[52] In 2008, the NYSDEC advanced the SPDES proceeding to the evidentiary phase, at the time when it resolved various appeals by the parties to the proceeding. Notably, NYSDEC determined that there is no need to adjudicate whether Indian Point's cooling system results in adverse environmental impacts because this issue has already been established as a matter of law and fact, and required that a supplemental EIS be prepared during the adjudication.[53]

140-h-AE contd.

The DSEIS not only contradicts the key findings and conclusions on entrainment and impingement at Indian Point contained in the SPDES FEIS but completely ignores the 2008 NYSDEC Ruling.[54] Tellingly, the 2008 NYSDEC Ruling relied on the United Stated Court of Appeals for the Second Circuit, in its decisions referred to as *Riverkeeper I* (2004) and *Riverkeeper II* (2007).[55] As the 2008 NYSDEC Ruling stated, the Second Circuit "specifically rejected the view that the EPA should only have sought to regulate impingement and entrainment where they have deleterious effects on the overall fish and shellfish populations in the ecosystem and emphasized that the EPA's focus on the number of organisms killed or injured by cooling water intake structures is eminently reasonable.[56] Thus, the NRC Staff's marked reliance on population trends is inconsistent with NYSDEC's and EPA's focus on the number of organisms killed or injured by the cooling system.

The DSEIS also includes, in its alternatives analysis (in Section 8.1.2), a Restoration Alternative that is unlawful based on the Second Circuit rulings in its *Riverkeeper I* and *Riverkeeper II* decisions. Pursuant to *Riverkeeper I* and *Riverkeeper II* "restoration" alternatives both at existing and new facilities are contrary to the CWA. Therefore, Section 8.1.2 should be stricken in its entirety. These failures and inconsistencies runs contrary to NRC's own precedent set forth in *Seabrook*, CLI-78-1, 7 NRC at 26, and *Entergy Nuclear Vt. Yankee*, 65 NRC at 387, indicating that NRC Staff must defer to the responsible permitting authority, here the NYSDEC.

140-i-AE

NYSDEC's 2008 Ruling also requires that a supplemental EIS be prepared to examine the environmental impacts that were not already addressed in the SPDES FEIS for closed cycle cooling, the proposed interim measures, and any alternative technologies that Entergy may propose in order to minimize adverse environmental impact at Indian Point.[57] There is no

140-j-AE

---

[51] NYSDEC, 2003, Final Environmental Impact Statement Concerning the Applications to Renew SPDES Permits for the Roseton 1 and 2, Bowline 1 and 2 and Indian Point 2 and 3 Electric Generating Stations (hereinafter NYSDEC, 2003 FEIS).
[52] NYSDEC, 2003, Draft SPDES Permit for Entergy Nuclear Indian Point Units 2 & 3 (NYSDEC, 2003 Draft SPDES Permit).
[53] *See Matter of Entergy Nuclear Indian Point 2 and Entergy Nuclear Indian Point 3*, Interim Decision of the Assistant Commissioner (August 13, 2008), *at* http://www.dec.ny.gov/hearings/45956.html ("NYSDEC, 2008 Ruling"), at 14-18 & 36-41.
[54] NYSDEC, 2003 FEIS, at 58.
[55] NYSDEC, 2008 Ruling, at 17 (*citing to* Riverkeeper I, [358 F.3d 174] at 196; Riverkeeper II, [475 F.3d 83] at 125.
[56] *Id.* fn 12 (citing to "Riverkeeper II, at 125 (quoting Riverkeeper I, at 196).").
[57] *Id.* at 39.

11

1

indication whatsoever that NRC Staff will defer to, and/or coordinate with, the NYSDEC's supplemental EIS, as required by NRC regulations and precedent.[58] 140-j-AE contd.

Finally, NRC Staff has not recognized NYSDEC's statements and concerns with respects to Indian Point's thermal impacts. The DSEIS' lack of a thermal analysis (discussed in the previous section) is plainly at odds with the available data on Indian Point's thermal plume, which shows that the facility does not comply with New York water quality standards for thermal discharges. As noted in the scoping comments filed by the State of New York – later incorporated in New York State's Petition to Intervene with respect to aquatic impacts: 140-k-AE

> The available data -- generated from the applicant and the other Hudson River power plant generators as part of the HRSA -- regarding the thermal discharge at Indian Point demonstrates that state water quality criteria are *not* being met.[59]

In addition, the 2007 Pisces Report on Entrainment, Impingement and Thermal Impacts, submitted to NRC Staff in November of 2007, clearly shows that temperature increases in the Hudson River caused by Indian Point's operation have had significant effects on aquatic life. 140-l-AE

2. Improper Analysis of Impacts to Endangered or Threatened Species

a. *<u>Listed Species – Shortnose Sturgeon</u>*

The license renewal of the Indian Point nuclear facility is a federal action which "may affect a listed species or critical habitat."[60] In the DSEIS, the NRC Staff admits that the license renewal will require consultation under Section 7 of the Endangered Species Act of 1973 ("ESA").[61] Because the operation of the Indian Point nuclear facility has resulted in the taking of the endangered shortnose sturgeon without a permit,[62] and the continued operation will continue to affect the fish if the license is renewed and Indian Point operates without a closed-cycle cooling system, such renewal is a federal action which may affect a listed species. 140-m-TS

The shortnose sturgeon was listed under the Endangered Species Preservation Act on March 11, 1967 and remained on the Endangered Species List when the ESA became law in 1973. Females live significantly longer than males; while females have reportedly reached 67 years, males usually will not live past 30.[63] This being the case, the sexes are nearly equal in number when young, but when the shortnose reaches 90 cm, females outnumber males by approximately four to one.[64] Also, because they are long living fish, in the mid-Atlantic region, the males will reach

---

[58] 10 C.F.R. § 51.70 (c); 40 C.F.R. § 1506.2 (b) and (c); *Seabrook*, CLI-78-1, 7 NRC at 26 (1978); *Entergy Nuclear Vt. Yankee*, CLI-07-16, 65 NRC 371, 389 (2007).
[59] NYS, Scoping Comments, at 8 (emphasis in original text).
[60] 50 C.F.R. § 402.14(a) (2008).
[61] *See* 16 U.S.C. § 1536 (2006); *See also* DSEIS, Main Report § 4.6, at 4-49.
[62] *See id.* § 4.6, at 4-51 (reporting that 714 endangered shortnose sturgeon were impinged at Indian Point from 1975 to 1990).
[63] NOAA Fisheries Office of Protected Resources, Shortnose Sturgeon, http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm (last visited March 13, 2009).
[64] *Id.*

12

1

reproductive maturity between four and seven years and the females at approximately eleven years.[65] Even still, while males may spawn every year, females will often go three years between spawning.[66] Because of this slow maturation process, *any* impacts on the shortnose sturgeon will have noticeable effects. It is, thus, critical that impacts on the shortnose species are kept to a minimum.

Riverkeeper recognizes that Section 7 consultation is based on astute principles designed to further the basic purpose of the ESA, which is to conserve endangered and threatened species and the ecosystems on which they depend.[67] Of particular relevance here are section 7 "philosophies" which encourage reliance on biology first, emphasize the ecosystem approach to species conservation, and stress the importance of the "best available scientific and commercial data."[68] These are commendable standards of practice, and NRC Staff should adhere to them during the relicensing process.

140-m-TS contd.

Although the NRC Staff admits that the continued operation of the Indian Point nuclear facility will impinge the shortnose sturgeon, the data relied upon in the DSEIS and the NRC Staff's Biological Assessment ("BA") appended thereto for assessing those impacts is incomplete at best.[69] The data provided by Entergy accounts only for shortnose sturgeon impinged at Indian Point Units 2 and 3 from 1975 through 1990.[70] Furthermore, there are several years during this period that have no reported data at all[71] and the data can be questioned due to the fact that over 90% of the recorded impingements occurred in only two years.[72] In a letter from Mary A. Colligan (National Marine Fisheries Service ("NMFS")) to David J. Wrona (NRC), NMFS echoed Riverkeeper's concerns about the lack of reporting data and the inconsistencies in those reports.[73] In Colligan's letter, NMFS instructed the NRC that there was insufficient information provided in the DSEIS and BA to start formal consultation.[74] Specifically, NMFS was concerned with the gaps in the reported impingements at the Indian Point nuclear facility.[75] More importantly, the impingement data provided in the DSEIS was from a period when the Indian Point nuclear facility did not use Ristroph screens to minimize fish impingement, which were installed in 1991.[76]

140-n-TS

---

[65] *Id.*
[66] *Id.*
[67] 16 U.S.C. § 1531(b).
[68] U.S. Fish and Wildlife Service and National Marine Fisheries Service, ESA § 7 Consultation Handbook, § 1.1, at 1-2, *available at* http://www.fws.gov/endangered/pdfs/Sec7/handbook/CH1-3.PDF.
[69] *See generally* DSEIS § 4.6; *see also id.* Appendix E, Biological Assessment of the Potential Effects on Federally Listed Endangered or Threatened Species from the Proposed Renewal of Indian Point Nuclear Generating Plant, Unit Nos. 2 and 3 ("BA"), at E-88 – E-100.
[70] *Id.*
[71] *Id.* (no reported impingements in 1980-1983, 1985, 1986, 1988-1990).
[72] *Id.* (out of 317 total impinged shortnose sturgeon, 176 were recorded in 1984 and 116 were recorded in 1987).
[73] Colligan (NMFS) to Wrona (NRC), RE: Biological Assessment for License Renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Feb. 24, 2009), attached to Riverkeeper's Comments as Exhibit B.
[74] *Id.*
[75] *Id.*
[76] DSEIS, Appendix E, BA § 4.3.2, at E-96.

13

1

Moreover, the impingement data cited in the BA, which the NRC Staff included in order to comply with Section 7 of the ESA,[77] is self-conflicting and does not create a complete, accurate or current illustration of the status of impinged shortnose sturgeon at the Indian Point nuclear facility. Included in the BA are two impingement reports, one each from NMFS and Entergy.[78] The NRC Staff concluded that because Entergy's reports of impinged sturgeon were larger than those of NMFS, they would disregard the NMFS reports.[79] Although it is important for the BA to be a conservative analysis of the impacts to the sturgeon, the NRC Staff's only reasoning disregarding the NMFS reports was that they were significantly lower than the data supplied by Entergy.[80] 140-o-TS

Entergy and the NRC Staff state that the implementation of the Ristroph screens, installed in 1991, may have resulted in reduced the impacts to shortnose sturgeon.[81] Despite these assurances from Entergy and the NRC Staff that these screens are mitigating the impingement of shortnose sturgeon, there is no data to support this conclusion. Because the NRC Staff fails to rely on any impingement monitoring after the screens were installed,[82] it cannot be assumed or concluded that these screens have had any mitigating effects. In order to properly assess the impacts of the Ristroph screens, the NRC Staff must rely on actual impingement data. The NRC Staff even admits that they cannot assess the extent to which the installation of the screens might reduce impacts to the sturgeon.[83] 140-p-TS

The lack of complete and recent impingement data significantly limits the NRC Staff's ability to form a conclusion about the actual affects on the shortnose sturgeon. Indeed, the NRC Staff readily admits that it is unable to come to a definitive conclusion based on this incomplete data. Based on its review of the impingement data supplied by Entergy, the NRC Staff finds in the DSEIS that due to "the uncertainty of the current impingement losses of . . . sturgeon and because insufficient data exist to use the [weight of evidence] approach," the effects on endangered shortnose sturgeon due to license renewal could range from "SMALL to LARGE."[84] In fact, the NRC Staff explicitly admits that the supplied data was insufficient and current monitoring is needed to form a conclusion about the effects of impingement on the shortnose sturgeon.[85] However, instead of gathering data to support a rational and reasonable assessment of the affects to the shortnose sturgeon, the NRC Staff was content to leave their analysis as incomplete and uncertain. NMFS has also shown concern with this lack of recording data.[86] Riverkeeper agrees with NMFS that unless the NRC Staff gathers impingement data or studies 140-q-TS

---

[77] 50 C.F.R. § 402.14 (2008).
[78] DSEIS, Appendix E, BA § 4.3.2, at E-96, E-97.
[79] *Id.* at E-97.
[80] *Id.*
[81] *See id.* at E-98.
[82] *See* DSEIS, Main Report Table 4-11 Impingement Data for Shortnose and Atlantic Sturgeon at IP2 and IP3, 1975-1990 (data from Entergy 2007b), at 4-52.
[83] DSEIS, Appendix E, at E-99.
[84] DSEIS, Main Report § 4.6.1, at 4-52.
[85] DSEIS, Appendix E, BA § 4.3.2, at E--98 -- E-99 (concluding that the license renewal would likely affect the species, but without current monitoring data, it is impossible to gauge the extent of the impact).
[86] Colligan (NMFS) to Wrona (NRC), RE: Biological Assessment for License Renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Feb. 24, 2009).

14

reflecting accurate estimates of impinged shortnose sturgeon, the impact assessment in the DSEIS is inadequate.[87]

The NRC Staff's inconclusive determination also rests in part on the lack of data regarding entrainment and heat shock. While the NRC Staff says that there is likely no entrainment of shortnose sturgeon occurring, this determination is based on a review of data dating back to the 1980s.[88] The NRC Staff admits that entrainment cannot be ruled out and that there is currently no monitoring program at Indian Point.[89] Similarly, in regards to potential heat shock, the NRC Staff admits that increased temperatures can have a "significant effect on the shortnose sturgeon," however, could not determine the extent to which the population would be affected because additional studies are required.[90]

The NRC Staff's ultimate "conclusion" that the range of impacts to shortnose sturgeon is "SMALL to LARGE"[91] lacks any definitiveness and is essentially meaningless, improperly flouting the requirements of NEPA.[92] While the lack of monitoring data and studies inhibits the ability to form specific conclusions, this does not excuse the NRC Staff from their obligation to accurately assess the impacts on endangered species affected by Indian Point. It is clear that the NRC Staff did not effectively or sufficiently analyze the impacts that license renewal would have on the shortnose sturgeon, and the NRC Staff cannot justify its inadequate conclusion simply by pointing to the unavailability of relevant data.

140-q-TS contd.

Pisces' expert report corroborates the deficiency of the NRC Staff's review.[93] Pisces points out that the data used by the NRC Staff to assess the number of shortnose and Atlantic sturgeon impinged at Indian Point is old, and that the lack of monitoring of impingement means that they do not know if current impingement rates are similar to those between the 1970s and 1990s. In addition, Pisces points out that the NRC Staff admit that they cannot assess the thermal impact on these species. The Pisces expert report concludes that, given these large uncertainties, the NRC Staff came to no conclusion on the impact of Indian Point on sturgeon, giving a range of small to large for the future impacts.[94]

The NRC Staff's analysis of the impacts to shortnose sturgeon is also wanting since it does not consider the impacts caused by IP1. If the license for Indian Point Units 2 and 3 is renewed, Entergy will use some of the systems from Indian Point Unit 1 in the continued operations of the facility.[95] Specifically, the intake structure for Unit 1 will be used to "[p]rovide support, shelter and protection for equipment credited for regulations associated with fire protection."[96] The

[87] *Id.*
[88] DSEIS, Main Report § 4.6.1. at 4-51; DSEIS, Appendix E at E-96.
[89] DSEIS, Appendix E at E-96.
[90] DSEIS, Main Report § 4.6.1. at 4-51; DSEIS, Appendix E at E-99-100.
[91] DSEIS, Main Report § 4.6.1, at 4-52.
[92] *See* 42 U.S.C. § 4332; *Marsh v. Oregon Natural Resources Counsel*, 490 U.S. 360, 374 (1989).
[93] Pisces Report at 10.
[94] *See* Pisces Report at 10.
[95] *See generally,* NRC: Indian Point Nuclear Generating Unit Nos. 2 and 3 – License Renewal Application (Apr. 30, 2007), *available at* http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html#application ("Entergy LRA").
[96] Entergy LRA § 2.4.2, at 2.4-5.

15

License Renewal Application states that travelling screens have been installed at the Unit 1 intake structure[97], but neither the DSEIS nor the application analyze the impingement impacts on the shortnose sturgeon. Moreover, neither of these documents cites to any reports of past shortnose impingements at the Unit 1 intake structure. By failing to analyze the effects of the continued use of the Unit 1 Intake Structure, the NRC has ignored another point of impact on the shortnose sturgeon. If Entergy is going to use the intake structure from Unit 1 in the continued operation of Indian Point, the NRC staff must take into account past and future impingement from Unit 1 in order to accurately analyze the total impacts on the species. 140-q-TS contd.

The NRC Staff also fails to recognize that the Indian Point nuclear facility will require an incidental take permit in order to comply with the ESA.[98] The NRC admits that future operation of the facility will likely impinge shortnose sturgeon, and this future impingement is considered a "take" under the ESA.[99] Any reliance on the fact that shortnose sturgeon appear to be rebounding in the River, is unfounded, since the fact remains that impingement is still occurring.[100] *Every* impingement of shortnose sturgeon that occurs without an incidental take permit is a violation of the ESA. Because the taking of shortnose sturgeon would be incidental to the operation of the plant, the ESA requires that the facility obtains a permit to regulate and minimize the impact on the species. Riverkeeper's concerns about future takings were echoed in a letter from Mary Colligan, Assistant Regional Administrator for Protected Resources for NMFS Northeast Region, to James Thomas at Enercon Services, a company assisting Entergy in its preparation of its Environmental Report (ER).[101] In this letter, Colligan stated that NMFS is aware that Indian Point has impinged shortnose sturgeon and that such impingement is a take under the ESA.[102] Colligan also wrote that since Indian Point has operated without a permit, such takes were violations of the ESA.[103] The DSEIS failed to note that any future impingements of shortnose sturgeon at the Indian Point nuclear facility without a permit will also be violations of the ESA. In the absence of recent data showing that impingement is not occurring, the NRC Staff and NMFS must assume that the shortnose sturgeon are continuing to be impacted by impingement, and comply with the law accordingly. 140-r-TS

Moreover, the DSEIS is inadequate due to a complete lack of assessment of the potential effects on federally listed species caused by groundwater contamination at Indian Point. As discussed in more detail below, the IP1 and IP2 spent fuel pools are have leaked extensive amounts of highly toxic radionuclides, including strontium-90 and tritium, into the groundwater around the plant. The NRC Staff at no point in the DSEIS assesses the effects of this toxic contamination on the Hudson River's federally listed shortnose sturgeon. Riverkeeper is highly concerned about the 140-s-TS

---

[97] *Id.* § 2.3.3.19, at 2.3-157.
[98] *See* 15 U.S.C. § 1539(a)(1)(B) (2006); *see also* 50 C.F.R. § 402.14(i) (2008) (NMFS may also include an incidental take statement in a biological opinion after formal consultation, but there is no reference to this option either).
[99] *See* 15 U.S.C. § 1532(19) (2006).
[100] *See* DSEIS, Main Report § 2.2.5.5, at 2-77 to 2-78; DSEIS, Appendix E, at E-95. In fact, the NRC Staff admits that increased population of shortnose sturgeon will likely result in increased impingement. *Id.* at E-97.
[101] *See* Entergy, Inc., License Renewal Application, Appendix E: Applicant's Environmental Report, Operating License Renewal Stage, Indian Point Energy Center (ER), Attachment A, Colligan (NMFS) to Thomas (Enercon) (Mar. 19, 2007), *available at* http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point/ipec-er-attachment-a2.pdf.
[102] *See id.*
[103] *See id.*

16

1

lack of analysis here, particularly because of the known dangers of exposure to radioactive substances such as strontium-90 and tritium. Strontium-90 imitates calcium by concentrating in fish bones and shells of clams and blue crab. Clams are a major part of the diet of sturgeon found in the Hudson River. Riverkeeper is therefore concerned that Hudson sturgeon are being exposed to elevated levels of this dangerous substance. Without reference to additional studies done to scrutinize the effects of such contamination on listed species and humans, the NRC Staff's DSEIS is woefully incomplete.

140-s-TS contd.

b. <u>Candidate Species – Atlantic Sturgeon</u>

The Atlantic sturgeon is currently a candidate species under the ESA, and is thus being considered for listing as threatened or endangered. As such, it does not currently receive any substantive federal protections. However, if the decision is made to list the Atlantic sturgeon the NRC may have to reinitiate Section 7 consultation with NMFS to assess the effects of relicensing on this species. The chances of re-initiation are particular strong because the listing decision will likely be released well before a final decision is made regarding the relicensing of Indian Point.

Riverkeeper is concerned with the NRC Staff's assessment of impacts on the Atlantic sturgeon. Similar to the data on shortnose sturgeon impingement, entrainment, and heat shock, the DSEIS relies on insufficient records to assess the impacts on the Atlantic sturgeon. Although the data for the impingement of Atlantic sturgeon is more complete than that for the shortnose sturgeon, there is no record of impinged fish after 1987.[104] The NRC Staff does not give a reason for why the monitoring of impingement was halted over 20 years ago and also fails to make its current impact assessments on best estimates or currently available data. Riverkeeper is also concerned that the reporting of impinged Atlantic sturgeon reflects the impingement of over 4,000 fish from 1976 to 1987.[105] If the Atlantic sturgeon is indeed listed under the Endangered Species Act, the NRC will be required to engage in the ESA Section 7 consultation process, in order to address the "taking" of Atlantic sturgeon by Indian Point's operation, and to consider mitigation measures necessary to minimize impingement and entrainment losses. The DSEIS lacks the current data that is necessary to assess potential impacts to the species and recommend mitigation strategies that could lessen the harm of those impacts. As a result, the NRC Staff has failed to provide sufficient factual support for its conclusion regarding the impacts of relicensing Indian Point to the Atlantic sturgeon.

140-t-TS

3. Improper Analysis of Groundwater Contamination Caused by Spent Fuel Pool Leaking

Sections 4.3, 4.5, and 4.7 of the DSEIS contain the NRC Staff's evaluation of the environmental impacts of spent fuel pool leaking at Indian Point.[106] The NRC Staff discusses the status of the leaking and its investigation findings earlier in the DSEIS, in section 2.2.7, but reserves

140-u-GW/SA

[104] DSEIS, Main Report § 4.6.1, at 4-52.
[105] *Id.*
[106] *Id.* §§ 4.3, 4.5, 4.7.

17

judgment on the environmental impacts of the leaking until section 4.0.[107] These brief portions of the DSEIS, taken together totaling a paltry 4 pages at best, constitutes the NRC Staff's entire evaluation of the extensive spent fuel pool leaking that has been ongoing at the Indian Point facility for years. A review of the NRC Staff's collective assessment in the DSEIS of the spent fuel pool leaks reveals an utter failure to address any of the concerns raised in Riverkeeper's Scoping Comments or by the contention filed by Riverkeeper on this issue.

Riverkeeper's Scoping Comments urged the NRC Staff to comprehensively assess the environmental impacts of the IP1 and IP2 spent fuel pool leaks.[108] Riverkeeper explained the gross inadequacy of Entergy's Environmental Report ("ER") and, thus, urged the NRC Staff not to rely upon it to prepare its draft supplemental environmental impact statement.[109] Riverkeeper highlighted the importance of fully evaluating the ever-accumulating contamination caused by the leaks on the Hudson River ecosystem, including on fish, shellfish, and river sediments.[110] Riverkeeper's Scoping Comments also suggested assessing the feasibility of requiring Entergy to move more fuel to dry casks as a reasonable mitigation measure.[111] Riverkeeper's subsequently filed contention on spent fuel pool leaks further elaborated on the deficiencies of Entergy's analysis and the need for a thorough review of the environmental impacts resulting from the leaks.[112]

140-u-GW/SA contd.

Yet, despite the reasoned and entirely valid requests articulated in Riverkeeper's Scoping Comments, the NRC Staff essentially grafted Entergy's assessment of the leaks into the DSEIS as their own.[113] This deficient analysis completely fails to comply with NEPA.

Firstly, the NRC Staff ignores the fact that Entergy has failed to definitively demonstrate that the leaking has even ceased. In fact, there is no discussion at all of whether the leaking is still active, and instead, the NRC Staff apparently accepts Entergy's current monitoring and other "remedial" activities, such as the draining of the IP1 pool, as enough.[114] Despite these actions, there is still no indication that Entergy will ever be able to definitively determine whether the IP2 pool continues to leak. Even though IP1 is no longer a possible source of leakage, IP2 still is. While Entergy identified and addressed some sources of the leakage from IP2, no one disputes that Entergy has been unable to inspect 40% of the IP2 pool liner due to the high density of the spent fuel storage racks and the minimal clearance between the bottom of the racks and the floor of the pool.[115] Indeed, Entergy has explicitly acknowledged that active leaks cannot be ruled out.[116] Moreover, as Riverkeeper has pointed out to the NRC Staff several times already, sample results

---

[107] *Id.* § 2.2.7, at 2-107 to 2-108. The NRC Staff references its findings relating to the significance of the spent fuel pool leaking sporadically throughout the DSEIS, but these four sections seem to represent the NRC Staff's primary analysis of this issue.
[108] Riverkeeper Scoping Comments at 12-15.
[109] *Id.*
[110] *Id.*
[111] *Id.*
[112] Riverkeeper Petition for Hearing at 74-86.
[113] DSEIS, Main report §§ 2.2.7, 4.3, 4.5, 4.7.
[114] *Id.* § 2.2.7, at 2-107 to 2-108, § 4.3, § 4.5, § 4.7.
[115] *See* Riverkeeper Scoping Comments at 13; Riverkeeper Petition for Hearing at 74, 80-81.
[116] *See* Groundwater Investigation Executive Summary (Indian Point Energy Center, Buchanan, N.Y., Jan. 2008), at 3, *available at* http://jic.semo.state.ny.us/Resources/ExecutiveSummary%20GW%20final.pdf.

18

1

clearly demonstrate that the contamination is the result of recent leaking, and not "historical" releases.[117]

Yet, Entergy has not provided any information on the feasibility of examining the remainder of the pool liner, or explained any other steps it will take to find any and all sources of leaks from IP2. In fact, Entergy has made no commitment whatsoever for augmented inspection of the spent fuel pool liners during the period of extended operation, and instead is relying on the one-time inspection of the accessible portion of the liner and groundwater testing.[118] The NRC Staff has expressed concern in its recent Safety Evaluation Report about the lack of a system at IP2 to monitor, detect and quantify potential leakage through the spent fuel pool liner, and stated that it is uncertain that the leakage problems have been permanently corrected.[119] Yet, despite these concerns, the DSEIS is devoid of discussion on the questionable status of the leaking.[120] Riverkeeper does not understand how the NRC Staff can accurately assess the environmental impacts of ongoing leaking during the 20-year extended licensing term without addressing the root of the problem.

140-u-GW/SA contd.

Secondly, the NRC Staff's analysis is deficient since it relies solely on the finding that radiological doses to humans from consumption of aquatic foods, the only current exposure pathway, is within regulatory limits.[121] The NRC Staff maintains that the spent fuel pool leaks, "while new information, are within the NRC's radiation safety standards . . . and are not considered to have a significant impact on plant workers, the public, or the environment.[122] However, the NRC Staff is continuing to improperly hide behind section 4.6 of GEIS, which analyzes radiological impacts based only on dosage limits.[123] However, the GEIS only addresses radiological impacts to man from *routine operations and releases*, and does not contemplate unplanned, unmonitored releases from leaking plant systems into the environment. As such, mere calculation of dose limits is not sufficient for assessing the "significance" of the impacts of the spent fuel pool leaks.[124]

Rather, NEPA requires a broader evaluation of environmental impacts beyond mere public health concerns.[125] The CEQ regulation defining "significantly," requires consideration of the context of the action and intensity or severity of the impacts.[126] Accordingly, in order to accurately evaluate the significance of the spent fuel pool leaking, the NRC Staff's must fully assess the impacts to the natural environment of the Hudson River. However, by relying on

140-v-GW/HH/RI

[117] *See* Riverkeeper Scoping Comments at 13-14; Riverkeeper Petition for Hearing at 74, 81-82.
[118] U.S. Nuclear Regulatory Commission, Safety Evaluation Report With Open Items Related to the License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3, Docket Nos. 50-247 and 50-286 (January 2009), at 3-123 ("SER").
[119] SER at 3-123.
[120] DSEIS, Main Report § 2.2.7, at 2-107 to 2-108, § 4.3, § 4.5, § 4.7.
[121] DSEIS, Main Report § 2.2.7, at 2-107 to 2-108; § 4.3, § 4.5, § 4.7. In addition to incorrectly relying on dose limits as a sole measurement of the impacts from the leaks, the NRC Staff's assessment of dose limits itself is fundamentally flawed since it does not take into consideration a proposed desalination plant right that is likely to result in a direct drinking water pathway. *See infra* for in-depth discussion.
[122] DSEIS, Main Report §§ 4.3, 4.5, 4.7.
[123] *Id.* §§ 2.2.7, 4.3, 4.5, 4.7.
[124] 10 C.F.R. § 51.53(c)(3)(iv); *See* 40 C.F.R. § 1508.27.
[125] *See Marsh v. Oregon Natural Resources Counsel*, 490 U.S. 360, 374 (1989).
[126] *See* 40 C.F.R. § 1508.27 (requiring analysis of ten different factors).

19

1

human dose standards, the NRC Staff completely foregoes *any* analysis of the impacts of the contamination to the Hudson River ecosystem.[127] In particular, the DSEIS fails to determine if toxic radionuclides such as strontium-90 or cesium-137 are bioaccumulating in the environment; there is no analysis of the contamination to Hudson River fish or shellfish despite sampling showing elevated levels of such radionuclides in fish;[128] there is no assessment of the effects of the contamination to the nearby ecologically critical area of Haverstraw Bay;[129] and there is no assessment of the potential effects of the leaking on the Hudson River's federally listed endangered species, such as the short-nosed sturgeon.[130]

140-v-GW/HH/RI contd.

There is also no evaluation of the cumulative long-term effects of the contaminated groundwater plumes. The NRC Staff cites Entergy's removal of spent fuel from the IP1 pool as evidence that impacts from the contamination would be minimized.[131] However, the extensive leaking from the Unit 1 pool, which contained strontium-90, one of the most toxic radionuclides, is still in the groundwater and will continue to slowly leach into the Hudson River.[132] Simply because this source of the leaking has now stopped does not change the fact that there has been no assessment of the environmental impacts of this contamination. Moreover, current and future accidental radioactive releases from the plant will only add to the existing plumes. For example, a recent underground pipe leak at the facility resulted in over 100,000 gallons of tritiated water being released directly into the plant's discharge canal, and the Hudson River.[133] The NRC Staff must sufficiently evaluate the cumulative environmental impacts of the contamination that has occurred. Likewise, any claims that the leaking has ceased from the pools altogether, which is dubious as explained above, similarly does not change the fact that there has been no analysis of the environmental impacts of the contamination to date.

140-w-GW/HH/RI

Section 4.5 of the DSEIS ostensibly analyzes the environmental impacts of operation on "Groundwater Use and *Quality*."[134] It is ludicrous to think that the NRC Staff could come to a conclusion on the *quality* of groundwater by only looking at public health impacts. And yet, the end conclusion in the DSEIS explicitly states that leaks do not have a significant impact on "plant workers, the public, *or the environment*,"[135] despite absolutely no inquiry into how the leaks are affecting the natural ecosystems surrounding Indian Point.

Furthermore, by only looking at whether public health doses were within regulatory standards, the NRC Staff has failed to accurately assess the degree of the contamination caused by the spent fuel pool leaks. There is no dispute that there are at least two extensive groundwater plumes

[127] *See* Riverkeeper Scoping Comments at 12, 14-15; Riverkeeper Petition for Hearing at 75, 84-86.
[128] *See* Riverkeeper Scoping Comments at 14; Riverkeeper Petition for Hearing at 75, 84-86.
[129] *See* Riverkeeper Scoping Comments at 14-15; Riverkeeper Petition for Hearing at 75, 84-86.
[130] *See also discussion infra.*
[131] DSEIS, Main Report § 4.3, at 4-36.
[132] In the months leading up to the completion of draining of the IP1 pool, Entergy reported it was leaking around 70 gallons per day, contributing thousands and thousands of additional gallons of polluted water into the groundwater and eventually the Hudson River. It is not clear that this additional leakage was factored into Entergy's conclusions in its Environmental Report or subsequent Investigation Report, and accordingly, it is not clear that the NRC Staff considered this either. It is, thus, apparent, that the NRC Staff has utterly failed to analyze the leaks that have occurred from IP1.
[133] *See* Annie Correal, *Indian Pt. Broken Pipe Spurs Safety Worries*, THE NEW YORK TIMES (Feb. 27, 2009).
[134] DSEIS, Main Report § 4.5 (emphasis added).
[135] *Id.* §§ 4.3, 4.5, 4.7 (emphasis added).

20

1

underlying the Indian Point site.[136] GZA GeoEnvironmental, the hydrogeological engineering firm hired by Entergy to examine the Indian Point site, had identified radionuclide contaminated plumes at depths ranging from 80 feet (below Indian Point 2) to 160 feet (near the Hudson River bank) for tritium, and from 120 feet (below Indian Point 1) to 150 feet (near the Hudson River bank) for strontium-90.[137] The geology under the Indian Point site is characterized by fractured bedrock, in particular Inwood Marble.[138] Strontium is chemically similar to calcium and prone to substitution for calcium in carbonate minerals such as marble.

A review of recent sampling results shows that the level of contamination is well in excess of EPA drinking water levels.[139] The DSEIS emphasizes the NRC Staff's investigation finding that there is currently no drinking water exposure pathway to humans.[140] As discussed at length below, this is flawed since a proposed desalination plant right across the river from Indian Point is likely to result in drinking water pathway. In any event, EPA maximum contaminant levels are a recognized, highly-conservative benchmark for comparison purposes, to assess the degree of contamination.[141] As Riverkeeper consistently points out, the NRC Staff routinely uses this method of measurement to analyze spent fuel pool leaks. Using drinking water standards is a perfect way to assess the "significance" of the leaking under NEPA, and the fact that the water at Indian Point is not used for drinking water right now is of no moment.[142] Instead, by relying solely on radiation dose calculations, the NRC Staff has failed to acknowledge the severity of the contamination.

140-w-GW/HH/RI contd.

With such glaring gaps in the NRC Staff's analysis, how can the NRC Staff possibly come to an accurate conclusion as to the "significance" of the spent fuel pool leaking? If they had taken into account that which NEPA requires, the NRC Staff should have found that the leaking is indeed "significant." The NRC Staff's opposite conclusion is entirely unwarranted, unfounded, and wrong.[143] Likewise, the NRC Staff's conclusion that "additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted" is based on a wholly incomplete analysis.[144] Thus, the NRC Staff should consider appropriate mitigation measures in light of the concerns raised herein, including, but not limited to, requiring Entergy to move more spent fuel to dry casks.[145]

---

[136] *See* Riverkeeper Petition for Hearing at 82 (referencing E-mail from James Noggle, NRC, to Timothy Rice and Larry Rosenmann of the NYS DEC (Nov. 6, 2006); Groundwater Investigation Executive Summary (Indian Point Energy Center, Buchanan, N.Y., Jan. 2008), at 2-4, *available at* http://jic.semo.state.ny.us/Resources/ExecutiveSummary%20GW%20final.pdf.
[137] *See* January 7, 2008 GZA GeoEnvironmental Inc., *Hydrogeologic Site Investigation Report*, Figure 9.1 - Unit 2 Tritium Plume, Cross Section A - A', *available at* NRC ADAMS Accession No. ML0800320055; *id.* at Figure 9.2 - Unit 1 Strontium Plume, Cross Section B - B', *available at* NRC ADAMS Accession No. ML0800320056.
[138] January 7, 2008 GZA GeoEnvironmental Inc., *Hydrogeologic Site Investigation Report* at 50. The GZA report is available at NRC ADAMS Accession No. ML080320540.
[139] *See* Riverkeeper Petition for Hearing at 82-84.
[140] DSEIS, Main Report § 2.2.7, at 1-108.
[141] *See* Riverkeeper Petition for Hearing at 82-84.
[142] *See* 40 C.F.R. § 1508.27; 10 C.F.R. § 51.53(c)(3)(iv).
[143] DSEIS, Main Report § 4.3, 4.5, 4.7.
[144] *Id.* § 4.3, at 4-35.
[145] Riverkeeper Scoping Comments at 15.

21

1

The NRC Staff has the ultimate responsibility for performing the required NEPA evaluation in relicensing proceedings.[146] Since Entergy's ER was wholly deficient in regards to analyzing the impacts of the spent fuel pool leaking, it is incumbent upon the NRC Staff to pick up the slack. As such, the NRC Staff must take into account the foregoing concerns, perform the necessary analyses and assessments as indicated, and incorporate their findings into the FSEIS.[147] 140-w-GW/HH/RI contd.

4. Failure to Consider the Rockland County Desalination Project

The NRC Staff's assessment of the spent fuel pool leaks in Section 4.0 of the DSEIS is premised upon the assumption that "no drinking water exposure pathway exists"[148] and that the "only noteworthy dose pathway resulting from contaminated ground water migration to the river is through the consumption of fish and invertebrates from the Hudson River."[149] However, the facts concerning United Water New York's proposed desalination plant in Rockland County, indicate a highly foreseeable outcome to the contrary, and, as such, must be considered and incorporated into the review process in all relevant contexts and document sections.

This desalination project, which will withdraw Hudson River water, to be sited across the river and slightly downstream from Indian Point,[150] and deliver 7.5 million gallons per day of drinking water, is currently undergoing review by the NYSDEC,[151] as well as other agencies, concerning various permit applications and SEQRA. United Water New York has stated that this project is in development pursuant to the Public Service Commission Order of December 2006 ("PSC Order"), which approved a merger and rate plan, and provided for an increase in the drinking water supply to Rockland County residents.[152] According to United Water New York, as required by the PSC Order, the scheduled in-service, operational completion date for the project is 2015.[153] Plans for a pilot plant, which has been designed to evaluate water treatment methodologies for the permanent plant, are now also in the application and permitting process 140-x-HH

[146] *See Exelon Generation Co., LLC* (Early Site Permit for Clinton ESP Site), ASLBP No. 04-821-01-ESP, 2005 N.R.C. LEXIS 61, *5-6 (2005); 42 U.S.C. § 4332.
[147] The NRC Staff has consistently refuted the necessity of assessing the environmental impacts of the spent fuel pool leaks in the manner Riverkeeper describes, including the need to consider leaks from IP1, the effects on the Hudson River ecosystem, or the need to use any other standards aside from NRC dose limits. However, Riverkeeper's contention relating to the leaks has been admitted for a hearing, and is currently being litigated. In light of the fact that these issues are in dispute, the NRC Staff should err on the side of caution in the preparation of its FSEIS and address the concerns presented herein.
[148] *See e.g.*, DSEIS, Main Report § 2.2.7 at 2-107.
[149] *Id.*
[150] The Intake Site consists of a one-acre portion of one tax parcel in the Town of Haverstraw, 21.09-2-1, located at 710 Beach Road. As shown in Figure 2-2, annexed hereto as Exhibit C, the Intake Site is on the south side of Beach Road on a point of land that extends into the Hudson River. The Intake Site is bounded to the north by the road and to the east by the Hudson River; *see also* Google Map showing rough proximity of Indian Point to proposed desalination plant, annexed hereto as Exhibit D.
[151] *See, e.g.*, Letter from William C. Janeway (DEC Regional Director) to Rebecca Troutman (Riverkeeper), March 9, 2009, annexed to Riverkeeper's comments as Exhibit E (Confirming DEC's lead agency status for the desalination plant project).
[152] Commission Order in Case No. 06-W-0131, Issued and Effective December 14, 2006 by the New York State Department of Public Service.
[153] Haverstraw Water Supply Project, Draft Environmental Impact Statement, September 26, 2008, at S-1. Please note that this document is currently in revision pursuant to direction from the DEC. Available at http://hudsondesal.com/home.cfm, and last viewed on March 11, 2009.

22

1

with DEC. Moreover, a Draft Environmental Impact Statement ("Desalination DEIS") on the project has already been submitted by United Water New York.[154]

Pursuant to NEPA, the NRC Staff is required to assess the impacts associated with the desalination plant in the DSEIS: An environmental impact statement must include discussion of any indirect effects of the proposed project and their significance.[155] "Indirect effects" are defined as those

> which are caused by the action and are later in time or farther removed in distance, but are still *reasonably foreseeable*. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous.[156]

Thus, an EIS must consider impacts which are "reasonably foreseeable."[157] There is no doubt that effects on Rockland County's drinking water supply due to radioactive contamination from Indian Point are "reasonably foreseeable." Due to the fact that the Hudson River flows south from IP towards the planned, closely situated intake site of the desalination plant, it is more than "reasonably foreseeable" that any current water-borne contamination, as well as potential additional contamination due to continued deterioration of plant systems, accident or terrorist event, will impact the water supply provided via the desalination plant, and in turn public health. Similarly, Entergy's own environmental documents admit that the topography of Indian Point is such that "surface drainage is toward the Hudson River."[158]

Neither Entergy nor the NRC Staff dispute that the leaking spent fuel pools have resulted in the leaching into the Hudson River of two extensive plumes of radionuclide-laden contamination.[159] Monitoring well samples at Indian Point show that the levels of contamination in the groundwater are well above EPA drinking water limits.[160] In addition to the ongoing spent fuel pool leaking, other future accidental discharges from the plant will also contribute contamination

140-x-HH contd.

---

[154] Available at http://hudsondesal.com/home.cfm, and last viewed on March 11, 2009.
[155] 40 C.F.R. § 1502.16.
[156] 40 C.F.R. § 1508.8(b)
[157] *See* C.E.Q., Memorandum, 40 Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, 46 Fed. Reg. 12086, 18031 (March 23, 1982) ("The EIS must identify all the indirect effects that are known, and make a good faith effort to explain the effects that are not known but are 'reasonably foreseeable.' . . . The agency has the responsibility to make an informed judgment, and to estimate future impacts on that basis, especially if trends are ascertainable. . . .The agency cannot ignore these uncertain, but probable, effects of its decisions." *See also, Swain v. Brinegar*, 542 F.2d 364, 7th Cir. 1976 ("An EIS need not review all possible environmental effects of a project. It is sufficient if it considers only those which are 'reasonably foreseeable.'"; *Carolina Environmental Study Group v. U.S.*, 510 F.2d 796, 798 DC Cir. 1975 ("Section 102(2)(C)(i) of NEPA requires a 'detailed statement' on 'the environmental impact of the proposed action.' That language requires description of reasonably foreseeable effects. A 'rule of reason' is used to ascertain those effects anticipated.").
[158] Entergy ER at 2-18.
[159] *See* Groundwater Investigation Executive Summary (Indian Point Energy Center, Buchanan, N.Y., Jan. 2008), at 2, *available at* http://jic.semo.state.ny.us/Resources/ExecutiveSummary%20GW%20final.pdf.
[160] *See* Riverkeeper Petition for Hearing at 82-83.

23

1

to the Hudson River. For example, a recent underground pipe leak at the facility resulted in over 100,000 gallons of tritiated water being released directly into the waterway.[161]

Moreover, and ominously, the Desalination DEIS *specifically considers* the presence of Indian Point and the impacts of its contaminants to the water quality:

> Due to the presence of the Indian Point nuclear power plant on the eastern shore of the Hudson River in Buchanan, NY, some have expressed concern regarding the possible radiological contamination of groundwater as well as the Hudson River close to the plant. A summary of the radiological results from United Water's sampling program is provided below. Table 2-4 summarizes the analyses performed for radionuclides in water samples collected at several locations in the Hudson River in 2007 and 2008.[162]

The Desalination DEIS states that preliminary testing showed that the water withdrawn in the vicinity of the intended site contains detectable levels of the radionuclides radium, uranium, strontium-90, and tritium.[163]

The proposed desalination plant is not merely speculative at this point given the fact that it is in the planning, environmental review, and permitting stages. It is, thus, "reasonably foreseeable," as contemplated by the regulations implementing NEPA, that impacts to drinking water quality will result due to the radiological contamination from Indian Point. The presence of an environmental impact statement for the Rockland County Desalination Project renders the foreseeability of these impacts irrefutable. Indeed, the NRC Staff does not have to rely on prognostication to consider the impacts of IP on the proposed desalination plant because there is currently ample available information for the agency to rely on. Thus, NRC Staff is required to assess the effects of Indian Point on the Rockland County desalination project.

Yet, despite the foreseeable nature of this project, the DSEIS is completely devoid of assessment of the impacts of the license renewal on drinking water quality as it relates to the use of the Hudson River as a source of drinking water via the proposed desalination plant. The NRC Staff's current analysis of radiological impacts is premised upon a hypothetical "maximally exposed individual" which does not include consumption of drinking water via the desalination plant as an exposure pathway.[164] While the NRC Staff cites to past radiological sampling data to demonstrate no detectable radiological effects on drinking water,[165] there is no mention whatsoever of what kinds of radiological effects on drinking water supply will result from having a facility in close proximity and downstream from Indian Point, withdrawing water for human consumption. Moreover, the NRC Staff's evaluation of the groundwater contamination from

140-x-HH contd.

---

[161] *See* Annie Correal, *Indian Pt. Broken Pipe Spurs Safety Worries*, THE NEW YORK TIMES (Feb. 27, 2009).
[162] Haverstraw Water Supply Project, Draft Environmental Impact Statement, September 26, 2008, at 2 – 9. Please note that this document is currently in revision pursuant to direction from the DEC.
[163] *Id.*
[164] *See* DSEIS, Main Report §§ 2.2.7, 4.3.
[165] *See id.* § 2.2.7 at 2-104, 2-105.

24

1
2

spent fuel pool leaks hinges on its finding that the only exposure pathway is through consumption of aquatic organisms.[166]

Thus, the DSEIS is substantially incomplete, and must be corrected prior to the conclusion of the environmental review process. The NRC Staff must comprehensively review and consider the impacts of radiological releases from the Indian Point facility, both through normal operations and from unplanned discharges, on drinking water quality in light of the Rockland County Desalination Project.

140-x-HH contd.

5. Failure to Properly Consider Impacts to the Communities Utilizing Hudson River Water as a Water Supply Source

Additionally, although the DSEIS acknowledges that "the Hudson River was and is used as a source of potable water,"[167] the NRC Staff fails to properly identify and evaluate potential adverse impacts to the communities which draw Hudson River water for their water needs. The DSEIS asserts that it includes "drinking water" in its evaluation of "airborne pathway," but omits this critical issue in the reference to "waterborne pathway."[168] Further, in the subsequent discussion of data from the "2006 REMP Results," the DSEIS simply refers to results of the "monthly drinking water samples" without identifying which sources (presumably those with potential airborne exposure only) were examined.[169]

Communities which use the Hudson River for their water supply needs, and are therefore vulnerable to waterborne exposure to contaminants, include, but are not limited to, the City of Poughkeepsie, the Town and Village of Rhinebeck, and New York City, which operates the emergency Chelsea pump station at New Hamburg. Due to the fact that the Hudson River is a tidal estuary (the water flows up and downstream), and dispersion and diffusion of contaminants occurs with their release into the waterway,[170] radionuclides can be transported upriver as well as downriver. Accordingly, the potential adverse impacts caused by the operation of Indian Point, under normal operation, with leaks, other accident or disaster, pertaining to the current use of the Hudson river as a source of water, must be fully assessed.

140-y-AE/CL

6. Improper Conclusions Regarding Cumulative Environmental Impacts of Operation

a. <u>Cumulative Impacts on Aquatic Resources</u>

In assessing the current and likely future stressors that contribute to cumulative impacts of aquatic resources of the Hudson River, the NRC Staff concedes that the continued operation of IP2 and IP3 has the potential to adversely affect a variety of RIS species due to the once-through

140-z-AE/CI

[166] *See id.* § 2.2.7 at 1-108.
[167] *Id.* § 2.2.5.2, at 2-40.
[168] *Id.* §2.2.7 at 2-104.
[169] *Id.* §2.2.7 at 2-105.
[170] *See e.g.,* Ho, D.T., P. Schlosser, & T. Caplow, Determination of longitudinal dispersion coefficient and net advection in the tidal Hudson River with a large-scale, high resolution SF6 tracer release experiment, Environ. Sci. Technol., 36, 3234-3241, 2002.; Ferdi L. Hellweger, Alan F. Blumberg, Peter Schlosser, David T. Ho, Theodore Caplow, Upmanu Lall, & Honghai Li, *Transport in the Hudson Estuary: A Modeling Study of Estuarine Circulation and Tidal Trapping,* Estuaries Vol. 27, No.3 pp.527-538 (June 2004).

25

cooling system.[171] (Interestingly, the staff's examination of cumulative impacts to water and sediment quality of the Hudson River does not even mention the radioactive contamination caused by spent fuel pool leaks at Indian Point[172]). When all the various factors, including the operation of Indian Point, were considered, the NRC Staff found that the overall effects on aquatic resources was "large."[173] In Pisces' expert opinion, "the Indian Point power plant must take its share of the responsibility and undertake to do as little damage a possible to an already stressed system."[174]

140-z-AE/CI contd.

b. Cumulative Radiological Impacts

The NRC Staff concludes in Section 4.8.2 of the DSEIS that the cumulative radiological impacts are "SMALL."[175] However, in light of the issues raised above regarding the NRC Staff's flawed assessment of spent fuel pool leaks, and the failure to consider the Rockland County Desalination Project or other drinking water supplies, this conclusion is dubious. A more thorough analysis that fully addresses the above-referenced concerns must be completed before the NRC Staff can come to an accurate conclusion as to cumulative radiological impacts of continued operation of IP2 and IP3.

140-aa-SM

DSEIS Section 5.0

Improper Analysis of Severe Accident Mitigation Alternatives

The assessment of Severe Accident Mitigation Alternatives ("SAMAs") in Section 5.2 of the DSEIS is wholly deficient because the NRC Staff incorrectly relied upon the assessment of SAMAs in Entergy's ER.[176] Specifically, the NRC Staff found that Entergy's methodology and analyses were completely sound.[177] Unfortunately, the NRC Staff has ignored several fundamental flaws in the methods employed by Entergy, which, if considered, would greatly change the outcome of the SAMA analysis.

1. Failure to Consider the Risk of Intentional Acts of Sabotage

The NRC Staff's SAMA assessment is utterly flawed because it fails to consider the risks posed by terrorist attacks on Indian Point. Riverkeeper recognizes that the NRC refuses to consider the environmental impacts of intentional attacks in a licensing proceeding. In the instant proceeding, the NRC Staff has explicitly said that the "issue of security and risk from malevolent acts at nuclear power plants is beyond the scope of license renewal . . . the Commission's long-standing position is that NEPA does not require inquiry into the consequences of a hypothetical terrorist attack."[178] It is Riverkeeper's unwavering position that this refusal is simply unreasonable.

140-bb-SM

---

[171] DSEIS, Main Report § 4.8.1, at 4-56.
[172] *Id.* § 4.8.1, at 4-57.
[173] *Id.* § 4.8.1, at 4-58; Pisces Report at 10.
[174] Pisces Report at 10.
[175] DSEIS, Main Report § 4.8.3, at 4-60.
[176] *Id.* § 5.2.
[177] *Id.* § 5.2, at 5-6 to 5-10.
[178] NRC Staff Scoping Summary Report at 279-80.

26

1

Numerous reports indicate that nuclear power plants remain likely targets of terrorist attacks. The 9/11 Commission Report revealed that the mastermind of the 9/11 attacks had originally planned to hijack additional aircrafts to crash into targets, including nuclear power plants, but wrongly believed the plants were heavily defended.[179] This report indicates that the terrorists were considering attacking a specific nuclear facility in New York which one of the pilots had seen during a familiarization flight near New York.[180] This was likely Indian Point, especially given the fact that more than 17 million people live within 50 miles of the facility.[181] In the years since the 9/11 attacks, the federal government, including the NRC, has repeatedly recognized that there is a credible threat of intentional attacks on nuclear power plants.[182] Notably, existing nuclear power plants in the United States were built between the 1950s and the 1980s and were not intended to be able to withstand the impact of aircraft crashes or explosive forces.[183] Thus, given the current landscape, it is, essential that the risks of intentional attacks be considered during the relicensing process.

The U.S. Court of Appeals for the Ninth Circuit has specifically found that the NRC's consistent refusal to consider the risks of terrorism is unreasonable,[184] although, misguidedly, the NRC has explicitly chosen to limit the applicability of that judicial opinion.[185] The U.S. Environmental Protection Agency also specifically requested the NRC Staff to address the impacts of intentional attacks in the Indian Point license renewal EIS, to no avail.[186]

The Commission's rationale for precluding this important issue from review during the relicensing process is very weak. For example, the Commission has concluded that the benefits of considering the environmental impacts of attacks during a license renewal term would be marginal because those impacts are addressed in the current license term.[187] This reasoning is not supportable since the level of defense required under NRC's Atomic Energy Act-based

140-bb-SM contd.

[179] Nat'l Comm'n on Terrorist Attacks Upon the U.S., *The 9/11 Commission Report* (2004), at 154 ("9/11 Commission Report").
[180] *Id.* at 245.
[181] *See* Edwin Lyman, *Chernobyl on the Hudson? The Health & Economic Impacts of a Terrorist Attack at the Indian Point Nuclear Power Plant*, at 23 (2004), *available at*, http://www.riverkeeper.org/document.php/651/11302007_EL_Lym.pdf.
[182] *See, e.g.,; Wide-Ranging New Terror Alerts*, CBS News.com (May 26, 2002), *available at*, http://cbsnews.com/stories/2002/05/24/attack/main510054.shtml (discussing heightened alert of the U.S.'s nuclear power plants as a result of information gained by the intelligence community); *FBI Warns of Nuke Plant Danger*, CBS News.com (May 1, 2003), *available at*, http://www.cbsnews.com/stories/2003/09/04/attack/main571556.shtml (discussing FBI warning to nuclear plant operators to remain vigilant about suspicious activity that could signal a potential terrorist attack); General Accounting Office, *Nuclear Regulatory Commission: Oversight of Security at Commercial Nuclear Power Plants Needs to be Strengthened*, GAO-03-752 (2003) (noting that U.S. nuclear power plants are possible terrorist target, and criticizing the NRC's oversight of plant security); *FBI's 4th Warning*, CBS News.com (July 2, 2004) (discussing FBI warning of recent intelligence showing Al-Qaeda interest in attacking nuclear plants).
[183] *In re All Nuclear Power Reactor Licensees*, DD-02-04 (Nov. 1, 2002), *available at* http://www.nrc.gov/reading-rm/doc-collections/petitions-2-206/directors-decision/2002/ml022890031.pdf; *NRC: Nuclear Power Plants Not Protected Against Air Crashes*, Associated Press (Mar. 28, 2002).
[184] *San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir 2006).
[185] *Amergen Energy Co., L.L.C.* (Oyster Creek Nuclear Generating Station), CLI-07-08, 65 N.R.C. 124 (2007).
[186] Letter from Grace Musumeci, U.S. EPA, to Chief, NRC Rules and Directives Branch (Oct. 10, 2007) (ADAMS Accession No. ML07290360).
[187] *See Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-26, 56 N.R.C. 358, 365 (2002).

1

security regulations is lighter than the fundamental design changes that may warrant consideration under NEPA if they are cost-effective.[188] Moreover, this reasoning is inconsistent with NEPA, which imposes mandatory obligations on the NRC in considering proposals for re-licensing of nuclear plants.[189]

The Commission also rationalizes its decision to preclude risk assessment of terrorist attacks by arguing that it had already assessed the impacts of intentional attacks in the 1996 GEIS.[190] The GEIS contains the conclusion that:

> Although the threat of sabotage events cannot be accurately quantified, the commission believes that acts of sabotage are not reasonably expected. Nonetheless, if such events were to occur, the commission would expect that resultant core damage and radiological releases would be no worse than those expected from internally initiated events.[191]

In the DSEIS, the NRC Staff relies upon the conclusions in the GEIS to rationalize its exclusion of risks associated with terrorism.[192] Unfortunately, the conclusions in the GEIS been outdated by the significant change in the Commission's analysis of the potential for intentional attacks

140-bb-SM contd.

---

[188] Gordon Thompson, Risk-Related Impacts from Continued Operation of the Indian Point Nuclear Power Plants (Nov. 28, 2007), at §§ 7, 9, *available at*, http://www.riverkeeper.org/document.php/652/11302007_GT_Tho.pdf ("Thompson Report").

[189] The NRC recognized as much in a 2001 decision denying a petition for rulemaking by the Nuclear Energy Institute ("NEI") that would have eliminated the requirement to consider SAMAs, *Nuclear Energy Institute; Denial of Petition for Rulemaking,* 66 Fed. Reg. 10,834 (February 20, 2001). In response to a comment that "the costs of performing the SAMA reviews required by Part 51 are not justified when compared to the small potential safety benefits that result from the reviews," the Commission stated: "The NRC believes that it should continue to consider SAMAs for individual license renewal applications to continue to meet its responsibilities under NEPA. *That statute requires NRC to analyze the environmental impacts of its actions and consider those impacts in its decisionmaking.* In doing so, Section 102(2)(C) of NEPA implicitly requires agencies to consider measures to mitigate those impacts when preparing an impact statement. *See Robertson v. Methow Valley Citizens Council,* 490 U.S. 332 (1989). *NRC's obligation to consider mitigation exists whether mitigation is ultimately found to be cost-beneficial and whether or not mitigation ultimately will be implemented by the licensee.*" 66 Fed. Reg. at 10,836 (emphasis added). The Commission also provided a detailed rebuttal to NEI's argument that license renewal was a mere "continuation" of the current operating term and therefore should not trigger NEPA obligations: ". . . [T]o the extent that license renewal involves a continuation of impacts already experienced at the site under the current operating license, the arguments made by the petitioner would appear to call for the elimination of almost the entire environmental review of impacts from operation during the license renewal term, a position clearly at odds with the Commission's approach to the matter and also, as discussed below, inconsistent with the case law related to relicensing." 66 Fed. Reg. at 10,836-37. The Commission found that that none of the cases under NEPA excusing agencies from considering certain environmental impacts supported petitioner's argument that the NRC can ignore the impacts of its actions in the context of a license renewal. *Id.* The Commission cited to a case which squarely addressed the issue and concluded that there is a need to consider environmental impacts in the context of a relicensing. *Id.* (citing *Confederated Tribes and Bands of the Yakima Indian Nation v. Federal Energy Regulatory Commission,* 746 F.2d 466 (9th Cir. 1984). Thus, the Commission's position in *Duke Energy* is inconsistent with both NEPA and the Commission's previous interpretation of NEPA.

[190] *See Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-02-26, 56 N.R.C. 358, 365 n.24 (2002).

[191] GEIS at 5-18.

[192] DSEIS, Main Report § 5.1.2, at 5-3.

28

1

that has occurred since September 11, 2001.[193] It also totally overlooks the fact that mitigation measures to avoid conventional accidents may be different than those designed to avoid effects of intentional attack. The findings in the GEIS also do not take into account the fact that radiological consequences of a spent fuel pool fire are significantly different from the consequences of a core damage accident,[194] and that mitigation measures for a spent fuel pool fire would be quite different from mitigation measures for a severe core-damage accident.[195]

Moreover, in a recent denial of a petition for rulemaking, which sought reconsideration and revocation of the Category 1 designation of spent fuel pool fires, the Commission explained that it considered the probability of a successful terrorist attack to be low because licensees have implemented mitigative measures believed to lower the likelihood that fuel will ignite if the pool is attacked:

> As previously described, the NRC has required, and nuclear power plant licensees have implemented, various security and mitigation measures that, along with the robust nature of SFPs, make the probability of a successful terrorist attack (i.e., one that causes an SFP zirconium fire, which results in the release of a large amount of radioactive material into the environment) very low. As such, a successful terrorist attack is within the category of remote and speculative matters for NEPA considerations; it is not 'reasonably foreseeable.' Thus, on this basis, the NRC finds that the environmental impacts of renewing a nuclear power plant license, in regard to a terrorist attack on a SFP, are not significant.[196]

In fact, in July 2007, the NRC amended IP3's operating license to require the licensee to address large fires and explosions including those caused by planes.[197]

However, such mitigation measures contemplated by the NRC to acceptably reduce the likelihood of a successful attack on a spent fuel pool were never considered in the GEIS or in any other subsequent NEPA document.[198] This starkly demonstrates that the GEIS does not validly deal with impacts related to terrorism, and the need to assess such impacts comprehensively under NEPA as part of the license renewal process is apparent.

Despite the foregoing, the NRC Staff refused to consider the risk of intentional attacks in its SAMA assessment in the DSEIS. Accordingly, the NRC Staff's SAMA analysis is patently deficient. The Indian Point reactors and spent fuel pools are vulnerable to a range of attack scenarios for which conventional probabilistic risk assessment ("PRA") techniques can be

140-bb-SM contd.

[193] *See San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir 2006) ("We find it difficult to reconcile the Commission's conclusion that, as a matter of law, the possibility of a terrorist attack is 'remote and speculative,' with its stated efforts to undertake a 'top to bottom' security review against this same threat.").
[194] Thompson Report at 9 n.9
[195] *Id.* at 52.
[196] Denial of Petition for Rulemaking, 73 Fed. Reg. at 46,211 (2008).
[197] Indian Point Unit 3 Operating License, DPR-64, Condition AC, Mitigation Strategy License Condition (July 11, 2007), ML052720273, at 8.
[198] Denial of Petition for Rulemaking, 73 Fed. Reg. at 46,211 (2008).

29

1

adapted by postulating an initiating event (malicious act) and then examining the outcomes of that event.[199] This has not been done.

Moreover, in the first step of Entergy's analysis (which the NRC accepts as sound), i.e., establishing the baseline of severe accidents, Entergy, and the NRC Staff in turn, did not consider the contribution to severe accident costs made by such intentional attacks at Indian Point.[200] The present value of cost risks for an attack at an Indian Point Reactor and its pool exceeds half a billion dollars, warranting significant expenditures on SAMAs.[201] The present value of cost risks for an attack on a reactor alone are also significant -- $62 million to $73 million.[202] Relevant SAMAs with a value of this magnitude have not been considered. Additionally, Entergy's original assessment, which the NRC Staff claims is sound, fails to address National Infrastructure Protection Plan principles for increasing the inherent robustness of infrastructure facilities against attack, which could significantly reduce the radiological and regulatory risk-related impacts of continued operation of the IP2 and IP3 plants.[203]

Based on the foregoing it is clear safety risks due to intentional attacks and accident mitigation alternatives have not been adequately addressed in the DSEIS.[204] The NRC Staff must factor such risks into its SAMA analysis prior to the end of the environmental review process.

140-bb-SM contd.

2. Failure to Consider the Risk of Spent Fuel Pool Fires

The SAMA analysis in the DSEIS does not adequately take into account the risk of spent fuel pool fires. Riverkeeper is aware that the NRC classifies the environmental impacts of pool accidents and related SAMAs as "Category 1" issues that are not subject to consideration in individual license renewal proceedings absent a waiver or change in the regulations.[205] However "new and significant" information about the risk of spent fuel pool fires warrants comprehensive review in the instant relicensing proceeding.

While initially, it was assumed that stored spent fuel generally did not pose significant risks, with the introduction of high-density, closed-form storage racks into spent fuel pools beginning in the 1970s, this understanding is no longer valid.[206] The closed-form configuration of the high density racks can create a major problem if water is lost from a spent fuel pool, including disastrous pool fires.[207] In fact, studies conducted after the issuance of the 1996 License Renewal GEIS contradict previous studies that had asserted that complete drainage of spent fuel pools was the most severe case and that aged fuel would not burn.[208] These later studies establish that if the water level in a fuel storage pool dropped to the point where the tops of the

140-cc-SM

[199] Thompson Report at 42-45.
[200] DSEIS, Main Report § 5.2; Entergy's ER at § 4.21.
[201] *See* Thompson Report at 45-46, Table 7-7, Section 9.
[202] *Id.* at 49.
[203] *See id.* at 58-59.
[204] *See generally id.* §§ 7, 9.
[205] *Florida Power and Light*, 54 N.R.C. at 12.
[206] Thompson Report at 18-27.
[207] *Id.*
[208] *See* Waste Confidence Rule, 55 Fed. Reg. 38,474, 38,481 (Sept. 18, 1990).

30

1

fuel assemblies are uncovered, the fuel would burn regardless of its age, and resulting fires can be catastrophic.[209]

In light of this "new information," the States of Massachusetts and California recently petitioned the NRC for a rulemaking seeking reconsideration and revocation of the Category 1 designation of spent fuel pool fires.[210] The Commission issued a decision in early 2008, finding that the petitioning states had not presented "new and significant" information so as to warrant supplementation of the GEIS.[211] However, in its decision, the Commission made no attempt to defend the continuing technical validity of the studies cited in the GEIS, and in fact confirmed the conclusions of NUREG-1738 that partial drainage of a spent fuel pool is a more serious condition than complete drainage, that aged fuel can burn, and that spent fuel fires will propagate.[212]

Further the Commission discussed various mitigation measures that have been implemented by nuclear power plant licensees, asserting that such measures rendered the environmental impacts of high-density pool storage of spent fuel insignificant.[213] For example, in response to the evidence that partial draindown is a more severe situation than total draindown, the Commission discussed the fact that

> all nuclear plant SFPs have been assessed to identify additional existing cooling capability and to provide new supplemental cooling capability which could be used during such rare events. This supplemental cooling capability specifically addresses the cooling needs during partial draindown events, and would reduce the probability of a zirconium fire during those extreme events.[214]

140-cc-SM contd.

The Commission also described other mitigation measures that have been imposed on all nuclear power plant licensees, including an "internal strategy" which implements a spent fuel pool "makeup system that can supply the required amount of makeup water and SFP spray to remove decay heat," and an "external strategy" in which an independently powered, portable SFP coolant makeup would be used to mitigate a range of scenarios that could reduce pool water levels.[215] The Commission further described "leakage control strategies" that would be considered in cases where SFP water levels can not be maintained, as well as development of timelines for dispersed and non-dispersed spent fuel storage.[216] The Commission cited to license amendments incorporating such strategies into plant licensing bases of all operating nuclear power plants in the United States.[217] Indeed, Indian Point's operating license has specifically

---

[209] NUREG-1738, *Final Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* (January 2001); 2006 NAS Study at 53-54.
[210] *See Massachusetts Attorney General; Receipt of Petition for Rulemaking*, 71 Fed. Reg. 64,169 (Nov. 1, 2006); *State of California; Receipt of Petition for Rulemaking*, 72 Fed. Reg. 27,068 (May 14, 2007).
[211] Denial of Petition for Rulemaking, 73 Fed. Reg 46,204 (2008).
[212] *Id.* at 46,208-10.
[213] *Id.* at 46,209-10.
[214] *Id.*
[215] *Id.* at 46,209.
[216] *Id.*
[217] *Id.*

31

1

been amended to incorporate such mitigation measures.[218] As discussed above, the Commission further emphasized that mitigative measures have reduced the risk of spent fuel pool fire from intentional attacks.

The Commission's discussion of spent fuel pool fires and mitigative measures is wholly contrary to their end conclusion that such fires are still a Category 1 issue. The NRC's three criteria for inclusion of an environmental impact in Category 1 are (a) the environmental impacts associated with the issue apply to all plants/plants having a specific site characteristic; (b) a single significance level has been assigned to the impacts, *and* (c) mitigation of adverse impacts associated with the issue has been considered in the analysis and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.[219]

With the Denial of Petition for Rulemaking, the Commission rendered it *impossible* for the issue of spent fuel storage to fit into the last criterion of Table B-1. As is clear from the above discussion, the Commission relied heavily on mitigative measures, which notably have been imposed at Indian Point, for its conclusion that the environmental impacts of spent fuel storage are insignificant.[220] Contrary to the criterion (c) above, not a single one of those mitigation measures was considered in the GEIS. In fact, the Denial of Petition for Rulemaking is apparently the first NEPA document in which they have been identified.[221] There are no previous NEPA documents evaluating the effectiveness of any license amendments imposed to reduce the risk of pool fires, nor any NEPA documents assessing cooling capability that were allegedly assessed for all operating spent fuel pools.[222]

140-cc-SM contd.

Accordingly, the NRC has effectively removed spent fuel pool impacts from the realm of Category 1, and, accordingly, such impacts must be considered in the instant proceeding.

Moreover, any reliance upon 10 C.F.R. §§ 51.95(c) and 10 C.F.R. § 51.23 is misplaced based on the foregoing. Section 51.95(c) provides that at the license renewal stage, the supplemental EIS for an individual plant "need not discuss . . . any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).[223] Section 51.23(a) explains that the Commission's generic determination that spent fuel can be safely stored for at least 30 years beyond the licensed life for operation,[224] and section 51.23(b) explains that because of this generic finding of no significant impact, then "within the scope of the generic determination in paragraph (a) of this section, no discussion of

[218] Letter from John P. Boska, NRC, to Michael A. Balduzzi, Entergy (July 11, 2007), ML071920023; *see also* Indian Point Unit 3 Operating License, DPR-64, Condition AC, Mitigation Strategy License Condition (July 11, 2007), ML052720273.
[219] 10 C.F.R. Part 51, Subpart A, Appendix B, Table B-1, note 2; *see also* Denial of Petition for Rulemaking, 73 Fed. Reg. at 46,206.
[220] *See* Denial of Petition for Rulemaking, 73 Fed. Reg. 46,204.
[221] *Id.* at 46,209-10.
[222] *Id.* at 46,209-10.
[223] 10 C.F.R. § 51.95(c).
[224] *See* further discussion below about why this generic determination is no longer supportable, necessitating comprehensive review of spent fuel storage impacts generally during the instant relicensing proceeding.

32

any environmental impact of spent fuel storage" is required in a license renewal proceeding.[225] However, the mitigative measures the Commission now relies upon to determine that spent fuel storage poses no significant impacts, are clearly not "*within the scope of the generic determination in paragraph (a)*" of section 51.23, and therefore neither 10 C.F.R. § 51.95(c) or 10 C.F.R. § 51.23(a) applies.

Accordingly, the NRC Staff has no lawful basis to refuse to consider the environmental impacts of high-density pool storage of spent fuel in the Indian Point relicensing proceeding. However, despite all of the foregoing, the NRC Staff did not consider the risk of spent fuel pool fire in its SAMA assessment in the DSEIS. As such, the NRC Staff's SAMA is patently deficient.

Specifically, in the first step of Entergy's analysis (which the NRC accepts as sound), i.e., establishing the baseline of severe accidents, Entergy, and the NRC Staff in turn, did not consider the contribution to severe accident costs by a fire in either of the spent fuel pools at IP2 or IP3.[226] No SAMAs that would avoid or mitigate such costs have been identified.[227] If the costs of pool fires were considered, the value of SAMAs would be significant. Even using unrealistically low probability estimates in NUREG-1353, *Regulatory Analysis for the Resolution of Generic Issue 82, Beyond Design Basis Accidents in Spent Fuel Pools* (1982), the offsite cost risk of a pool fire is substantially higher than the offsite cost risk of an Early High release from a core-damage accident.[228] The present value of cost risk for a conventional pool accident at Indian Point (i.e., an accident not caused by intentional attack), using the unrealistically low probability assumptions in NUREG-1353, is $27.7 million, a significant sum.[229] If more realistic assumptions about the likelihood of a pool fire were used, the cost would be considerably higher.[230] Moreover, the present value of costs risks ("PVCR") for a spent fuel pool fire would increase substantially (i.e., from $27.7 million to $38.7 million) if the discount rate were changed from 7% to 3%, a more appropriate rate for an analysis of the benefits of measures to prevent or mitigate radiological accidents that Entergy used to test the sensitivity of its SAMA analysis.[231] If the discount rate were dropped to zero, a rate that is justified in light of the catastrophic nature of the consequences involved, the PVCR for a spent fuel pool fire would be even higher -- $51.5 million.[232]

Based on the foregoing it is clear safety risks due to spent fuel fires and accident mitigation alternatives have not been adequately addressed in the DSEIS. The NRC Staff must factor such risks into its SAMA analysis prior to the end of the environmental review process.

140-cc-SM contd.

[225] *See* 10 C.F.R. § 51.23.
[226] DSEIS, Main Report § 5.2; Entergy's ER at § 4.21.
[227] DSEIS, Main Report § 5.2
[228] Thompson Report at 28
[229] *Id.* at 49 and Table 7-7.
[230] *Id.* at 51.
[231] *Id.* at 51-52.
[232] *Id.* at 52.

33

1

3. Failure to Consider the Risk of Reactor Containment Bypass

The SAMA analysis in the DSEIS does not adequately take into account the risk of reactor containment bypass.[233] The SAMA analysis in the DSEIS seriously underestimates the potential for containment bypass during a core-damage accident. In light of current knowledge about severe reactor accidents, it is prudent to assume that (1) any high/dry accident sequence, (i.e., those in which the secondary side dries out due to unavailability of feedwater and the reactor coolant system ("RCS") pressure remains high while primary coolant (i.e., water) is lost and the core is uncovered), would involve induced failure of steam generator tubes, and (2) that one or more of the secondary side safety valves downstream of the affected steam generator(s) would remain open after tube failure.[234] Taking these prudent assumptions into account, the conditional probabilities of atmospheric release categories in the event of core damage increase significantly: the conditional probability of an Early High release rises from 3.6% to 51.8% for the IP2 reactor, and from 8.2% to 54.1% for IP3.[235] Correspondingly, the present value of cost risk associated with atmospheric releases increases by a factor of 5.42 for IP2 and a factor of 3.18 for IP3.[236] 140-dd-SM

However, in the first step of Entergy's analysis (which the NRC accepts as sound), i.e., establishing the baseline of severe accidents, Entergy, and the NRC Staff in turn, did not properly consider the contribution to severe accident costs made by severe accidents involving such reactor containment bypass via induced failure of steam generator tubes.[237] Because it does not account for the above-mentioned assumptions, Entergy's estimates of conditional probabilities of atmospheric release categories are incorrectly low.[238] Correspondingly, the value Entergy assigned to the cost risk associated with atmospheric releases is mistakenly low.[239] As a result, Entergy underestimated the potential value of relevant SAMAs by approximately $47.3 million for IP2 and $23.4 million for IP3.[240] If the economic benefit of averted containment bypass accidents were appropriately considered, a number of SAMAs rejected by Entergy as too costly would be cost-effective.[241]

Since induced accidents involving reactor containment bypass via induced failure of steam generator tubes have not been accounted for, the SAMA analysis in the DSEIS is flawed. The NRC Staff must factor the foregoing into its SAMA analysis prior to the end of the environmental review process.

---

233 DSEIS, Main Report § 5.2.
234 *See* Thompson Report at 14-18, 50.
235 *See id.*
236 *See id.*
237 DSEIS, Main Report § 5.2; Entergy's ER at § 4.21; *See* Thompson Report at 14-18, 50.
238 *See* Thompson Report at 14-18, 50.
239 *See id.*
240 *See id.*
241 *See id.*

34

1

4. Inadequate Consequence Analysis

Lastly, the SAMA analysis is flawed because the NRC Staff accepts Entergy's inadequate consequences analysis.[242] Entergy grossly miscalculated radiological consequences of severe accidents in performing its SAMA analyses for three reasons,[243] none of which the NRC Staff has taken into consideration in the DSEIS.

First, Entergy significantly underestimated off-site costs resulting from a severe accident at Indian Point by using a source term that resulted in unusually low mean off-site accident consequences in comparison to results obtained with source terms vetted by independent experts and recommended for use by the NRC.[244] The source term Entergy used to estimate consequences of the most severe accidents with early containment failure was based on radionuclide release fractions generated by the MAAP code, which are smaller for key radionuclides than the release fractions specified in NRC guidance such as NUREG-1465, *Accident Source Terms for Light-Water Nuclear Power Plants* (1995) and the NRC's recent reevaluation for high-burnup fuel, ERI/NRC 02-202, *Accident Source Terms for Light-Water Nuclear Power Plants: High Burnup and MOX Fuels* (2002).[245] The source term used by Entergy results in lower consequences than would be obtained from NUREG-1465 release fractions and release durations.[246] It has been previously observed that MAAP generates lower release fractions than those derived and used by NRC studies, such as NUREG-1150.[247] Since Entergy's use of the MAAP code yielded lower consequences than use of the NRC's source term, Entergy should be required to repeat its SAMA analysis using source terms that are based on publicly available analysis. However, a review of the NRC Staff's assessment of Entergy's SAMA analysis reveals that they have no qualms with Entergy's source term based on the MAAP code.[248] 140-ee-SM

Second, Entergy significantly underestimated off-site costs resulting from a severe accident at Indian Point because it failed to adequately consider the uncertainties in its consequence calculations resulting from meteorological variations by only using mean values for population dose and offsite economic cost estimates.[249] Entergy's uncertainty analysis for its estimate of the internal events core damage frequency ("CDF") uses an inconsistent approach and omits 140-ff-SM

[242] Riverkeeper's Contention EC-2, filed in the relicensing proceeding, but rejected by the Atomic Safety and Licensing Board raised this issue, which was supported by two expert reports: Edwin S. Lyman Expert Report, *A Critique of the Radiological Consequence Assessment Conducted in Support of the Indian Point Severe Accident Mitigation Alternative Analysis* (Nov. 2007) ("Lyman, IP SAMA Analysis Report"); Edwin S. Lyman Expert Report, *Chernobyl on the Hudson? The Health and Economic Consequences of a Terrorist Attack at the Indian Point Nuclear Plant* (Sept. 2004), *available at* http://www.riverkeeper.org/document.php/651/11302007_EL_Lym.pdf ("Lyman, Chernobyl on the Hudson"). *See* Riverkeeper Petition for Hearing at 68-74.
[243] *See* Entergy's ER § 4.21.
[244] *See* Riverkeeper Petition for Hearing at 68-70.
[245] *See* Riverkeeper Petition for Hearing at 68-70; Lyman, IP SAMA Analysis Report.
[246] *See* Riverkeeper Petition for Hearing at 68-70; Lyman, IP SAMA Analysis Report.
[247] *See* Riverkeeper Petition for Hearing at 69; J. Lehner et al., *Benefit Cost Analysis of Enhancing Combustible Gas Control Availability at Ice Condenser and Mark III Containment Plants*, at 17 (Final Letter Report, Brookhaven National Laboratory, Dec. 23, 2002) (ADAMS Accession Number ML031700011).
[248] *See* DSEIS, Exhibit G.
[249] *See* Riverkeeper Petition for Hearing at 70-71; Lyman, IP SAMA Analysis Report.

35

1

consideration of the uncertainties associated with other aspects of its risk calculation, including uncertainties associated with meteorological variations, which are found to be greater than the CDF uncertainties.[250] It is unreasonable to ignore such variations in the SAMA analysis.[251] However, the NRC Staff once again did not identify this as a deficiency with Entergy's SAMA analysis. In fact, the NRC Staff specifically found that the "approach taken for collecting and applying meteorological data in the SAMA analysis is reasonable."[252] Moreover, the NRC Staff stated that it "based its assessment of offsite risk on the CDF's and offsite doses reported by Entergy."[253] Accordingly, the NRC Staff has not addressed this defect in the SAMA analysis.

Third, Entergy significantly underestimated off-site costs resulting from a severe accident at Indian Point by inappropriately using $2,000/person-rem dose conversion factor.[254] The $2,000/person-rem conversion factor is intended to represent the cost associated with the harm caused by radiation exposure with respect to the causation of "stochastic health effects, i.e., fatal cancers, nonfatal cancers, and hereditary effects.[255] The use of this conversion factor in Entergy's SAMA analysis leads to a serious underestimation of the population-dose/health related costs of a severe accident at Indian Point.[256] This is because it (i) does not take into account the significant loss of life associated with early fatalities from acute radiation exposure that could result from some of the severe accident scenarios included in Entergy's risk analysis, i.e. deterministic effects and (ii) it underestimates the total cost of latent cancer fatalities that would result from a given population dose because it fails to take into account the fact that some members of the public exposed to radiation after a severe accident will receive doses above the threshold level for application of a dose- and dose-rate reduction effectiveness factor ("DDREF").[257] Thus, the single cost conversion factor used is not appropriate when some members of an exposed population receive doses for which a DDREF would not be applied.[258] Yet, the NRC Staff had no problem with Entergy's dose conversion factor. The NRC Staff explicitly accepts Entergy's use of the $2000/person-rem factor.[259] As such, the NRC Staff has failed to address this defect in the SAMA analysis.

The above-discussed deficiencies in the SAMA consequence analysis significantly undervalues the off-site costs of severe accidents.[260] Entergy's erroneously low cost estimate has, therefore, led it to underestimate the benefits of SAMAs that would mitigate or avoid the environmental impacts of severe accidents.[261] The NRC Staff's adoption of Entergy's methodology and

140-ff-SM contd.

---

[250] *See* Riverkeeper Petition for Hearing at 70-71; Lyman, IP SAMA Analysis Report at 4.
[251] *See* Riverkeeper Petition for Hearing at 70-71; Lyman, IP SAMA Analysis Report.
[252] DSEIS, Exhibit G, at G-18.
[253] DSEIS, Main Report § 5.2.2. at 5-6.
[254] *See* Riverkeeper Petition for Hearing at 68-74; Lyman, IP SAMA Analysis Report.
[255] *See* Riverkeeper Petition for Hearing at 71-74; Lyman, IP SAMA Analysis Report at 5; NUREG-1530, *Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy* (1995).
[256] *See* Riverkeeper Petition for Hearing at 73; Lyman, IP SAMA Analysis Report at 6, 10.
[257] *See* Riverkeeper Petition for Hearing at 71-74; Lyman, IP SAMA Analysis Report at 5. The DDREF is a factor that reflects the reduced potency of radiation to cause cancer at low doses or low dose rates. *See* Riverkeeper Petition for Hearing at 72, n.110.
[258] *See* Riverkeeper Petition for Hearing at 71-74; Lyman, IP SAMA Analysis Report at 5.
[259] DSEIS, Exhibit G, at G-28, G-29.
[260] *See* Riverkeeper Petition for Hearing at 68-74; Lyman, IP SAMA Analysis; Lyman, Chernobyl on the Hudson.
[261] *See* Riverkeeper Petition for Hearing at 68-74; Lyman, IP SAMA Analysis; Lyman, Chernobyl on the Hudson.

36

1

analysis fails to address these concerns. Based on the foregoing concerns, the NRC Staff must address these flaws in the SAMA analysis prior to the conclusion of the NEPA review process. 140-ff-SM contd.

DSEIS Section 6.0

Inadequate Analysis of Impacts of On-Site Storage of Spent Fuel

Riverkeeper's Scoping Comments explained the need for the NRC Staff to consider "new and significant" information regarding the environmental impacts of spent fuel storage, rather than relying on the outdated GEIS. Riverkeeper cited to increased security concerns due to terrorism and the failure of a long-term disposal solution as material changes affecting the baseline environment since the GEIS was written.[262] Riverkeeper, thus, urged the NRC Staff to assess the future environmental impacts of spent fuel storage in light of these material changes in the Indian Point License Renewal NEPA review process.

However, despite the serious environmental concerns associated with long-term onsite storage of spent nuclear fuel at Indian Point, the NRC Staff has chosen to avoid its responsibilities under NEPA and hide behind the wholly inadequate assessment in the GEIS which has not been updated since 1996, over 13 years ago. Specifically, the NRC Staff states in the DSEIS that it has not identified any new and significant information relating to the finding in the GEIS that "the increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants" if a permanent disposal solution is not available.[263] This finding is completely unjustified. 140-gg-UF

The finding of small environmental effects from spent fuel storage in the GEIS, upon which the NRC Staff relies, stems from the NRC's generic "waste confidence" determination that spent fuel can be safely stored onsite for at least 30 years beyond a plant's operating life, including license renewal.[264] The NRC Staff explicitly cites to this rule, which was codified at 10 C.F.R. § 51.23(a), to evade any meaningful site-specific environmental analysis of decades of spent fuel storage at Indian Point in the DSEIS.[265]

However, given "new and significant" circumstances described herein, the NRC's generic finding of no significant impact can not be relied upon. The NRC's reasonable assurance of safe interim storage, first instituted over a quarter of a century ago and never supported by an environmental assessment or environmental impact statement under NEPA,[266] simply does not hold up given current knowledge and circumstances. Moreover, the NRC recently published a proposed update to its "Waste Confidence Decision" which, if finalized would extend the finding

---

[262] *See* Riverkeeper Scoping Comments at 1, 7-12.
[263] DSEIS, Main Report § 6.1 at 6-6 to 6-7.
[264] *Id.* § 6.1 at 6-2, 6-6 to 6-7; GEIS § 6.4.6.3; NRC Staff Scoping Summary Report at 222.
[265] NRC Staff Scoping Summary Report at 222; *see* 10 C.F.R. § 51.23(b) (precluding review of spent fuel storage environmental impacts in any NRC proceeding due to the generic finding of no significant impact).
[266] Final Waste Confidence Decision, 49 Fed. Reg. 34658 ("[T]he Commission finds that NEPA does not require an EIS to support the [temporary storage] finding"); *see also* 40 C.F.R. § 1508.9 (explaining that environmental assessments under NEPA should provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI).

of no significant impact an additional 30 years.[267] A concomitant proposed rule change would omit any reference to how long spent fuel can safely be stored in "temporary" on- or off-site facilities, and simply state that such waste can be so temporarily stored without significant impact "until a disposal facility can reasonably be expected to be available."[268] If these changes are implemented, the NRC's generic finding of no significant impact will essentially be extended to some indefinable point in the future. In any event, foregoing any analysis of impacts of decades of spent nuclear waste storage because of the NRC's "waste confidence" is improper.

The NRC's "confidence" in extended safe temporary storage at reactor sites is largely the result of the NRC's expectation that a long-term repository will become available eventually.[269] However, the viability of Yucca Mountain as a long-term disposal site is becoming more tenuous by the day[270] and there is no other foreseeable long-term repository on the horizon. The NRC essentially admits this in rationalizing its proposed update to the Waste Confidence Decision.[271] Moreover, if Yucca ever does become available, it will take decades to transfer the spent fuel from Indian Point, and it will not accommodate any of the waste generated by Indian Point during the extended licensing term.[272] As such, spent fuel will continue to be stored on-site at Indian Point for the foreseeable distant future.

Yet, the NRC Staff refuses to consider the impacts of this "temporary" storage at Indian Point, pointing to the generic finding of no significant impact, despite the fact that it is completely dated and fails to consider current circumstances. Most blatantly, the NRC's generic assurance of benign spent fuel pool storage is completely undermined by the evidence of leaks at Indian Point.[273] The IP1 pool began leaking as early as the 1990s, and the leaks from IP2 were discovered in 2005.[274] With spent fuel pool degradation already an issue at Indian Point, it is patently absurd to rely on the generic no impact finding to project the long-term integrity of the pools for decades into the future. Given the site-specific situation at Indian Point, a comprehensive environmental impact review of the storage in the pools is necessary during the

140-gg-UF contd.

---

[267] Waste Confidence Decision Update, 73 Fed. Reg. 59,551, 59551, 59563-59569 (Oct. 9, 2008) ("WCD Update").
[268] Proposed Rule on the Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation, 73 Fed. Reg. 59,547, 59551 (Oct. 9, 2008) ("Proposed Rule Change").
[269] Proposed Rule Change, 73 Fed. Reg. at 59549 (referring the WCD Update rationale) (explaining that the original 30 year timeframe for safe interim spent fuel storage was related to the NRC's expectation of when sufficient repository capacity would be available).
[270] *See* Riverkeeper Scoping Comments at 7-9; *see, e.g.*, Remarks of Chairman Klein, Feb. 25, 2008, Waste Management Symposium (explicitly stating that NRC and DOE have "inadequate funds to meet their statutory obligations" relating to Yucca); Lisa Mascaro, *Yucca Funding: Another $100 Million Cut*, Las Vegas Sun (Feb. 27, 2009), *available at*, http://www.lasvegassun.com/news/2009/feb/23/yucca-funding-another-100-million-cut/ (Obama vowing that Yucca will never open as a nuclear waste repository).
[271] Proposed Rule Change, 73 Fed. Reg. at 59549 (explaining how the Commission no longer finds the 30-year timeframe useful since an unknown amount of time will be needed to bring about the necessary societal and political acceptance for a repository site).
[272] Riverkeeper Scoping Comments at 7-9.
[273] *See Liquid Radioactive Release Lessons Learned Task Force Final Report*, U.S. Nuclear Regulatory Commission, at 5-6 (September 1, 2006), *available at* http://www.riverkeeper.org/document.php/539/NRC_Lessons_Lea.pdf (hereinafter "Radioactive Release Task Force Report").
[274] *See* Entergy's Environmental Report, at 5-4; Groundwater Investigation Executive Summary (Indian Point Energy Center, Buchanan, N.Y., Jan. 2008), *available at* http://jic.semo.state.ny.us/Resources/ExecutiveSummary%20GW%20final.pdf.

38

1

relicensing process. Addressing the leaks as the NRC Staff did in the DSEIS is clearly inadequate.[275]

The NRC's unbridled confidence in the safety of dry cask storage is also questionable. As Riverkeeper's Scoping Comments discussed, it is not clear what environmental impacts will result if dry casks remain loaded with spent fuel beyond their design life.[276] In light of the fact that these casks will remain on the banks of the Hudson River indefinitely into the future, the NRC Staff must perform a site specific assessment of impacts of such long-term storage.

140-gg-UF contd.

The NRC's generic finding of no significant impact also flies in the face of new information about the risks of accidents from natural forces at Indian Point. Numerous reports and studies show that fuel storage pools are potentially susceptible to fire and radiological release from natural phenomena.[277] As mentioned above, the environmental impacts of a fire in a spent fuel pool may be severe, extending over a geographic area larger than a state's legal boundaries and continuing for decades.[278] Despite such ominous potential consequences, the NRC Staff completely ignores the vulnerability of stored spent fuel at Indian Point to natural phenomenon, such as earthquakes. This is unwise given recent new information about the likelihood of earthquakes near Indian Point.

140-hh-SM

Seismologists at Columbia University's Lamont-Doherty Earth Observatory published a study in August 2008 on earthquakes in the greater New York City Area.[279] The study indicated that the Indian Point nuclear power plant sits on a previously unidentified intersection of two *active* seismic zones.[280] Indeed, several recent earthquakes in New Jersey right near the Ramapo fault, which runs directly underneath Indian Point, starkly demonstrate the active nature of the seismic areas around the facility.[281] The Columbia study further found that historic activity of earthquakes of a magnitude more than 5 has been higher in southeastern New York than in many other areas of the central and eastern United States, and that the fault lengths and stresses suggest

140-ii-SM/UF

[275] See discussion above regarding inadequate discussion of leaks.
[276] *See* Riverkeeper Scoping Comments at 9-10.
[277] *See, e.g.*, NUREG-1738, Final Technical Study of 1 Spent Fuel Pool Accident Risk and Decommissioning Nuclear Power Plants (NRC: January 2001); National Academy of Sciences Committee on the Safety and Security of Commercial Spent Nuclear Fuel Storage, Safety and Security of Commercial Spent Nuclear Fuel Storage (The National Academies Press: 2006); Gordon Thompson, Risks and Risk-Reducing Options Associated with Pool Storage of Spent Nuclear Fuel at the Pilgrim and Vermont Yankee Nuclear Power Plants (May 25, 2006); Jan Beyea, Report to the Massachusetts Attorney General on the Potential Consequences of a Spent-fuel Pool Fire at the Pilgrim or Vermont Yankee Nuclear Plant (May 25, 2006).
[278] *See generally*, Gordon Thompson, Risk-Related Impacts from Continued Operation of the Indian Point Nuclear Power Plants (Nov. 28, 2007), at 18-27, *available at*, http://www.riverkeeper.org/document.php/652/11302007_GT_Tho.pdf ("Thompson Report").
[279] *See* Lynn R. Sykes, John G. Armbruster, Won-Young Kim, & Leonardo Seeber, *Observations and Tectonic Setting of Historic and Instrumentally Located Earthquakes in the Greater New York City-Philadelphia Area*, Bulletin of the Seismological Society of America, Vol. 98, No. 4, pp. 1696-1719 (August 2008) ("2008 Columbia Earthquake Study").
[280] *Id.*
[281] *See, e.g.*, Lawrence Ragonese, *Morris County Shows Signs of Stress: Four Quakes*, The Star-Ledger (Feb. 18, 2009), *available at*, http://www.nj.com/news/index.ssf/2009/02/morris_county_shows_sign_of_st.html.

39

1

magnitude 6 or 7 quakes (which would be 10 and 100 times bigger than magnitude 5, respectively) are "quite possible.[282]

However, despite the availability of such new seismological information, the NRC has never allowed old information, upon which nuclear plants' original licenses were based, to be contested in considering extensions of licenses.[283] There is no certainty whatsoever that the dry casks or spent fuel pools at Indian Point are designed so as to be able to withstand such natural occurrences in light of the new seismic information. Given the recent revelation about the specific seismology surrounding the Indian Point facility, reliance by the NRC Staff on a generic determination of environmental safety for potentially long-term on-site storage of spent fuel is totally inappropriate. The NRC Staff must assess the reasonably foreseeable impacts of continued storage of spent fuel at Indian Point in light of new information about potential accidents from natural forces.

140-ii-SM/UF contd.

The NRC Staff also relies upon the Commission's generic safety determination to further justify its refusal to consider the risks to spent fuel storage from intentional acts of sabotage.[284] However, the likelihood and seriousness of such risks necessitates a thorough review of the impacts of long-term storage of spent fuel at Indian Point. As discussed at length above, future terrorist attacks at Indian Point remain reasonably foreseeable, and such risks must be fully assessed in the relicensing proceeding.

Spent fuel pools are particularly at risk for intentional attacks and would pose significant environmental consequences should such attacks occur. A 2006 study by the National Academy of Sciences on security risks posed by the storage of spent fuel at nuclear plant sites ("2006 NAS Study") confirmed that attacks by civilian aircrafts remain a plausible threat.[285] The study found that attacks on spent fuel pools are attractive targets since they are less protected structurally than reactor cores and typically contain much greater inventories of medium and long-lived radionuclides than reactor cores.[286] The NAS study concluded that storage pools are susceptible to fire and radiological release from intentional attacks.[287] The environmental impacts of a fire in a spent fuel pool may be severe, extending over a geographic area larger than a state's legal boundaries and continuing for decades.[288] Moreover, as discussed above, new studies demonstrate the severe risks of spent fuel pool fires which were not known at the time the NRC issued its "waste confidence" findings.

140-jj-SM

---

[282] 2008 Columbia Study; *see also* Robert Roy Britt, *Large Earthquakes Could Strike New York City* (Aug. 21, 2008), *available at* http://www.livescience.com/environment/080821-new-york-earthquakes.html.
[283] 2008 Columbia Earthquake Study at 1717.
[284] *See* DSEIS, Main Report § 6.1; WCD Update, 73 Fed. Reg 59,551. The NRC's overall general exclusion of issues relating to terrorism in license renewal proceedings is unwarranted, as discussed above.
[285] Nat'l Acad. of Sciences., *Safety and Security of Commercial Spent Nuclear Fuel Storage: Public Report*, at 30 (2006) ("2006 NAS Study").
[286] 2006 NAS Study at 36.
[287] *Id.* at 49, 57; *see also* German Reactor Safety Org., *Protection of German Nuclear Power Plants Against the Background of the Terrorist Attacks in the U.S. on Sept. 11, 2001* (Nov. 27, 2002) (finding that large jetliners crashing into nuclear facilities under different scenarios could cause uncontrollable situations and the release of radiation). Although the NRC considers impacts of spent fuel pool fires outside the scope of license renewal review, as discussed at length above, this conclusion is no longer valid.
[288] *See generally*, Thompson Report, *supra*.

40

1

Moreover, the 2006 NAS Study also concluded that the "potential vulnerabilities of spent fuel pools to terrorist attacks are plant-design specific. Therefore, specific vulnerabilities can be understood only by examining the characteristics of spent fuel storage at each plant."[289] At Indian Point, numerous factors demonstrate the susceptibility of the spent fuel pools to attack, including the fact that the pools are not within containment, but are housed in non-reinforced cinderblock industrial buildings. The fact that the pools are densely packed adds to the risk of catastrophic fire in the event of an attack.[290] Given the foregoing, it is essential that the NRC Staff perform a site-specific assessment of long-term spent fuel pool storage.

The dry casks storing spent fuel at Indian Point also present security concerns. Importantly, the dry casks were designed to ensure safe storage of spent fuel, and not to resist terrorist attacks.[291] The regulations for such storage systems are designed to ensure passive heat removal and radiation shielding during normal operations, off-normal events, and accidents.[292] The 2006 NAS Study found breach of a dry cask from a terrorist attack could potentially result in releases of radioactive material from the spent fuel environment, with offsite radiological consequences.[293] Moreover, while the regulations require that dry storage facilities be located within a protected area of the plant site, the protection requirements for such installations are lower than for reactors or spent fuel pools.[294] In addition to the foregoing, at Indian Point in particular, the dry casks in the Independent Spent Fuel Storage Installation ("ISFSI") are stored on an outdoor concrete pad, lined up in rows that are easily visible from the air and the Hudson River.

140-jj-SM contd.

Thus, as currently configured, this ISFSI is potentially vulnerable to sabotage. Given that Entergy intends to continue constructing dry casks in this manner and the fact that the spent fuel generated at Indian Point will remain stored that way for the foreseeable distant future, the NRC Staff must assess the risks associated with intentional attacks on the ISFSI. As Riverkeeper's Scoping Comments called for, the NRC Staff should consider the mitigation measures recommended by the 2006 NAS Study to reduce the risk of impacts from intentional attacks, including: additional surveillance to detect and/or thwart attacks, creating earthen berms to protect casks from aircraft strikes, placing visual barriers around storage pads to prevent targeting of individual casks, re-spacing the casks to reduce likelihood of cask-to-cask interactions in the event of aircraft attack, and implementing design changes to newly manufactured casks to improve cask resistance to attack.[295]

Based on the foregoing, a comprehensive site-specific analysis of indefinite on-site spent fuel storage at Indian Point is necessary prior to the end of the NRC Staff's environmental review process. In light of extensive "new and significant" information, the NRC Staff can not rely upon an outdated, baseless generic finding of no significant impact to avoid its obligations under NEPA.

---

[289] 2006 NAS Study.
[290] *See* Thompson Report, *supra,* at 18-27.
[291] *See* 2006 NAS Study; 10 C.F.R. Pt. 71.
[292] *See* 2006 NAS Study; 10 C.F.R. Pt. 72.
[293] *See* 2006 NAS Study.
[294] *Id.*
[295] Riverkeeper Scoping Comments at 11-12; 2006 NAS Study.

41

1

DSEIS Section 8.0

1. Irrelevance of the NRC Staff's Assessment of Alternatives to the Existing IP2 and IP3 Cooling-Water System

As indicated above, the NRC Staff must defer to NYSDEC's determinations in the SPDES proceeding. This includes NYSDEC's assessment of alternatives to once-through cooling at Indian Point. As such, the NRC Staff's assessment in the DSEIS of alternatives to the existing IP2 and IP3 cooling-water system is totally meaningless. The NYSDEC's 2008 Ruling requires that a supplemental EIS be prepared to examine the environmental impacts that were not already addressed in the SPDES FEIS for closed cycle cooling, the proposed interim measures, and any alternative technologies that Entergy may propose in order to minimize adverse environmental impact at Indian Point.[296] The NRC Staff must defer to the future determinations of NYSDEC relating to cooling-water system alternatives. Problematically, there is no indication whatsoever in the DSEIS that NRC Staff will defer to, and/or coordinate with, the NYSDEC's supplemental EIS, as required by NRC regulations and precedent.[297] 140-kk-AL

Moreover the DSEIS also includes a Restoration Alternative in Section 8.1.2 that is unlawful, as the Second Circuit ruled, in its *Riverkeeper I* and *Riverkeeper II* decisions. Pursuant to *Riverkeeper I* and *Riverkeeper II* "restoration" alternatives both at existing and new facilities are contrary to the CWA. Therefore, Section 8.1.2 should be stricken in its entirety. 140-ll-AL

2. Deficiencies in Assessment of Alternate Energy Sources

As Riverkeeper's Scoping Comments discussed, the NRC Staff is obligated fully consider the use of alternative energy sources in its analysis of alternatives for Indian Point. NEPA,[298] CEQ regulations,[299] NRC regulations,[300] and Appendix to Part 51 mandate that the full and complete environmental impacts of license renewal of IP2 and/or license renewal of IP3, be compared to the projected impacts of all reasonable alternatives. As delineated in CEQ regulations, the obligations include rigorously exploring and objectively evaluating all reasonable alternatives, devoting substantial treatment to each alternative, and including alternatives not within the jurisdiction of the lead agency.[301] Moreover, the scope of the NRC Staff's review encompasses the requirements to which the license renewal applicant is held in its Environmental Report, which includes the requirement to consider "new and significant information."[302]

A review of Sections 8.2 and 8.3 of the DSEIS reveals that the NRC Staff has utterly failed to meet this requirement.

---

[296] NYSDEC, 2008 Ruling at 39.
[297] 10 C.F.R. § 51.70 (c); 40 C.F.R. § 1506.2 (b) and (c); *Seabrook*, CLI-78-1, 7 NRC at 26 (1978); *Entergy Nuclear Vt. Yankee*, CLI-07-16, 65 NRC 371, 389 (2007).
[298] NEPA, 42 U.S.C. § 4321 et seq.
[299] 40 C.F.R. § 1502.1.
[300] 10 C.F.R. §§ 51.45, 51.71, 51.95.
[301] 40 C.F.R. 1502.14(a) – (f).
[302] 10 C.F.R. § 51.71(a); 10 C.F.R. § 51.53(c)(3)(iv); 10 C.F.R. Part 51, Subpart A, Appendix B; *see also* 40 C.F.R. § 1502.9(c)(1)(I) (requiring a supplemental EIS if there are "significant new circumstances or information relevant to environmental concerns and bearing on the proposed actions or its impacts."

42

1

a. Reliance on Outdated Energy Information Administration Reports

The DSEIS fails to address significant new information in reliance on outdated energy production and consumption forecasts. The Energy Information Administration of the Department of Energy ("EIA") issues annual reports and frequent updates on energy production, consumption, and prices, the Annual Energy Outlook and associated supplements and updates. The DSEIS states that "the NRC staff uses the EIA's analysis to help select reasonable alternatives to license renewal."[303] The DSEIS, released and dated December 2008, cites and references "Annual Energy Outlook 2007 with Projections to 2030,"[304] "Assumptions to the Annual Energy Outlook 2006 with Projections to 2030,"[305] and "Assumptions to the Annual Energy Outlook 2007, Electricity Market Module."[306] However, the data and information contained in these annual reports have been superseded by the "Annual Energy Outlook 2009 Early Release Overview" ("2009 EIA Report").[307]

The 2009 EIA Report provides substantially changed data and information from that considered and referenced in the DSEIS concerning all of the alternative energy sources. For instance, the DSEIS relied on data from 2007 projecting coal-fired electric generation to rise to 32% of all generated capacity.[308] By contrast, the 2009 EIA Report adjusts the coal-fired electric generation projection to 24%, no significant increase from 2007, and projects reduced outlook and investment in new coal-fired generating capacity.[309] In line with this projection, the 2009 EIA Report projects much lower coal consumption by 2030 than projected even one year ago. Specifically, the 2009 EIA Report projects: (1) an even greater use of renewable energy than even one year ago, growing at 3.3% annually through 2030; (2) the largest source of growth in the electric power sector to be biomass and wind energy sources; and (3) renewable energy generation growth to 14.1% by 2030, even without a renewal of federal subsidies. Most significantly, the 2009 EIA Report projects that non-hydropower renewable power meets 33% of the total generation growth between 2007 and 2030.[310]

The DSEIS contains many assumptions about alternative energy sources derived directly from outdated data from EIA reports dating from 2006 and 2007. At a minimum, the DSEIS must select and evaluate any alternative energy source or combination of sources in light of the new and substantially different data and projections from the 2009 EIA Report. The failure of the NRC to amend the data relied upon for the analysis of alternative energy sources would violate the requirements of NEPA. Because NEPA requires an EIS in order to inform the agency of the environmental consequences of its actions, it is critical that the NRC Staff revisit their conclusions in light of the most recent data.

140-mm-AL

[303] DSEIS, Main Report § 8.3, at 8-33.
[304] DOE/EIA-0383(2007).
[305] DOE-EIA-0554(2006).
[306] DOE-EIA-0554(2007).
[307] DOE/EIA-0383(2009) (released December 2008, full report available March 13, 2009).
[308] DSEIS, Main Report § 8.3, at 8-32.
[309] 2009 EIA Report, Table 1.
[310] AEO2009 Early Release Summary Presentation.

b. Coal-Fired Generation Alternative

The DSEIS devotes a majority of consideration of alternative energy sources to a single alternative that presents the arguably least feasible and least environmentally sound alternative to relicensing. This analysis sets up a "straw man" scenario that skews objective comparisons to the proposed relicensing.

The DSEIS devotes the bulk of analysis of alternative energy sources to an off-site supercritical coal-fired generation source[311] despite the fact that no New York-based utility has pending application for new coal generation in Zones H, I, J, and K.[312] In contrast, the DSEIS gives short shrift to analysis of other alternatives, in particular, renewable energy sources and conservation. This analysis and seeming preference to prove the unsuitability of a single coal-fired source comes at the expense of considering a more effective portfolio of alternative energy sources. Moreover, the analysis of the supercritical coal-fired generation source in the DSEIS fails to satisfy the requirements of NEPA.

The NRC Staff opened its analysis of this alternative by assuming that a new source would have to generate 2200 MW(e) to replace the power produced by Indian Point Units 2 and 3.[313] At the outset, this analysis ignores the fact that energy alternatives must also be considered separately.[314] The NRC Staff failed to consider the effects of this alternative in place of only one of the units at the Indian point facility. It also failed to include evidence of other, non-coal sources of power generation and conservation when completing its analysis.[315] In order to remedy these flaws, the NRC Staff must consider all of the energy alternatives in light of the fact that the license renewal is for two power generating units and with respect to other existing sources and conservation efforts. An analysis of the alternatives must occur for both units together and for each unit separately in order to comply with NEPA.[316]

140-nn-AL

c. Natural Gas-Fired Generation Alternative

In its analysis of natural gas-fired combined-cycle generation as an alternative to the license renewal for Indian Point Units 2 and 3, the DSEIS notes that this alternative source operates at "markedly higher thermal efficiencies" and requires less water for condensing cooling, thus requiring smaller cooling towers than the existing facility.[317] However, in its conclusion about the effects of alternative sources, the NRC Staff concludes that the license renewal would have similar impacts to alternatives.[318] Even though the analysis of the natural gas-fired alternative

140-oo-AL

---

[311] DSEIS, Main Report § 8.3.1, at 8-33 to 8-46.
[312] *See* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 31.
[313] DSEIS, Main Report § 8.3.1, at 8-34.
[314] Riverkeeper's Scoping Comments discussed at length the need to assess reasonable alternatives to IP2 and IP3 separately. Riverkeeper Scoping Comments at 15-17 (citing NUREG-1437 vol. 1 §§ 1.2, 1.4, 1.8 (requiring a plant, not plants, specific review and a full analysis of alternatives at *individual* license renewal reviews.)).
[315] *See* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 31.
[316] *See* Riverkeeper Scoping Comments at 15-17.
[317] DSEIS, Main Report § 8.3.2, at 8-46.
[318] *Id.* § 8.4, at 8-78.

44

1

acknowledged significant environmental benefits, the NRC Staff ignored these factors when making a conclusion based on all of the energy alternatives. The NRC Staff cannot ignore their analysis of a natural gas-fired generation alternative when making a general conclusion on the impacts of alternatives subject to the decision not to renew the licenses for Indian Point Units 2 and 3.

Although the DSEIS addresses the fact that Indian Point Units 2 and 3 could be replaced by natural gas-fired combined-cycle generation at the Indian Point site or other locations, the analysis does not go far enough to show the development of natural gas generation in New York. The DSEIS ignores current construction of natural gas-fired facilities and other new sources that have been planned or permitted.[319] Because of this lack of consideration of the existence of and increased reliance on natural gas-fired power generation, the DSEIS is inadequate. In order to fulfill the requirements of NEPA, the NRC Staff should readdress the natural gas-fired generation alternative in order to reflect current information and trends. Currently, without this analysis, the DSEIS is incomplete.

140-oo-AL contd.

d. Combination of Alternatives

The DSEIS suggests two options in which combinations of energy sources are used.[320] Unfortunately, these two combination alternatives are artificially narrow and arbitrary and fail to take into account additional combinations of alternatives in violation of NEPA. The NRC Staff's shoddy combination assessment in the DSEIS stems from the assumption in the GEIS that the only way to replace a large generating unit like a nuclear power plant is with another similarly large generating unit.[321] This assumption is not valid today, as utilities are meeting demand requirements with a broad combination of conservation, innovative modifications to existing plants, and renewable energy, without considering the construction of new fossil-fuel burning facilities.[322] As Riverkeeper's Scoping Comments explained, a recent study clearly demonstrates that the approximately 2000 MWe generated by Indian Point is replaceable and that if Indian Point were to close, a replacement strategy focusing on conservation, energy efficiency, renewable energy sources, and improving transmission infrastructure, would be technically feasible and achievable with no major disruptions.[323] Another study by the Nuclear Research Institute and the Institute for Energy and Environmental Research found that a reliable U.S. electricity sector is achievable without nuclear power through a combination of conservation and

140-pp-AL contd.

[319] *See* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 32.
[320] DSEIS, Main Report § 8.3.5.
[321] GEIS § 8.1 ("NRC has determined that a reasonable set of alternatives should be limited to analysis of single, discrete electric generation sources"); DSEIS, Main Report § 8.3.5 (relying on NRC's recommendation in the GEIS that consideration of alternatives should "be limited to single, discrete generating options"). Riverkeeper's Scoping Comments further explained that this statement in the GEIS does not comply with NEPA's mandate to assess all reasonable alternatives to the proposed action, nor with NRC regulations mandating that *all* reasonable alternatives be identified and considered. *See* Riverkeeper's Scoping Comments at 19-20.
[322] *See* Michael Grunwald, *America's Untapped Energy Resource: Boosting Efficiency*, Time (Dec. 31, 2008), *available at* http://www.time.com/time/magazine/article/0,9171,1869224,00.html; EPRI, *Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S. (2010 – 2030)* (published Jan. 14, 2009); *see also* Riverkeeper Scoping Comments at 15-21.
[323] *See* Riverkeeper Scoping Comments at 18-19 (citing NAS, *Alternatives to the Indian Point Energy Center for Meeting New York's Electrical Power Needs*, June 2006, Chapters 1-5).

45

1

alternative sustainable energy sources.[324] Thus, given the feasibility of developing and implementing energy portfolios that include renewable energy sources, conservation, and energy efficiency measures, the NRC Staff should have considered a broader range of alternatives in the DSEIS. The NRC Staff's continued reliance on the GEIS ignores the significant progress made on energy issues and, in turn, ignores NEPA's mandate to fully consider "new and significant" information in the supplemental EIS.

In particular, the combination assessment completely ignores the known potential of renewable energy sources. The NRC Staff's combination alternatives reflect the NRC's arbitrary belief that there are too many obstacles to implementing sufficient wind power or other renewable energy sources such that these sources could not provide anything more than 200 to 400 MW to replace either or both IP units.[325] Such beliefs are utterly misguided.[326] The NRC Staff also discounts and eliminates any contribution from hydropower or geothermal energy.[327] By limiting the consideration of energy sources in this manner, the NRC Staff's combination assessment it deficient.

140-pp-AL contd.

The NRC Staff's combination alternatives also largely ignores the benefits of energy conservation and efficiency. The NRC Staff has failed to consider New York State's lofty plans and steps taken for reducing the state's electricity usage and increasing energy efficiency.[328] Recent information demonstrates the increasing financial, technical, and political viability of energy conservation.[329] However, by incorrectly assuming that energy conservation would only result in a savings of 800 MW, the NRC Staff arbitrarily fails to consider energy conservation as a full replacement for one or both of the units.[330]

140-qq-AL

Based on the foregoing, the NRC Staff's consideration of renewable energy sources and energy conservation and efficiency is severely wanting. Since the DSEIS does not adequately analyze the availability and environmental impacts of alternatives, the NRC Staff's assessment of the no-action alternative in section 8.2 of the DSEIS is flawed.[331] Indeed, the no-action alternative assessment does not consider and analyze much new information about various measures that would be taken if the no-action alternative were chosen, compared to the detriments that would

140-rr-AL

---

[324] *See* Riverkeeper Scoping Comments at 19 (citing IERR, "Carbon Free and Nuclear Free – A Roadmap for U.S. Energy Policy" (Oct. 2007)).
[325] DSEIS, Main Report § 8.3.5 at 8-65 to 8-66.
[326] *See generally See* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 27-28 (citing Report by Synapse Energy Economics, Inc. demonstrating the viability of wind energy and other renewable resources).
[327] *See* DSEIS, Main Report § 8.3.4 at 8-61, 8-62, § 8.3.5, at 8-65, 8-66.
[328] *See* New York State, Public Service Commission, Energy Efficiency Portfolio Standard, http://www.dps.state.ny.us/Phase2_Case_07-M-0548.htm (last visited March 16, 2009); Energy Efficiency Fact Sheet, http://www.ny.gov/governor/press/factsheet_0107092.html; *see generally* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 23-29; Riverkeeper Scoping Comments at 20.
[329] *See generally* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 24-25.
[330] DSEIS, Main Report § 8.2, 8.3.5.
[331] 10 C.F.R. § 51.71; 10 C.F.R. Part 51, Subpart A, Appendix A, Section 4; 40 C.F.R. § 1502.14(a).

46

1

be caused by relicensing of IP2 and IP3.[332] In contrast, the State of New York, with expert support, has laid out examples of combination alternatives using more realistic estimations, which demonstrate that the no-action alternative, i.e., not relicensing IP2 or IP3, is preferable.[333] Such combinations would use mostly renewable energy sources coupled with energy efficiency measures and are readily achievable under existing and identified New York State programs.[334]

Lastly, Riverkeeper's Scoping Comments explained the necessity under NEPA to compare Indian Point's cumulative detrimental contribution to climate change and environmental degradation to safe and clean renewable energy sources.[335] The NRC Staff has not performed such an analysis in the DSEIS.

Overall, the NRC Staff's assessment of energy alternatives to Indian Point in the DSEIS is deficient, and must be fixed prior to the conclusion of the environmental review process under NEPA.

140-rr-AL contd.

DSEIS Section 9.0

Based on the foregoing, the NRC Staff has demonstrably not performed sufficient analysis to support its preliminary recommendation "that the adverse environmental impacts of license renewal for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable."[336] In order to comply with the mandates of NEPA, the NRC Staff must consider and address the foregoing comments before issuing the FSEIS.

140-ss-LR

Thank you for your consideration.

[332] *See generally* State of New York Contentions Concerning NRC Staff's Draft Supplemental Environmental Impact Statement, Docket Nos. 50-247-LR and 50-286-LR (filed February 27, 2008) at 22-29.
[333] *See id.* at 33-34.
[334] *See id.*
[335] *See* Riverkeeper Scoping Comments at 20-21.
[336] DSEIS, Main Report § 9.3, at 9-8.

47

1

Sincerely,

s/

Phillip Musegaas, Esq.
Hudson River Program Director
Riverkeeper, Inc.
828 South Broadway
Tarrytown, NY 10591
914-478-4501 (ext. 224)
phillip@riverkeeper.org

s/

Victor M. Tafur
Senior Attorney
Riverkeeper, Inc.
828 South Broadway
Tarrytown, NY 10591
914-478-4501 (ext. 222)
vtafur@riverkeeper.org

s/

Deborah Brancato
Staff Attorney
Riverkeeper, Inc.
828 South Broadway
Tarrytown, NY 10591
914-478-4501 (ext. 230)
dbrancato@riverkeeper.org

Comments relating to the Indian Point NRC draft EIS on the Cooling System

P. A. Henderson & R. M. H. Seaby

March 2009

Pisces Conservation Ltd
IRC House
The Square
Pennington
Lymington
Hampshire
SO41 8GN
UK

pisces@pisces-conservation.com

www.irchouse.demon.co.uk
www.pisces-conservation.com

Phone: 44 (0) 1590 674000
Fax 44 (0) 1590 675599

1

Index of figures

1 Summary

This report comments on the US NRC *'Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 38: Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3: Draft Report for Comment'* issued December 2008 (NUREG – 1437), Environmental Impacts of Cooling System. We are only concerned here with aquatic issues, and the impact of the plant's cooling system on fish and crustaceans in particular. The main impacts we look at in this document are entrainment, impingement and the effect of the thermal plume.

The assessment of impact undertaken on the representative important species (RIS) of (17 common fish species and the blue crab) is based on a scoring system that appears completely objective and quantitative. However, detailed examination of the method shows that it makes assumptions about the statistical properties of populations, the impact of cooling water systems on invertebrates prey species, and the relative importance of local and larger-scale changes in population number, that have not been justified and may be arbitrary.

A particular problem concerns the scoring method used to assess the strength of connection; this is a poor measure of the impact of the power plant on the species. The strength of connection is a flawed measure because it is based on rank abundance, furthermore, the lack of importance given to impacts on invertebrates makes low to moderate levels of impact for many species almost inevitable.

Another concern is that the distinction between '*Large*' and '*Small*' population impacts is hard to support from an examination of the overall population trend data.

The use of both river-wide and river segment 4 data (where Indian Point is located), and the use of population decline criteria that include a measure of the deviation from the mean of a normal distribution produce results that do not necessarily reflect the actual population trends, and have the potential to understate the importance of recent changes in abundance.

The comparison of species' proportional rank abundance in the power station kill with that living in the river results in potentially misleading conclusions. For example, the fish that contributes the highest proportion of the number of individuals killed by the power plant, and which is also the commonest in the river, only has a medium strength of connection. In our opinion, such a situation where a fish is killed in high numbers and is locally common would suggest a high degree of linkage.

1

A number of the RIS species have a prey score for impingement and entrainment of 1, and thus are unlikely to score highly for the strength of connection. This feature of the scoring protocol is thus central to the final outcome.

A key underlying point to note about the analysis of impingement and entrainment is the reliance on data collected between 1981 and 1990. These data are old and may not reflect current conditions.

NRC staff concludes that thermal impacts associated with the discharge are small to moderate, principally on the grounds that there is no evidence for the scale of the impact. The assertion that, because no appropriate evidence has been collected, there is therefore only a small to moderate impact, is not logical.

NRC staff state that they cannot determine the effects of climate change, particularly in relation to thermal issues. We believe they should have, at the very least, concluded that they needed more data on thermal issues before reaching a conclusion.

Although the NRC does not come to a definite conclusion about the effect of Indian Point on the sturgeon, they are concerned that they continuing operation will have adverse effects.

The cumulative effects of all the impacts on the River Hudson are assessed as large. The power plant, along with other users, must take their share of the responsibility and undertake to do as little damage a possible to an already stressed system.

1

2 Introduction

This report comments upon the US NRC *'Generic Environmental Impact Statement for License Renewal of Nuclear Plants Supplement 38: Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3: Draft Report for Comment'* issued December 2008. We will refer to this document below as NUREG-1437. We are only concerned here with aquatic issues, and the impact of the plant's cooling system on fish and crustaceans in particular.[1]

Fish and other species can be impacted in several ways by the operation of the power plant. They can be impinged (caught on the power station screens) as the power station withdraws water from the Hudson, entrained (smaller organisms pass thought the power station undergoing several stressors), or can be effected by the thermal plume produced by the cooling water.

The NRC method of assessing the above impact had several steps.

- Identifying the species to be examined,
- Examining what evidence there was of changes in populations and how useful it was.
- Assigning species to *Small*, *Moderate* or *Large* depending on their potential to be effected.
- Assigning a connection of *Low, Medium* or *High*, depending on whether the species was impinged or entrained in different numbers than they were present in the river.
- Combined the potential to be effected with the connection score to assess the impact of Indian Point.

3 Impingement and Entrainment: The scoring system

Impingement and entrainment effects are considered together by the NRC. This is an approach that has merit because the goal is the well-being of the populations as a whole, and not particular age classes.

The possible impact of the power plant is assessed using a scoring system that takes into account changes in species abundance (the trend) and strength of connection (connection), and which attempts to measure the relationship between abundance in the environment and in the power station catch. The analysis is restricted to the 18 RIS species (common fish species and the blue crab). The choice of these species is historic and was designed to represent the overall aquatic resource. They have all been studied over many years. The NRC staff note, as have many others before, that there have been notable declining

140-tt-AE

[1] NUREG-1437, Vol. 1, sections 2.2.5 Aquatic Resources, 4.1 Cooling System, 4.6 Threatened or Endangered Species, 4.8 Cumulative Impacts, 4.9 Summary of Impacts of Operations during the Renewal Term; 8.1 Alternatives to the Existing IP2 and IP3 Cooling-Water System.

1

1

trends in many RIS fish (see Population Line of Evidence column in Table shown in Figure 1). In this respect NRC staff agree with our previous analyses.[2]

Table 4-4. Impingement and Entrainment Impact Summary for Hudson River RIS

Species	Population Line of Evidence	Strength of Connection Line of Evidence	Impacts of IP2 and IP3 Cooling System on Aquatic Resources
Alewife	Large	Low to Medium	Small to Moderate
Bay Anchovy	Moderate	Low to Medium	Small to Moderate
American Shad	Large	Low to Medium	Small to Moderate
Bluefish	Large	High	Large
Hogchoker	Large	Medium to High	Moderate to Large
Atlantic Menhaden	Moderate to Large	Unknown[(a)]	Unknown[(b)]
Blueback Herring	Large	Low to Medium	Small to Moderate
Rainbow Smelt	Large	Medium	Moderate
Shortnose Sturgeon	Unknown	Unknown[(a)]	Unknown[(b)]
Spottail Shiner	Large	Low to Medium	Small to Moderate
Atlantic Sturgeon	Large	Unknown[(a)]	Unknown[(b)]
Striped Bass	Small	High	Small
Atlantic Tomcod	Large	Low to Medium	Small to Moderate
White Catfish	Large	Low to Medium	Small to Moderate
White Perch	Large	Medium to High	Moderate to Large
Weakfish	Small	Medium to High	Small
Gizzard Shad	Unknown	Unknown[(a)]	Unknown[(b)]
Blue Crab	Small	Unknown[(a)]	Unknown[(b)]

(a) Strength of connection could not be established using WOE, therefore strength of connection could range from LOW to HIGH
(b) Conclusion of impact could not be established using WOE, therefore impacts could range from SMALL to LARGE.

Figure 1: A copy of Table 4-4 from NUREG-1437, Vol. 1.

The serious decline in abundance of many species is reflected in the number of '*Large*' classifications in column 2 of the table in Figure 1. We choose two species from Table 4-4, white catfish and weakfish, to illustrate the nature of these declines. These two species also serve to demonstrate that the distinction made in Table 4-4 between '*Large*' and '*Small*' impacts is hard to support from an examination of the overall population trend data.

3.1 White Catfish

The Year Class Reports for the Hudson River Estuary Monitoring Program shows that, river-wide, juvenile white catfish have been in a steep decline in abundance since 1990 (Figure 2).

140-tt-AE contd.

[2] See "Status of Fish Populations and the Ecology of the Hudson River" and "Entrainment, Impingement and Thermal Impacts at Indian Point Power Station." Copies of these reports were are provided as Attachments 3 and 4, respectively, to the declaration of Dr. Peter Henderson, in support of Riverkeeper's request for a hearing and petition to intervene with respect to the license renewal proceeding for the Indian Point Nuclear Power Station (November 2007).

2

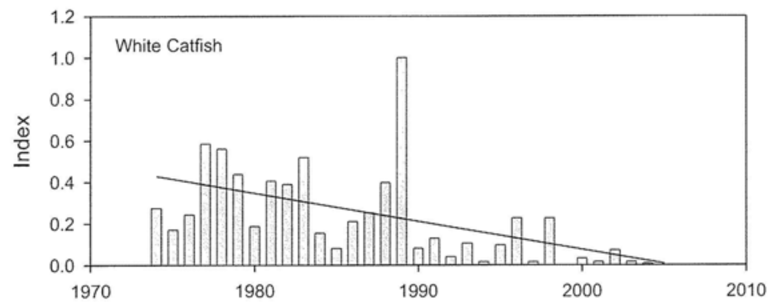


Figure 2: The standardised juvenile index for white catfish in the Hudson, showing a decreasing trend though time.
The trend is significant (a = -0.0136, b = 27.216, F = 14.0414, p = 0.0008) (Seaby and Henderson, 2007)

It is therefore unsurprising that in Table 4-4 (see Figure 1) the population line of evidence is for a 'Large' potential adverse impact. The trend shown in Figure 2, which is statistically significant, certainly seems to correspond with the definition of Large given on page H-33, NUREG-1437, Vol 2:

> *"A LARGE potential for an adverse impact to an RIS population was determined if population trends had slopes that were significantly different from zero (i.e., detectable slope) and had greater than 40 percent of annual abundance outside the defined level of noise (i.e., support for potential impact). This response was considered clearly noticeable, and an adverse environmental impact was likely."*

140-tt-AE contd.

The fact that 40% of the observations lie outside the standardised mean abundance level observed over the first 5 years of the long-term study is also significant. To quote from page H-36, NUREG-1437, Vol. 2:

> *"Thus, observations outside the boundaries of ±1 standard deviation from the mean of the first 5 years were considered outside of the natural variability (noise). If greater than 40 percent of the standardised observations were outside this defined level of noise, then a potential for adverse impact was considered supported."*

There are two important points to note about this definition. First, it is based on the normal distribution. The abundance of natural populations is never normally distributed. This brings into question the validity of the method.

3

1

Second, the approach is based on events in the first 5 years of the time series. If during this period the population showed unusually great variability, it would make it much harder, if not impossible, to score for a Large potential impact.

3.2 Weakfish

Like white catfish, weakfish have also shown river-wide a steep decline in abundance since 1990 (Figure 3). However, unlike white catfish, for this species Table 4-4 classifies the population line of evidence as 'Small'.

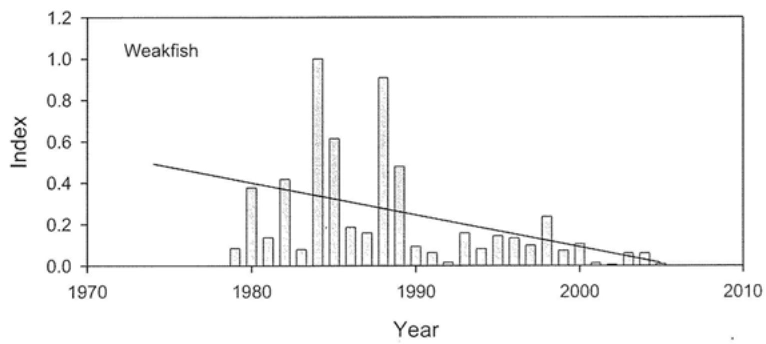


Figure 3: The standardised juvenile index for weakfish in the Hudson showing a decreasing trend though time.
The trend is significant (a = -0.0155, b = 31.0218, F = 7.0811, p = 0.0134) (Seaby and Henderson, 2007)

A 'Small' potential for adverse impact is defined on page H-32 vol 2 as:

> *"A SMALL potential for an adverse impact to an RIS population was determined if population trends had slopes that were not significantly different from zero (i.e., no detectable slope) and had ≤40 percent annual abundances falling outside a predetermined level of noise (defined here as +/-1 standard deviation from the mean of the first 5 years of data). This suggested that the RIS population had not changed detectably over time, and adverse environmental impacts were unlikely."*

The classification of the weakfish population line of evidence as Small in Table 4-4 if difficult to understand as there are clear signs that the population has shown a significant decline. If this is so, the population line of evidence should not be small, irrespective of the noise in the data set. The classification as small seems to arise because the weight of evidence (WOE) score (Table H-15, NUREG-1437, Vol. 2) assesses river-wide, river segment 4 and coastal scores

140-tt-AE contd.

4

1

for potential adverse impact. River-wide there is a moderate adverse impact assessment; see p H-42:

> *"Analysis of abundance index data suggested a large potential for adverse population impacts for three RIS (American shad, white catfish, white perch) and a* ***moderate*** *potential for adverse impacts for bay anchovy, blueback herring, Atlantic tomcod, and* ***weakfish*** *)."*

However, within river segment 4 the impact is only assessed as 'Small'. The final result is an overall 'Small' level of impact.

Weakfish are mobile, migratory predators that never complete their life cycle within river segment 4. We therefore can see no justification for including the river segment 4 analyses in an assessment of adverse population trends.

We conclude therefore that the WOE scoring system, which uses both river-wide and river segment 4 data, and uses population decline criteria that include deviation from the mean of a normal distribution, produces results that do not necessarily reflect the actual population trends, and have the potential to understate the importance of recent changes in abundance. Examination of the river-wide abundance trends for white fish and weakfish indicates that both species have, since 1990, appreciably declined in abundance. Yet while the decline in white catfish is classified as 'Large', that in weakfish is 'Small'. Such differences are more a reflection of the arbitrary nature of the statistical and quantitative approach taken, than a real difference in the state and health of the populations.

3.3 Problems with the assessment of the strength of connection line of evidence

In comparison with the evidence from the trends resulting in the population line of evidence shown in column 2 of Table 4-4 (Figure 1), the final impact assessment in the right hand column only shows a large effect for one fish, the hogchoker. There is also a moderate to large effect for a single species, white perch. The reason why so few of the large trends are translated into a large impact relates to the strength of connection measure in the third column of the table. A consideration of this measure and how it is computed is therefore of key importance.

From NUREG-1437 Vol. 2 (page H-29) we have this description of how strength of connection is measured.

> *"Impingement and/or entrainment can also remove and reintroduce RIS prey into the aquatic system in a manner that alters food web dynamics and produces indirect effects that may result in decreased recruitment, changes in predator-prey*

5

140-tt-AE contd.

1

relationships, changes in population feeding strategies, or movements of populations closer to or farther away from the cooling system intakes or discharges. Staff based the analysis of impingement on the concordance of two ranked proportions. The first proportion was the ratio of the number of YOY and yearling fish of each species impinged in relation to the sum of all fish impinged. The second proportion was the ratio of each species abundance in the river near IP2 and IP3 relative to the total abundance of all 18 RIS. A large rank for both proportions would mean that the proportion impinged for the given RIS and the proportion abundance in the river were both large. The ratio of these two ranks would then be close to 1, suggesting that the stationary sampler was sampling proportionately to the abundance in the river (a medium strength of connection)."

The first point to note is that the analysis is undertaken by comparing a species' **proportional rank abundance** in the power station kill with that living in the river. Rather oddly, a fish that contributes the highest proportion to the number of individuals killed by the power plant, and which is also the commonest in the river, only has a medium strength of connection. In our opinion, such a situation where a fish is killed in high numbers and is locally common would suggest a high linkage. This is a point that needs consideration and critical appraisal. The effect is to reduce the assessment of the power plant's impact on abundant, commonly-caught fish.

The second point to note is that a species which is ranked less common in the power plant kill than in the river will be scored small to moderate. The key point is that the power plant kill may actually reflect the abundance in the river, however the rank could decline if other species are killed in unusually high numbers. Thus, each species is not being fairly assessed on its own merits.

We will now examine the generation of these assessments of the strength of connection line of evidence in more detail. Figure 4 shows the Weight of Evidence for the Strength of Connection table.

140-tt-AE contd.

6

1

Table I-32 Weight of Evidence for the Strength-of-Connection Line of Evidence Based on the Result Scores of Low = 1, Medium = 2, and High = 3

Measurement	Impingement Result Score		Entrainment Result Score		WOE Score[b]	Strength of Connection
	RIS	Prey	RIS	Prey		
Use and Utility[a]	1.9	2.0	1.6	2.1		
Alewife	2	1	2	1	1.5	Low to Medium
Bay Anchovy	2	1	2	1	1.5	Low to Medium
American Shad	2	1	2	1	1.5	Low to Medium
Bluefish	4	2	2	2	2.5	High
Hogchoker	4	1	2	1	2.0	Medium to High
Atlantic Menhaden	Unknown	1	Unknown	1	Unknown	Unknown
Blueback Herring	2	1	2	1	1.5	Low to Medium
Rainbow Smelt	2	1	4	1	1.9	Medium
Shortnose Sturgeon	Unknown	1	Unknown	1	Unknown	Unknown
Spottail Shiner	1	2	1	2	1.5	Low to Medium
Atlantic Sturgeon	Unknown	1	Unknown	1	Unknown	Unknown
Striped Bass	2	4	2	2	2.5	High
Atlantic Tomcod	2	1	2	1	1.5	Low to Medium
White Catfish	2	1	2	1	1.5	Low to Medium
White Perch	2	2	2	2	2.0	Medium to High
Weakfish	2	2	2	2	2.0	Medium to High
Gizzard Shad	Unknown	1	Unknown	1	Unknown	Unknown
Blue Crab	Unknown	1	Unknown	1	Unknown	Unknown

(a) Use and Utility: Low = <1.5, Medium = ≥1.5 but ≤2.0, High = >2.0
(b) WOE Score: Small = <1.5; Small-Moderate = 1.5; Moderate = >1.5 but <2.0; Moderate-Large = 2.0; Large = >2.0

Figure 4: A copy of Table I-32 from NUREG-1437, Vol 2, page I-47.

We will illustrate weaknesses with the approach taken using, as above, a specific example from the list of RIS species.

3.4 *Rainbow smelt*

Juvenile rainbow smelt have disappeared from the survey since the mid 1990s (Figure 5), and it is therefore unsurprising that Table 4-4 assesses the population line of evidence as '*Large*'. However, the impact of Indian Point 2 and 3 is assessed as moderate because the strength of connection is assessed as '*Medium*'. 140-tt-AE contd.

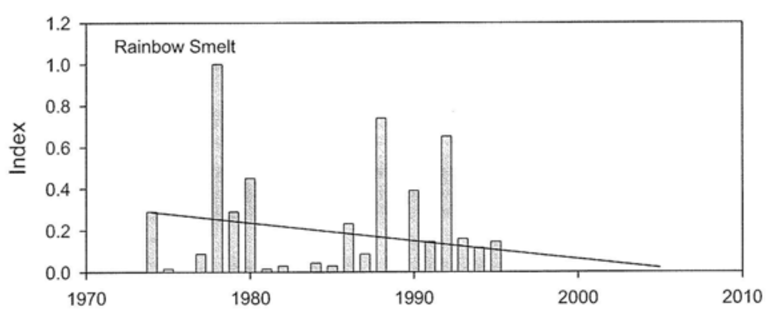


Figure 5: The standardised juvenile index for rainbow smelt in the Hudson.

7

Examination of Table I-32 (Figure 4) shows why the overall impact is only 'Moderate'. This table shows that both the impingement and entrainment of rainbow smelt has been appreciable, and entrainment has been given the highest score possible of 4. However, the strength of connection is only medium because both the impingement and entrainment prey scores are 1. The reason for this is stated in NUREG-1437, Vol. 2 page I-41.

> *"All remaining YOY RIS eat plankton, zooplankton, benthic invertebrates, and amphipods. These prey were assumed to be unaffected by the cooling systems, and a low strength of connection was concluded."*

This example demonstrates that an unsubstantiated and unproven assumption, that invertebrate prey species are not affected by the cooling water system, leads in turn to the conclusion that the rainbow smelt, a species which has effectively disappeared from the data in recent years and has been assessed as potentially highly impacted by entrainment, is only given a moderate impact in Table 4-4.

Before a conclusion of this nature could be justified, the assertion that the cooling water system has no impact on invertebrate prey species needs to be demonstrated. There is considerable evidence that large numbers of invertebrates are entrained and potentially killed by the cooling water system. There is therefore no reason to believe that invertebrate prey species such as amphipods are not adversely affected. This impact may extend beyond entrainment effects as the heated discharge water may also adversely affect them.

140-tt-AE contd.

3.5 Other species

Examination of Table I-32 (Figure 4) shows that a number of the RIS species have a prey score for impingement and entrainment of 1, and thus are unlikely to score highly for the strength of connection. This feature of the scoring protocol is thus central to the final outcome. The Atlantic tomcod makes a telling further example. The tomcod population shows considerable year-to-year variation, but appears to be in long-term decline (Figure 6). The average standardised index from 1975 until 1995 is 0.158; in comparison the index for the last ten years of sampling (1996-2005) is only 0.0617. In the last 10 years, only 2001 produced a good recruitment, although there are signs of a recent slight improvement in tomcod numbers.

8

1

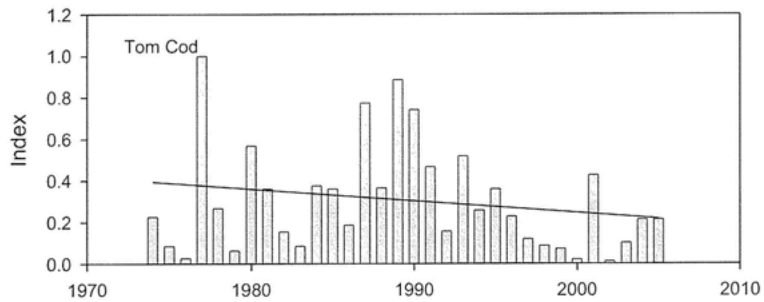


Figure 6: The standardised juvenile index for tomcod in the Hudson showing a decreasing trend though time. (Seaby and Henderson, 2007)

While the population line of evidence for a decline is large, the invertebrate prey of this species is primarily responsible for the low-to medium strength of connection and the final conclusion that the impact is small to moderate.

140-tt-AE contd.

4 The age of the data

A key underlying point to note about the analysis of impingement and entrainment is the reliance on data collected between 1981 and 1990. These data are old, and may not reflect current conditions. Further, there are hints that the NRC staff did wonder if the data reflected present conditions. For example they noted that the data showed a declining dominance of RIS species:

> *"Until 1984, the RIS fish made up greater than or equal to 95 percent of all impinged taxa. This percentage has significantly decreased at a rate of 0.8 percent per year (linear regression; n = 16; p = 0.002) from 1985 to 1990."*

If impinged data were available for 2008 would we find that the impinged fish had changed even more? The risks inherent with the use of old data are not addressed.

It is worth noting that, although the impingement and entrainment data are over 17 years old, the population data that shows the decline in so many of these species is current. The differences in the population of fish between the 1990s and the present are great.

9

1

5 Threatened and Endangered Species

The NRC staff review the number of shortnose and Atlantic sturgeon that are impinged at Indian Point. The data used to assess the impact are old, and the lack of monitoring of impingement means that they do not know if current impingement rates are similar to those between the 1970s and 1990s. In addition, they admit that they cannot assess the thermal impact on these species (page 4-51). Given these large uncertainties the NRC staff come to no conclusion on the impact of Indian Point on theses species, giving a range of small to large for the future impacts.

140-uu-TS

6 Potential Mitigation Options and Cumulative Impacts

In section 4.1.5 the NRC staff state that they believe that the continued operation of Indian Point will have an adverse effect on the aquatic system of the lower Hudson River; we agree with this statement. However, they then go on to review some of the potential mitigation methods including many that are not viable method for this facility; we believe this review of mitigation options is meaningless. .

140-vv-AE

Finally, the cumulative adverse impacts of the many factors that affect the Hudson River are considered in section 4.8.1. The NRC staff conclude that the continued operation of Indian Point will have a large impact on some of the species examined, and could be detrimental to the shortnose sturgeon. They also consider that the effects of climate change could be substantial and are an important component of the likely adverse impact.

When all the various factors, including the operation of Indian Point, were considered (p4-58) the overall effects were considered large. Clearly, the Indian Point power plant must take its share of the responsibility and undertake to do as little damage a possible to an already stressed system.

140-ww-AE/CI

7 Thermal impacts

In NUREG-1437, Vol. 1, page 4-27 NRC staff conclude that thermal impacts associated with the discharge are small to moderate, principally on the grounds that there is no evidence for the scale of the impact:

> *"In the absence of specific studies, and in the absence of effects sufficient to make a determination of a LARGE impacts, the NRC staff concludes that thermal impacts from IP2 and IP# could thus range from SMALL to MODERATE depending on the extent and magnitude of the thermal plume, the sensitivity of various aquatic species and lifestages likely to encounter the thermal plume, and*

140-xx-AE

10

1

the probability of an encounter occurring that could result in lethal or sublethal effects."

The assertion that, because no appropriate evidence has been collected, therefore there is only a small to moderate impact is not logical.

Linked to thermal impacts must be a consideration of climate change impacts. The following conclusion is reached in H-60:

"Thus, the NRC staff has concluded that the cumulative effects of climate change cannot be determined."

We therefore have the odd situation where they are willing to conclude that thermal effects are small to moderate and can therefore be dismissed, yet they cannot determine the effects of climate change. We believe they should have, at the very least, concluded that they needed more data on thermal issues before reaching a conclusion.

140-xx-AE contd.

8 Conclusion

The assessment of impact on the RIS species is based on a scoring system that initially appears objective and quantitative. However, detailed examination of the method shows that it makes assumptions about the statistical properties of populations, the impact of cooling water systems on invertebrates and the relative importance of local and larger scale changes in population number, that have not been justified.

A particular problem concerns the scoring method used to assess the strength of connection; this is a poor measure of the impact of the power plant on the species. The strength of connection is a flawed measure because it is based on rank abundance, furthermore the lack of importance given to impacts on invertebrates makes low to moderate levels of impact for many species almost inevitable.

The data relied on to measure impingement and entrainment is old, and many populations have shown marked changes since that period. This brings into question the reliability of the conclusions when applied to the future.

Although the NRC does not come to a definite conclusion about the effect of Indian Point on the sturgeon, they are concerned that they continuing operation will have adverse effects.

The cumulative effects of all the impacts on the River Hudson are assed as large. The power plant, along with other users, must take their share of the responsibility and undertake to do as little damage a possible to an already stressed system.

140-yy-AE

11

1

9 References

Seaby, R M H and Henderson, P A, 2007. The status of fish populations and the ecology of the Hudson. Prepared for Riverkeeper, New York.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

FEB 24 2009

David J. Wrona, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Program
US Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Biological Assessment for License Renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3

Dear Mr. Wrona:

This correspondence responds to a letter dated December 22, 2008 (received January 2, 2009) regarding the initiation of formal consultation for the proposed renewal by the US Nuclear Regulatory Commission (NRC) of the Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) operating licenses for a period of an additional 20 years pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended. The current operating licenses for these units expire on September 28, 2013 (IP2) and December 12, 2015 (IP3). Consultation with NOAA's National Marine Fisheries Service (NMFS) regarding the proposed license renewal is appropriate as the action may adversely affect the federally endangered shortnose sturgeon (*Acipenser brevirostrum*). Accompanying your letter was a Biological Assessment (BA) evaluating the impact of the proposed renewal on federally endangered shortnose sturgeon (*Acipenser brevirostrum*), as well as a copy of the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 39 Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 Draft Report*. NMFS has completed an initial review of the BA and draft EIS and has determined that we have not received all of the information necessary to initiate consultation. To complete the initiation package, we will require the information outlined below.

Section 4 of the BA contains life history and status information for shortnose sturgeon. Several corrections are necessary in this section. In the Hudson River, shortnose sturgeon spawn when water temperatures are between 8 and 15°C, which typically occurs in April. Recent information suggests that the population estimate calculated by Bain, and included in the BA, likely overestimates the number of shortnose sturgeon in the Hudson River. Dr. Katherine Hattala, a biologist with the State of New York, has examined the data used by Bain and determined that a more appropriate estimate is approximately 30,000 adult shortnose sturgeon.

Section 4.3.2 of the BA assesses the impact of impingement on shortnose sturgeon. The BA contains a summary of the available information on impingement of shortnose sturgeon (Table 2). NMFS requests that NRC staff provide the following information in regards to Table 2: (a) for each year, indicate the level of monitoring effort (e.g. weekly for six months, etc.); (b) for each year when there is no number recorded, indicate whether that was due to a lack of monitoring, or due to a lack of capture; (c) indicate the date of impingement; and, (d) indicate the size and condition (i.e., alive, injured or dead) of the impinged fish. It is our understanding that no impingement monitoring has been conducted since traveling Ristroph-type screens were installed at the facility in 1991. As noted in the BA, the lack of information makes it difficult to predict the effects of relicensing and an additional 20 years of operation on shortnose sturgeon. If the NRC is not able to require the applicant to conduct monitoring in support of relicensing, NMFS requests that the NRC provide an estimate, based on the best available scientific information, of the likely number of shortnose sturgeon impinged at the facility with the traveling Ristroph-type screens in use. NMFS expects that the NRC could use the existing impingement data in conjunction with data on the effectiveness of Ristroph-type screens to calculate this estimate. As noted in the BA, another important factor is the mortality rate of impinged sturgeons. NMFS requests that NRC provide an estimate of the mortality rate for impinged shortnose sturgeon. NMFS expects this rate could be calculated based on available mortality rate data for other similar species and/or other facilities where similar screen types have been installed.

Section 4.3.3 of the BA discusses thermal impacts. As noted in the BA, without a model of the thermal plume it is extremely difficult to predict what the level of exposure to elevated water temperatures is for shortnose sturgeon. If NRC is unable to require that the applicant conduct modeling of the thermal plume in support of relicensing, NMFS requests that the NRC use the best available scientific information to estimate the likely temporal and spatial extent to which shortnose sturgeon will be exposed to water temperatures where adverse effects are likely (i.e., greater than 28°C).

It is NMFS understanding that the proposed action is the relicensing of the facility with no modification to the existing intakes. However, in the DEIS, the NRC discusses alternatives including cooling towers. NMFS seeks clarification as to the process by which the NRC will determine whether the installation of cooling towers, or other measures, will be required of the applicant. NMFS also seeks clarification regarding the current requirements of the National Pollutant Discharge Elimination System (NPDES) Permit issued by the State of New York and the potential outcome of the adjudication process currently ongoing regarding this permit, as well as the potential for the State NPDES permit to require cooling towers.

The formal consultation process for the proposed action will not begin until we receive all of the requested information or a statement explaining why that information cannot be made available. We will notify you when we receive this additional information; our notification letter will also outline the dates within which formal consultation should be complete and the biological opinion

1

delivered. My staff is available to discuss these information needs with NRC staff. I look forward to continuing to work with you and your staff during the consultation process. If you have any questions or concerns about this letter or about the consultation process in general, please contact Julie Crocker at (978) 282-8480.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

cc: Crocker, F/NER3 (hardcopy)
Damon-Randall, Hartley – F/NER3 (pdf)
Rusanowsky– F/NER4 (pdf)
Logan – NRC (pdf)

File Code: Sec 7 NRC Indian Point Nuclear Plant Relicensing

PCTS: F/NER/2009/00619

3

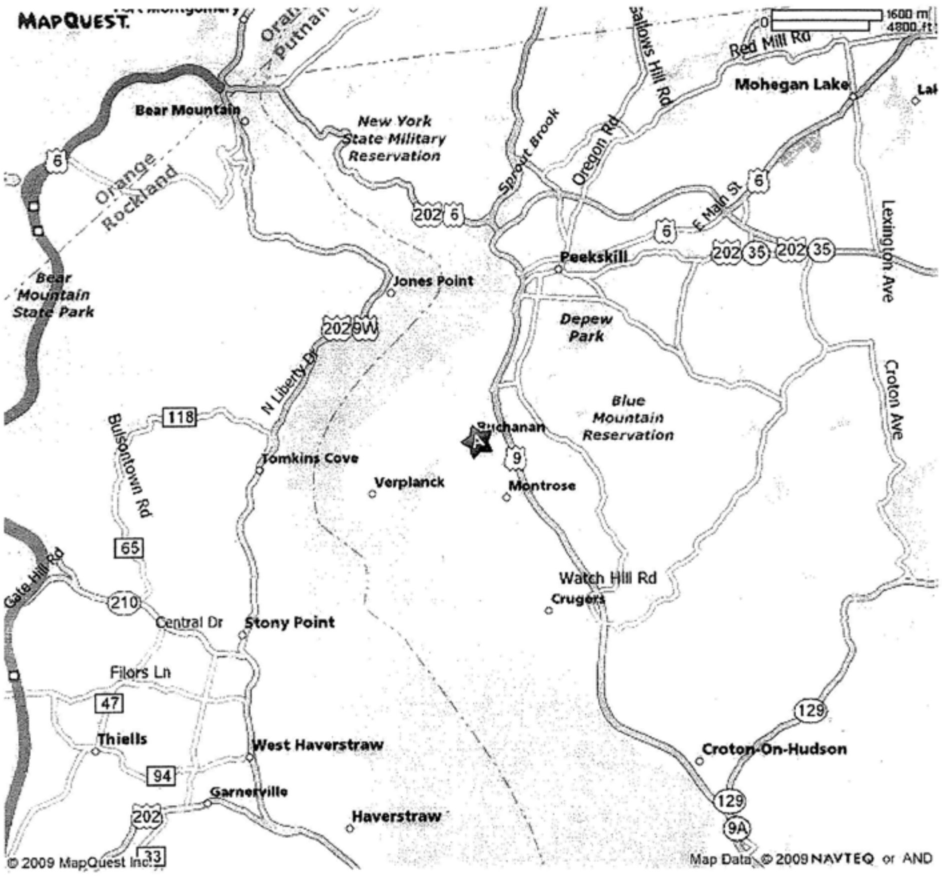
Figure 2-2
Project Site Boundaries

UNITED WATER Haverstraw Water Supply Project

1

Map of Buchanan, NY by MapQuest

Page 2 of 2



http://www.mapquest.com/maps?city=Buchanan&state=NY

3/16/2009

New York State Department of Environmental Conservation
Director, Hudson Catskill Region, Region 3
21 South Putt Corners Road, New Paltz, NY 12561-1620
Phone: (845) 256-3033 • **FAX:** (845) 255-3042
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

March 9, 2009

Ms Rebecca Troutman
Riverkeeper
828 South Broadway
Tarrytown, NY 10591

Dear Ms Troutman:

Thank you for your letter of January 12, 2008 regarding United Water New York, Inc.'s Proposal to Build a Desalination Plant in Rockland County. Your letter expressed the concern that that "every component of this Project warrants the highest scrutiny under applicable federal and state laws, and all relevant policy considerations," and urged the Department to assume Lead Agency status under the State Environmental Quality Review Act for the project.

The Department's regional staff, on February 10, 2009, forwarded to Riverkeeper staff letters addressing the environmental review of this proposal. These letters are attached for your consideration. These letters addressed the Department's intentions regarding the SEQRA review of both the pilot plant and the long-term plant associated with this proposal, and indicated the Department's intent to be the lead agency for such review.

The Department has not received any objections to our lead agency status, and no such objections being submitted as required by law, now assumes the Lead Agency role for the environmental review. In response to your letter, the Department intends to conduct a full and thorough SEQRA review as required by law, and welcomes full and open participation of the public in that process as it moves forward.

Thank you for your interest in the Department's role in the consideration of the proposed project. We look forward to your and others participation.

Sincerely,

William C. Janeway
Regional Director

1

RULES AND DIRECTIVES BRANCH

ROAR

Religious Organizations Along the River

2009 MAR 20 AM 9: 30

RECEIVED

Chief of Rulemaking, Directives and Editing Branch
Division of Administrative Services
Office of Administration, Mailstop T-6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

12/31/08
73 FR 80440
13

March 12, 2009

Dear Chief of Rulemaking:

On behalf of and in the name of ROAR, I would like to submit comments on the re-licensing request by Entergy Company for the Indian Point plant.

ROAR, initiated in 1996, is a network of religious Congregations and organizations with property in the Hudson Valley of New York State. We come together to: support one another in using our lands with an attitude of respect for the beauty and integrity of earth; address the interrelated issues of poverty, justice and ecology in this bio-region.

The members of **ROAR** are very concerned and very opposed to the relicensing of the nuclear plant at Indian Point. We are supportive of the **RIVERKEEPER's** position on the relicensing. 141-a-OR

Firstly, the Indian Point plants are located in a densely populated area of our state, only 24 miles from New York City. Safety issues are of prime concern because of the possibility of corrosion with such aging plants. Approximately 20 million people live within a 50 mile radius of the plant. Additionally, the long term storage of thousands of tons of highly toxic nuclear waste in poorly maintained spent fuel pools and "dry casks," are accidents waiting to happen. 141-b-AM/DE/PA/RW

Secondly, we have grave environmental concerns related to Indian Point plants. The continued leaking of radioactive water from the Indian Point 2 spent fuel pool into groundwater and into the Hudson River is frightening. Residual contamination is caused by the plumes of contaminated water that slowly leach toxic strontium 90 and cesium-137 into the River. Additionally, shortnose sturgeon, an endangered species, are killed when trapped against cooling water intake screens at the plant. 141-c-AE/LE/RI

We hope that the NRC will refuse the relicensing of the Indian Point power plant. We sympathize with the need for energy and for jobs, but as Section 8 of the DEIS document points out - alternate energy sources are available which will provide both energy and jobs. 141-d-AL/OR

Thanks you for taking our thoughts into your considerations!

The Members of **ROAR**
(Dorothy Scesny, PBVM; Nancy Erts, OP; Mary Ann Garisto, SC; Dorothy Maxwell, OP; Dorothy Calvani; Carol DeAngelo, SC; Doreen Longres, MM; Ann Braudis, MM; Regina Murphy, SC; Fern Gosselin, MM)

156 Convent Rd
Nanuet, N.Y.
March 17, 2007

To Whom It May Concern:

Our N.Y. State Attorney General Andrew Cuomo and the State Department of Conservation along with Riverkeeper are opposed to granting Indian Point a twenty years extension of its license. Presently there are environmental concerns such as continuing leak of radioactive water from the Indian Point 2 spent fuel pool into the groundwater and Hudson River. Unless this and other issues are cleaned Indian Point should not be given a license extension. I support that the Hudson River is clean.

I appreciate a response

Thank you

Sincerely
Sister Mary Christine

142-a-LE/OR

IPRenewalCEmails ML 090700174

From: Alice D Rosenfeld [alicedr@juno.com]
Sent: Tuesday, March 10, 2009 5:25 PM
To: IndianPointEIS Resource
Subject: Draft Environmental Impact Statement

Please be informed that as a resident of Westchester County who would be within range of any environmental failure at Indian Point, I strongly oppose renewal of its ability to continue. Their waste pollutes our land and our beautiful Hudson, not to mention damage done to residents in the area.

I truly believe that you cannot in conscience allow this energy facility to continue, and I sincerely hope that you will follow up after any closure requirements to assure that they leave as little damaging "stuff"
in our environment as possible. 143-a-GI/OR/RW

Alice D. Rosenfeld
492C Heritage Hills
Somers NY 10589

MR. RYAN: Good evening neighbors. My name is Tom Ryan. I'm a field construction boilermaker for Local 5, but I assure you I have not been compensated by either them or Entergy to come speak in support of re-licensing. I also say neighbors because I live in the so-called 10-mile kill zone over in Yorktown. My four small children live there with me and go to school there. My wife lives with me and also works there. I've worked in power plants, Long Island, New York City and the lower Hudson Valley. I've been at Indian Point when we unloaded the cask systems for the spent-fuel. I've been actually in the reactors while supporting Entergy and their maintenance department. I don't say this to impress you, but to impress upon you, I speak from experience. Of all the power plants that I have worked in the last nine years, Indian Point is undoubtedly, hands down, the cleanest, safest, most secure and most efficient. Indian Point produces 2000 Mw of clean, low-cost electricity. It's extremely important considering Tomkin's Cove is now closed, hydropower has been closed-down in Sullivan County at the dams and Bowline rumor has it may soon be dormant. 144-a-EC/SC/SR

Renewable resource research and development is applaudable, but it's not keeping the lights on. Southeast New York will need another 2000 Mw by 2012. That's a conservative estimate by the Independent System Operator. Lack of a Article-10 Power Plant Siting Law is stifling the growth of our power 144-b-EC/SO needs in New York State. Especially downstate. As for labor, Indian Point Energy Center is a friend of labor and the middle class. It provides inexpensive power as well as very good paying jobs, benefits and health care to hundreds upon hundreds of qualified employees and contractors. We hear about endangered species. The middle class is the most endangered species economically today and most in need of the economic stimulant called Indian Point. As for environment and security,

144-b-EC/SO contd.

New York City is the target. I'm not a member of the Central Intelligence Agency, but I don't need to remind you that New York City is the target. Not all the way up here. New York City power plants are shockingly unsecure. The IPEC security is more than adequate in-house. However, you can't have too much. I would definitely urge the NRC, when looking at the re-licensing, to urge Governor Patterson to returning the National Guard to the site as well as increasing the United States Coast Guard patrols both sea and air. And strictly enforcing the no-fly zone.

144-c-ST

As for foreign oil, most tools in a nuclear power plant because they have the money and such stringent rules and regulations and safety laws, most of the tools are made here in America. You go to other construction sites and they’re not. They’re made abroad. They're made in China, a communist country. I won't get into politics. The uranium is mined in

144-d-OS

the U.S.. Foreign oil obviously isn't. I'm going to think the NRC for hearing my thoughts and I'll just leave you with this. Talking about the environment. I've got quite a few friends, close friends, and family that served in the front lines, both Afghanistan and the Middle East. There is no reason why American blood should be spilled for foreign oil. Indian Point helps prevent that. Thank you.

144-d-OS contd.

IPRenewalCEmails 1

From: Martyn Ryan [mjr273@gmail.com] 2
Sent: Wednesday, March 18, 2009 3:57 PM
To: IndianPointEIS Resource
Subject: Comments on Indian Point Relicencing

The re licencing of Indian point needs to consider the following environmental impacts which have or could have a devastating effect on our environment:

-Operation of an ageing nuclear power facility beyond its intended life span within a highly populated area. The environmental impact statement needs to include and look at potential dangers from emissions/accident and include modelling to determine the possible outcome. 145-a-AM/PA

-The storage of nuclear waste materials above ground on the banks of the Hudson River- the impact and threat associated with this and the impact in the event of a release/ accident in the storage facility. Direct terrorism or sabotage must be included in the analysis. The cost of this storage and maintenance of this material over its' lifetime needs to be included in the economic analysis. 145-b-RW/ST

-A constant histroy of leaking of radioactive water from Indian Point into our groundwater and into the Hudson River. The true costs of these emissions to public health with proper studies on children in the surrounding comunities must be included. 145-c-HH/LE

-Inadequate inspection of underground pipework which is old and beyonds its' useful service life.

-A constant history of leaching toxic strontium 90 and cesium 137 into the River - the potential that the hudson river will be used as a water source for Rockland COunty with this nuclear plant emitted radioactive substances into the river. 145-d-LE/OM/WA

-killing of short nose sturgeon (endangered species) and Atlantic Sturgeon

-the slaughter of billions of fish, eggs, and larvae as a result of Indian Point's outdated cooling water intake system which uses billions of gallons of Hudson River water daily - there is an alternative to this and this must be stopped. 145-e-AE

This re licencing must be denied on the basis that the true cost of operating this plant in its' current location is way beyond any financil benefit. If a new nuclear facility was being planned for this populated are it would not be even entertained as the dangers are too high. We must look at this plant in the same way. 145-f-DE/OR

Tahnks,
Martyn Ryan
153 Hudson terrace
Piermont
NY 10968

MR. RYAN: My name is Martin Ryan. I'm a resident of Rockland County. And I live beside the Hudson River just downstream of Indian point. I'm here tonight representing myself. I'm a chemical engineer by profession. I believe that the impact assessment as presented to this board has many inadequacies. There’re too many to really mention all of them here tonight. The process needs to ensure that all of the impacts of Indian Point are catalogued and analyzed. The current assessment fails on the following fronts.

The storage of spent fuel at the Indian Point cite within a densely populated area. The effect of the outdated cooling system on the Hudson River ecosystem and many endangered species. The effect of current groundwater contamination present at the site and the status of underground piping, which has not been addressed at all. The effect of current groundwater contamination and air contamination on our children and families. The effect of accidental and uncontrolled release of materials into our water or air. The NRC has ultimate responsibility to ensure that these issues are adequately addressed. We cannot turn a blind eye to these impacts. Whatever decision is made, it must be made with all the relevant information. The outdated impact assessment that has been presented does not do that and it needs to be updated with accurate and researched information. Thank you.

145-g-OE

MR. SAFIAN: Thank you. My name is Keith Safian. I'm a president and CEO of Phelps Memorial Hospital, right here in Westchester, where I've worked for 19 years. There seems to be a strong Brooklyn contingent, that is my personal homeland, but I really been focused in Westchester, as I said, for almost two decades. I speak tonight as Westchester's 10th largest employer. Phelps Memorial Hospital has over 1500 employees. About 140 more than we had two years ago. We continue to grow. We have over 450 medical staff, 300 volunteers and that adds up to over 2200 people who work at Phelps every week. We serve as a backup hospital for Indian Point and have done that for over 20 years. They train with our staff every year on disaster preparedness. Although we've never received a nuclear related injury from Indian Point since Phelps' been there and since Indian Point has been there.

This training, however, really serves a very important purpose of preparing us for chemical and biological disasters. It was very helpful on September 11, 2001 when seven victims from the World Trade Center drove to Phelps Hospital for care for their injuries. It was very helpful when anthrax was discovered in Manhattan and about 200 people reached out to Phelps to ask for help because they were exposed. And thanks to Indian Point, our hospital was prepared for these kinds of disasters, not the things you would think of. Phelps is a very,

146-a-EP/SE

very busy and growing hospital. We served over 268,000 patient registrations last year, which was another record as was the year before. But we also spent a million dollars buying heating oil. That cost us 30% more than the year before. All I can say is thank goodness our electricity is not based on foreign oil because otherwise that bill would have gone up. Our hospital expanded in the last two years by physically 100%. We doubled our square footage. We added a new medical office building, a new emergency department, which has all private rooms. We put in a new gigantic outpatient physical therapy and occupational therapy service with an aqua-therapy swimming pool and a parking garage with 750 additional free parking spaces. But despite all of that much increased square footage our electricity bill only went up 12%. 100% more square footage, only a 12% increase in electricity because Entergy and the Indian Point plants were there to give us literally unlimited additional electricity whenever we needed it. There was never a question in our expansion plans that electricity would be a limiting factor.

146-a-EP/SE contd.

146-b-EC

So, as a very large employer and a major health-care provider, Indian Point is critical to our continued growth. But where I wear my health-care provider hat, we're also very concerned about the serious effects of air pollution on our community. We've seen the incidence of lung cancer particularly

146-c-AQ/SR

in women grow dramatically in the last few years. It has really become the most a frequent killer of women, far more than you'd think. So, clean, pollution free nuclear power is the best source of power for the health of our community. Absent adequate electricity, my hospital could not continue to grow. We could not continue to hire more employees. We could not continue to accommodate another 20,000 additional patient visits each year. And given the terrible economic crisis that's facing our state government and Washington, it's unthinkable that we could lose the safe, economically viable and irreplaceable source of critically important electrical power. My last comment is, the last thing you want as our community is for my hospital to divert money from patient care to pay for more higher cost electricity that's fired by imported oil rather than safe and inexpensive nuclear power. Thank you.

146-c-AQ/SR contd.

146-d-EC/SO

ML090700175

1

2

IPRenewalCEmails

From: asambrook466 [asambrook466@aol.com]
Sent: Tuesday, March 10, 2009 5:30 PM
To: IndianPointEIS Resource
Subject: Draft Environmental Impact Statement (EIS) for Indian Point.

I wish to comment on the Draft Environmental Impact Statement (EIS) for Indian Point.

The Draft EIS fails to evaluate the impact of global warming – including the projected warming of the Hudson River and the projected increase and severity of storms and flooding – upon Indian Point. Two examples: (1) The warming of the Hudson River will exacerbate the impact of the hot plume of water expelled by Indian Point into the river. (2) Increased storms and flooding will exacerbate the corrosion, rusting, etc. of underground piping and other systems at the plant, thereby increasing the likelihood of more accidental radiation releases such as the one discovered in February 2009. 147-a-GE/LE

The cost/benefit analysis of the Draft EIS is incomplete and inadequate and constitutes a violation of NEPA. Notably, it relies upon the preposterous conclusion that a major nuclear accident need not be of concern, and even if one occurred, it would not have a significant effect on the environment or public health. This flies in the face of the United States government's (including the NRC's) own former analyses. 147-b-NE/PA The NRC must include the postulation of a major radioactive release — the including the possibility of a meltdown and spent fuel fire – in its cost/benefit analysis.

The Draft EIS is defective in neglecting to evaluate the environmental risks inherent in an aging nuclear facility which has already demonstrably shown signs of **deterioration**. The NRC's disregard of aging as a separate crucial factor, and its reliance upon "aging management" as a failsafe for finding all potentially critical problems, not only flies in the face of standard engineering risk analysis, 147-c-AM but is belied by the actual experience at the plant.

The failure of the NRC to acknowledge the above represents a deplorable disregard of the NRC mandate to protect human health and the environment and strongly suggests that the Draft EIS is merely a façade for rubberstamping Indian Point's relicensing. 147-d-OR

Sincerely,

Andrea Sambrook
Mamaroneck, NY

MR. SAMUELS: Good afternoon. My name is Al Samuels. I am President and CEO of the Rockland Business Association. Our organization represents over a thousand businesses in the region. 24% of our members are from outside of Rockland. 7% from Westchester. 7% from Orange County. We represent a very diverse group. We have a very diverse membership base. We speak on their behalf on many issues concerning rebuilding an expansion of infrastructure, affordable health care and of course the reliability and availability of electricity, which is why I come before you today.

Historically, Rockland's residents have rarely viewed Indian Point as being beneficial to the county. While they have participated in the emergency planning process as part of Rocklands officials responsibilities to the E-Plan without either apparent tax or power benefits from the site, some residents and elected officials took the viewpoint there was no viable connection between the site and the county. If recent events have taught us anything, it's that seemingly disconnected pieces of our economy, whether here or thousands of miles away are delicately interconnected and when those pieces break, we all suffer consequences and equally feel the financial impact. The time for Rockland's agnostic feelings towards the future of Indian Point is over.

148-a-AL/SO

Indian Point's power now flows through our lines to our businesses and our homes. Indian Point employees live in Rockland County. When they spend their hard-earned money, those dollars flow to our shops, to our gas stations, to our restaurants. When they pay their school taxes that money flows to our classrooms and goes towards paying our teacher salaries. We agree with our colleagues in labor. This is not the time to put union workers on the unemployment line.

Now in the face of the mounting budget cuts, the threat of economic collapse, we need Indian Point's, green low-cost electric power more than ever. The lower Hudson Valley receives 18-36% of its electricity from Indian Point. A large amount of power and by any reasonable measure, an amount we cannot easily afford to lose or to replace.

Our association is very proud of something we call our green counsel. This group addresses many issues and seeks many green solutions, but business owners cannot rely on empty or fanciful promises of alternative sources of energy. We have businesses to run. Employees to pay. Taxes to make do. We must submit this and pay these things every day. We must have reliable and affordable electricity that runs 24/7 that parallels the demands of our businesses. We need this in order to be competitive in today's economy to survive. The Rockland Business Association fully supports both our counties and our state's energy efficiency reports and there were efforts. We

148-a-AL/SO contd.

believe in the investing and the development of new sources of green power. But let's first prove that we can both save enough electricity through new efficiency programs and build enough additional transmission and power producing infrastructure before we casually dismiss 2000 Mw of efficient base-load power right here in the Hudson Valley.

Rockland is no stranger to seeing energy providers close up shop. Plant closures such as the Lovett Plant in Stonypoint have significantly impacted the budgets of our North Rockland communities, of which I am a resident, and our school district. We cannot allow other communities to suffer the same consequences. That is why I am here today to support the continued operation of the Indian Point Energy Center and to urge the Nuclear Regulatory Commission to extend the site license for another 20 years. And I thank you very much for your time.

148-a-AL/SO contd.

1

03/10/2009 02:27 NO.205 002

RBA

March 9, 2009

Mr. Samuel J. Collins
Regional Administrator
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Collins:

The Rockland Business Association (RBA) represents the concerns of over 1,000 member companies –ranging from major corporations to small business owners. We are proud to stand in strong support of the relicensing of Indian Point.

Indian Point's power flows through our lines, and to our businesses and homes. Indian Point's employees own homes in Rockland County, and when those same employees pay their school taxes, their money flows to Rockland classrooms and goes toward paying teachers' salaries. When Indian Point buys goods and services, Rockland companies fulfill those needs. And when Rockland County's emergency services provide assistance to local residents, it's because investment dollars from Indian Point were given to the county that went beyond just planning and training for the slim possibility of a radiological emergency.

Now, in the face of mounting budget cuts and the threat of economic collapse, we need Indian Point's green, low-cost electric power more than ever. The lower Hudson Valley receives between 18 – 38% of its electricity from Indian Point; a truly large amount of power. This is not an amount that we cannot easily afford to lose or easily replace.

The RBA fully supports both the county's and state's energy efficiency efforts, as well as investing in the development of new sources of green power. However, let's prove we can both save enough electricity through new efficiency programs and build enough additional transmission and power producing infrastructure before we casually dismiss 2,000 megawatts of efficient, clean baseload power right in our backyard. 148-b-AL/SO

Rockland is no stranger to watching energy providers close up shop along the Hudson River. Plant closures, such as the Lovett plant in Stony Point have significantly impacted the budgets of local Rockland communities and school districts. We cannot allow more communities to suffer the same fate.

Finally, Entergy has invested the funds necessary to ensure that the plants are maintained and operated in a safe and secure manner. They have also proven themselves as a worthy corporate citizen, and extended a hand of friendship to Rockland County. Entergy has not shied away from meeting with elected officials, the media, business owners and residents, and have proven itself over and over again a responsible operator.

On behalf of the Rockland County Association, we urge you to implement an expedited timeline for final review of Indian Point's application. When the final review commences, I know that you will agree with me that Indian Point has earned a renewed operating license.

Sincerely yours,

Al Samuels
Al Samuels
President/CEO
Rockland Business Association

One Blue Hill Plaza / P.O. Box 1567
Pearl River, NY 10965
tel: 845.735.2100 / fax: 845.735.2482
www.rocklandbusiness.org

ROCKLAND/BUSINESS/ASSOCIATION/INC

TESTIMONY OF AL SAMUELS

PRESIDENT, ROCKLAND BUSINESS ASSOCIATION

MY NAME IS AL SAMUELS. I AM PRESIDENT AND CEO OF THE ROCKLAND BUSINESS ASSOCIATION. THE RBA REPRESENTS OVER 1,000 MEMBER COMPANIES –RANGING FROM MAJOR CORPORATIONS TO SMALL BUSINESS OWNERS.

THIS REFLECTS A DIVERSE MEMBERSHIP BASE AND A WIDE SPECTRUM OF INDIVIDUALS FOR WHOM WE SPEAK WHEN EXPRESSING CONCERNS ABOUT CRITICAL ISSUES FACING THIS REGION SUCH AS REBUILDING AND EXPANDING INFRASTRUCTURE, AFFORDABLE HEALTHCARE, AND THE RELIABILITY AND AVAILABILITY OF ELECTRICITY – WHICH IS WHY I COME BEFORE YOU TODAY.

HISTORICALLY, ROCKLAND'S RESIDENTS HAVE RARELY VIEWED INDIAN POINT AS BEING BENEFICIAL TO THE COUNTY. WHILE THEY HAVE PARTICIPATED IN THE EMERGENCY PLANNING PROCESS AS PART OF ROCKLAND'S OFFICIAL RESPONSIBILITIES TO THE E-PLAN, WITHOUT EITHER APPARENT TAX OR POWER BENEFITS FROM THE SITE, SOME RESIDENTS AND ELECTED OFFICIALS TOOK THE VIEWPOINT THERE WAS NO VIABLE CONNECTION BETWEEN THE SITE AND THE COUNTY. 148-c-AL/SO

1

IF RECENT EVENTS HAVE TAUGHT US ANYTHING, IT'S THAT SEEMINGLY DISCONNECTED PIECES OF OUR ECONOMY – WHETHER HERE OR THOUSANDS-OF-MILES AWAY – ARE DELICATELY INTERCONNECTED, AND WHEN THOSE PIECES BREAK, WE ALL SUFFER THE CONSEQUENCES AND EQUALLY FEEL THEIR FINANCIAL IMPACT.

THE TIME FOR ROCKLAND'S AGNOSTIC FEELINGS TOWARD THE FUTURE OF INDIAN POINT IS OVER.

INDIAN POINT'S POWER NOW FLOWS THROUGH OUR LINES AND TO OUR BUSINESSES AND HOMES. INDIAN POINT EMPLOYEES LIVE IN ROCKLAND COUNTY. WHEN THEY SPEND THEIR HARD-EARNED MONEY, THOSE DOLLARS FLOW THROUGH ROCKLAND SHOPS, GAS STATIONS, AND RESTAURANTS. WHEN THOSE SAME EMPLOYEES PAY THEIR SCHOOL TAXES, THEIR MONEY FLOWS TO ROCKLAND CLASSROOMS AND GOES TOWARD PAYING OUR TEACHERS' SALARIES.

WHEN INDIAN POINT BUYS GOODS AND SERVICES, IT'S ROCKLAND COMPANIES FULFILLING THOSE NEEDS ALONGSIDE BUSINESS OWNERS FROM THROUGHOUT THE REGION. WHEN ROCKLAND COUNTY'S EMERGENCY SERVICES ARE PROVIDING ASSISTANCE TO LOCAL RESIDENTS, IT'S BECAUSE INVESTMENT DOLLARS FROM INDIAN POINT

148-c-AL/SO contd.

WERE GIVEN TO THE COUNTY THAT WENT BEYOND JUST PLANNING AND TRAINING FOR THE SLIM POSSIBILITY OF A RADIOLOGICAL EMERGENCY.

SINCE PURCHASING INDIAN POINT, ENTERGY HAS PROVEN TO BE A WORTHY CORPORATE CITIZEN. ENTERGY HAS EXTENDED IT'S REACH BEYOND THE WALLS OF INDIAN POINT, AND HAS COME ACROSS THE HUDSON TO EXTEND A HAND OF FRIENDSHIP TO ROCKLAND. THE COMPANY HAS NOT SHIED AWAY FROM MEETING WITH ELECTED OFFICIALS, THE MEDIA, BUSINESS OWNERS OR RESIDENTS.

WHEN ROCKLAND OFFICIALS RECENTLY RAISED CONCERNS ABOUT THE COVERAGE AREA FOR THE NEW SIREN SYSTEM, ENTERGY LISTENED AND DID RIGHT BY THE COUNTY AND ITS RESIDENTS.

148-c-AL/SO contd.

NOW, IN THE FACE OF MOUNTING BUDGET CUTS AND THE THREAT OF ECONOMIC COLLAPSE, WE NEED INDIAN POINT'S GREEN, LOW-COST ELECTRIC POWER MORE THAN EVER. THE LOWER HUDSON VALLEY RECEIVES 18 – 38% OF ITS ELECTRICITY FROM INDIAN POINT -- A LARGE AMOUNT OF POWER, AND BY ANY REASONABLE MEASURE, AN AMOUNT WE CANNOT EASILY AFFORD TO LOSE OR EASILY REPLACE.

BUSINESS OWNERS CANNOT RELY ON EMPTY OR FANCIFUL PROMISES OF "ALTERNATIVE SOURCES OF ENERGY." WE HAVE BUSINESSES TO RUN,

EMPLOYEES TO PAY, TAX PAYMENTS TO SUBMIT TODAY AND EVERY DAY. WE MUST HAVE RELIABLE AND AFFORDABLE ELECTRICITY THAT RUNS AROUND THE CLOCK IN PARALLEL TO THE DEMANDS OF OUR BUSINESSES. WE NEED THIS IN ORDER TO REMAIN COMPETITIVE.

THE ROCKLAND BUSINESS ASSOCIATION FULLY SUPPORTS BOTH THE COUNTY'S AND THE STATE'S ENERGY EFFICIENCY EFFORTS, AS WELL AS INVESTING IN THE DEVELOPMENT OF NEW SOURCES OF GREEN POWER, BUT LET'S PROVE WE CAN BOTH SAVE ENOUGH ELECTRICITY THROUGH NEW EFFICIENCY PROGRAMS AND BUILD ENOUGH ADDITIONAL TRANSMISSION AND POWER PRODUCING INFRASTRUCTURE BEFORE WE CASUALLY DISMISS 2,000 MEGAWATTS OF EFFICIENCT, BASELOAD POWER RIGHT HERE IN THE HUDSON VALLEY.

ROCKLAND IS NO STRANGER TO SEEING ENERGY PROVIDERS CLOSE UP SHOP. PLANT CLOSURES, SUCH AS THE LOVETT PLANT IN STONY POINT, HAVE SIGNIFICANTLY IMPACTED THE BUDGETS OF OUR NORTH ROCKLAND COMMUNITIES AND SCHOOL DISTRICT. WE CANNOT ALLOW MORE COMMUNITIES TO SUFFER THE SAME EXPERIENCE.

ENTERGY HAS CONSISTENTLY PROVEN ITSELF A RESPONSIBLE OPERATOR. THEY RUN THE INDIAN POINT ENERGY CENTER WELL BY

148-c-AL/SO contd.

1

INVESTING THE FUNDS NECESSARY TO ENSURE THE PLANTS ARE SAFE AND SECURE.

FOR OPPONENTS TO MALIGN ENTERGY'S REPUTATION SIMPLY BECAUSE IT RUNS A FOR-PROFIT BUSINESS IS A BASELESS ARGUMENT, AND GOES AGAINST EVERY PRINCIPAL OF GOOD REASON AND JUDGEMENT. I APPLAUD ENTERGY FOR SURVIVING AND THRIVING IN THIS MISERABLE ECONOMIC CLIMATE. THEY ARE REAPING THE BENEFITS OF THEIR INVESTMENT, AND WE, AS CUSTOMERS, TAXPAYERS AND BUSINESSES ARE CONTINUALLY BENEFITTING FROM THEIR SUCCESS.

THAT IS WHY I AM HERE TODAY TO SUPPORT THE CONTINUED OPERATION OF THE INDIAN POINT ENERGY CENTER AND URGE THE NUCLEAR REGULATORY COMMISSION TO EXTEND THE SITE LICENSE FOR ANOTHER 20 YEARS. THANK YOU.

148-c-AL/SO contd.

1

Drew Stuyvenberg
Project Manager
U.S. Nuclear Regulatory Commission

Regarding Supplement 38

While attending Ramapo College of New Jersey I am currently enrolled in an Environmental Assessment class. Our class has had an opportunity to review Entergy's DSEIS Supplement 38 for the license renewal for Indian Point. This has been a worthwhile experience as I have learned a great deal about Indian Point power plant, and the extensive process that must take place for process renewal. Most importantly I have been educated in the area of understanding impact statements and what should be included.

Unfortunately I have discovered a number of pertinent issues that have not been addressed or discussed in full. In the GEIS under NUREG-1437 Supplement 38 2-50 it states, "The angled screen system did not significantly reduce impingement mortality" … Con Edison and the New York Power authority elected to install Ristroph screen system. "No further studies were conducted after the installation of the modified Ristroph system at IP2 and IP3 to determine actual mortality of key species, and no additional impingement monitoring was conducted." So the screens were replaced to reduce impingement, but when they were replaced no study was conducted to see if it is a change for better or for worse. Impingement rates were obviously a large enough issue initially to change the screens so it is extremely important to follow up after replacing them. Thus, a study must be conducted to see the impacts of impingement on the Ristroph screens.

149-a-AE

The second issue I feel needs to be addressed concerns the subsistence fishermen. This is an environmental justice issue that cannot be ignored. It was stated in the DEIS on page 2-109 that, "Contaminated ground water is moving into the Hudson River…Public exposure can occur from the ground water entering the Hudson River through consumption of fish". Continuing on page 2-108 the DEIS states, "The principal exposure pathway to humans is from the assumed consumption of aquatic foods taken from the Hudson River in the vicinity of Indian Point that has the potential to be affected by radiological effluent releases." Are there signs warning the public of where these releases are located, and which spots should not be fished? How might radioactivity released from Indian Point affect the fishery and the safety of fish consumption?

149-b-EJ/HH

Also it is stated in the Draft NUREG-1437, Supplement 38 2-104 that Strontium-90 were potentially plant-related radionuclide detected in some environmental samples. Strontium-90 is being released, but the direct health effects of the releases are not specified. Since it is being released and a potential health hazard all the impacts should be stated. The EPA recognizes the source of Strontium-90 coming from a by-product of the fission of uranium and plutonium in nuclear reactors. Strontium 90 can be absorbed into the body through inhalation, and ingesting along with food and water. When it is ingested 70-80% passes through the body, the remaining 20-30% is deposited in the bones, and 1% is distributed among the blood. Strontium-90 is similar to calcium, which is why it is known as the 'bone seeker' and deposited in bone. Internal exposure is linked to bone cancer, cancer of the soft tissue near the bone, and leukemia. New information should be

149-c-HH/LE

taken into consideration and studied further, for example The Mothers Milk Project. Some members of the public have become concerned with the affects of Strontium-90 and the effect on lactating mothers of humans and animals. The DSEIS stated in Supplement 38 on page 2-106 from a report done by the New York State Department of Health Monitoring (NYSDOH) in 1993, "No milk sample was collected, as the remaining nearby dairy farm had closed." In 1994 the (NYSDOH) again reported, "No milk samples were collected in 1994, as the last dairy farm closed in 1992." Now it has come to the public's attention that human breast milk, along with other lactating animals may have been exposed to Strontium-90. Particularly given the Mothers Milk Study, it is clear that it is both possible to get milk samples for testing and that the results are such tests are required for the final SEIS. In the DSEIS on page 2-105 states that the low levels f Strontium-90 found are due to atmospheric testing. A study is required to confirm this assumption and to assure that biomagnification does not lead to unexpected concentrations. Such a study will serve as the basis for establishing public trust and peace of mind if done well and contamination is undetected.

149-c-HH/LE contd.

The FGEIS should also attend to the issues of spent fuel rod storage and the viability of evacuation plans. Not having a concrete place to store spent fuel rods or having a viable evacuation plan is completely irresponsible. These are major issues that need an immense amount of attention that are receiving much too little.

Given the higher vulnerability of women and children, the DGEIS errors in using the 30-year-old white male as the basis of effects modeling. Risk analysis should be based upon impacts to those with greatest vulnerability not the least. This seems to be a way to hide the fact that women and children have a much higher risk to exposure, and gives people a false reassurance.

149-d-EP/HH/RI

It is stated in 2-85 Supplement 38 three federally listed species, may or may not be on location. The potential presence of federally listed species must be studied and confirmed or disconfirmed in the FGEIS.

149-e-TS

Thank you for your time,
Julianne Scarola

References

EPA. http://www.epa.gov/rpdweb00/radionuclides/strontium.html. Date accessed 3-4-09

http://www.mothersmilkproject.org/

MR. SEGER: Good evening. My name is Bob Seger. I'm the business manager of Millwright Local-740. For those of you who don't know what a millwright does, we pretty much do the turbines and the generators inside, not only Indian Point but every other powerhouse in the area. I'd like to thank the NRC for the opportunity to speak. I have worked in those plants since 1972, and I can tell you from first-hand knowledge that out of the three owners that I've worked for in those plants, Entergy is by far the best one yet. They've invested millions of dollars in the plant for safety and I can tell you that based on work that I've had to do in there and that my members have to do. I can't tell you how frustrating it is to know the job that you want to do and have somebody come along and stop you because they tell you that you’re not doing it safe enough. Entergy's been that way since they took over the plants. From an economical standpoint, I can just tell you that a lot of the people that I think will get up here tonight and have gotten up here prior to this, are probably not people that have or are going to be directly impacted by the plant closing. When some of the gas stations and the delicatessen's start closing because there's no money around here, those are the people that are going to be affected, not the people that live in another area. Over the last 10-years I've had the opportunity to meet with some of the management of Indian Point. And all I keep getting

150-a-SA/SE

150-b-SA/SO

told is safety, safety, safety. I guess there’s things I really can't mention that they've told me as far as the things that have been done for safety and security because from what I'm told, they won't let me back in the plant if I do. But, I just can't stress the difference that Entergy has made in these plants. I had to write some things down, which I don't think I've ever done before. 150-b-SA/SO contd.

Entergy is probably under more scrutiny than any nuclear facility that I've ever worked in. I've worked in For Creek, I've worked in Three-Mile Island. Very rarely do you hear anything about either. I think out of all the scrutiny that they've gone through, they have always come out with excellent ratings as to the improvements that they make and the response time to the problems that they've had. I would only suggest to some of people here that if you had trouble with a car or if you had trouble with your house, you wouldn't throw the car in the junkyard or burn it down to the ground. You'd fix it. I believe that that's what Entergy's intentions are and have been and I believe that they'll continue to do it. I’d just like to say on behalf of my members and the rest of the tradesmen that are in this room, thanks for the opportunity to speak. I'll get it out away now. Yes, I'm interested in the jobs that they provide for all of my members and the rest of the organized labor as well as their own employees. But I've said 150-c-SA/SE it here before, I would not send anybody from my Local into a place that I did not believe safe. I have no problems sending all of them into that facility. Thank you. 150-c-SA/SE contd.

1

Millwright and Machinery Erectors
Local Union No. 740

U.B. of C. and J. of A. — A.F. of L. - C.I.O.
89-07 ATLANTIC AVENUE
WOODHAVEN, NEW YORK 11421
718-849-3636 • FAX 718-849-0070

BOB SEEGER
BUSINESS MANAGER

MILLWRIGHT & MACHINERY ERECTORS LOCAL UNION 740 U.B. of C. & J. of A. – A.F. of L.

MEETS 1st THURSDAY NIGHTS
FRANK IPPOLITI
RECORDING SECRETARY

March 11, 2009

12/31/08
73FR80440
28

RECEIVED
2009 JUN -3 PM 2: 46
RULES AND DIRECTIVES BRANCH USNRC

Mr. Samuel J. Collins
Regional Administrator
U.S. Nuclear Regulatory Commission, Region 1
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Collins:

I am writing to you today in support of Indian Point's relicensing.

At a time of great alarm over the real impact of skyrocketing energy costs, Entergy has consistently managed and invested in Indian Point for the long term. This includes making sizable capital expenditures to improve the quality and efficiency of this important facility. 150-d-EC/SR

Indian Point has consistently been one of, if not the most, scrutinized nuclear facility in the nation and continues to earn high grades for safety and security. It has also earned the respect of its community for its commitment to our growth and prosperity.

Indian Point's commitment to organized, highly skilled labor and to its employees has been well documented over the years with the salaries for employees on par or better in comparison with many other comparable positions within the Hudson Valley. 150-e-AQ/OP/SO

Indian Point's benefits to the environment are also well documented, with emissions free energy generation as a key reason why New York has some of the lowest per capita carbon emissions in the nation.

Indian Point has worked with the community to make it a better place to live, work and raise a family. It is critical to our energy future and an important economic engine for New York. 150-f-SO/SR

I urge you to expedite the final timeline for application review and to support the relicensing of Indian Point.

Sincerely yours,

Bob Seeger

Bob Seeger
Business Manager
Millwright Local 740

MS. SEEMAN: Hello, my name is Laurie Seeman. Thank you for this opportunity to speak. I am a resident that lives within 10 miles of the Indian Point Power Plant. I am also a mother of two children. I am an environmental educator that works with children, outdoor education and I teach them about sustainability. I ask you that you do not re-license Indian Point Power Plant. I asked that and the same time I ask that you do that, I'm doing something on my end. I'm teaching children about conservation of energy. When I talk to the children about the power plant, there's absolutely no way I can explain to them why that power plant exists in this Hudson Valley region. There’s absolutely not one explanation that makes sense to the heart of a child. 151-a-OR

I also would like address you and tell you that three years after the Three-Mile Island nuclear incident I was there in that vicinity for 11 days making a short independent film. We were in the farmland within view of the towers and when people saw us filming, the residents pulled over and spoke with us. I could not believe the stories that I heard. I was hearing that there is sickness as a result of that power plant. I was aware that there was a complete devastation of community. Spiritual devastation. Financial devastation. I wish the people here that work in these facilities could hear me speak right now because the people in that town were abandoned by 151-b-OS their government. These people that work in these facilities now do need to know that if there is an incident, the people that are supporting them now will be gone. It's very interesting to know that if that was a mishap at Three-Mile Island those years ago, which was conveniently a term that our media used, then why are those people still 30-plus years later having open mic night once a year for people to stand up and speak about what happened to them at that incident. It's a very significant parallel situation, the people in that town, if they were to hear about the savings that they benefited from would hardly disagree and say they would give up every penny that they have ever made in their lifetime to go back to the day before that that incident occurred. 151-b-OS contd.

I have been to many town hearings about Indian Point. It is my one passionate issue that I have stayed with since the 1980s. I've heard Entergy speak before our Rockland County legislature and explain the benefit of the savings that we enjoy from this power plant. I can't believe that we are gambling on this type of a concept of safety. We are talking about numbers that nobody can agree upon. As a matter of fact, we can't agree on the numbers because so many of them are not factual. I have been to these hearings. I heard very informed people speak about how reports are made on the wrong dates, so that incidents are not pulled in under a certain timeframe which would make 151-c-SA them red-flagged. So many of these things that we're gambling our future on are based on non-truths. I've been following it along and I'm old enough now to see the longer picture and it's very frightening. 151-c-SA contd.

I would like to address the comment that the doctor made from the hospital. I also heard Dr. Eric Larson speak before our Rockland County Legislature. He has been for twenty-some years head of the emergency department at Westchester Medical. Dr. Larson was also trained in triage for Indian Point Power Plant. He has had an incident there. It's one of the most striking stories I've heard in all of the testimony. They had one member calm there who had his leg caught in a doorway and his protection suit was gashed. Nuclear contamination got into his wound. He was brought to Westchester Medical. OK, now I'm talking one person. They had to close down the emergency room, triage all of the 40 other people to other locations. Their entire medical staff that was available, I think he said 30 people were brought to work on this one person. Eric, Dr. Larson kept saying this was one person. The only treatment they had was to flush him down with water. And where did that water go? It went into the drain and it's a fact. That is a fact. If you want to base your decisions on facts, I would really hardly like you to focus on that particular fact because that one really speaks to my heart and tells me what's true. Thank 151-d-EP you for this opportunity to speak. 151-d-EP contd.

Oh, one more thing. I'm so sorry. I have this newspaper that I have had in my office since 2006. The headline is RADIOACTIVE WATER MAY BE FOLLOWING CRACKS TO THE HUDSON. I went to the hearing on this. This nuclear power plant is based on water technology. If there's one thing I know as an environmentalist, water is the most ungovernable of all of the elements. This nuclear power plant is not safe simply for the fact that it's run on water. When I heard your panel of people address this issue, you had two different hydrologists that spoke that night, they were in such contrary opinion about what water does and where this was going and who’s safe and who's not safe. One of them said those of us on the other side of the river don't have to worry about it. It's out of control. I really hope that this power plant will be closed down and we can begin a future of conservation and living in a very healthy way where we all can get together and have a future. Thank you. 151-e-OR

MS. SHAPIRO: Yes, hi. I represent the Sierra Club and before I get into my comments on the draft EIS, which I believe this meeting was for, I want to congratulate Entergy on there really great PR campaign for giving lots of money to not-for-profits that came here today to call for their support, which is not what this meeting was really about and I think there was a lot of misinformation that was told to these groups and I think that’s a sad comment on Entergy though. I hope the NRC understands that, you know, if you use money to pay for people to come and support you that doesn't mean that is a public safety evaluation. I also wanted to say I'm sorry these people left from the City, but the reality is no one who is calling for the closure of Indian Point for safety reasons believes that we should be putting coal- fired plants that would increase asthma in their communities or any community. That's never been a replacement factor. Going to the GEIS, which I believe is an incomplete and inadequate document because, there are a few reasons, which I'll go through.

The first one is that it doesn't consider the long-term impacts of this new superseding license that Entergy is planning to grant with regard to seismology evacuation possibility and the increased population density in this area. Because it is a new license as acknowledged by Entergy, these factors must be considered. The EIS and the re-licensing

152-a-GE/PA

document does not consider those and therefore it’s fully inadequate and incomplete. This environmental report also does not include the fact that Entergy nor the NRC actually knows the current licensing basis of the plant at the moment. They don't actually have that knowledge because over of the time, the last 40 years the plant has been operating, they’ve been granting exemption on top of exemption on top of exemption on top of exemption on safety standards at the plant. So, it's running not at design basis. Those issues will be carried over into the new superseding license period. That must be included in the EIS because those are large impacts when you have a degraded system.

152-a-GE/PA contd.

152-b-AM/SA

For example, currently, the fire safety standards at Indian Point are highly degraded. They exempted, NRC granted an exemption from a one-hour fire rating because the rack that was used was inadequate and they allow them now to operate with a 24-minute fire rating. Which means, if there's a fire in this crucial part of the planet that's needed for safe shutdown, you have to detect and put out the fire within 24-minutes or there'll be a melt down. That's what we in this area and all of the New York City people are living under that danger. The other things that have been recently exempted in the last year are that the spent-fuel pool, which we know is leaking, which has been acknowledged to be leaking, they cannot inspect 60% of

152-c-LE/OP

it. They could inspect it, but the cost to Entergy, the cost analysis to Entergy is too much. So the NRC has granted an exemption. That makes this report highly incomplete and inaccurate. Without a full inspection of the spent-fuel pool that is known to be leaking, this report is not complete.

Further, they called it a relaxation of the standards, to inspect a design basis required inspection, which is the rust in the dome. They know there's rust in the dome. Five years ago they got an extension for this inspection. Now, they decided this year it's too difficult, it's too expensive, to actually inspect this. So, they've given them a permanent, permanent, which means they will never inspect this part of the plant, which is known to have rust in the dome. Which is truly an aging management problem. They've granted that as an exemption. These have great, large environmental impacts which are not included in this. Additionally, 60% of the underground piping at Indian Point and the cables are not being inspected. Further, the last two things I'd to mention is that recently at Indian Point a small camera, a digital camera, actually shut down the plant because when Indian Point was built there were no RF signals. Therefore, in the aging management of Indian Point, it is required, it’s new information, that they must include how they're going to deal with new technologies. Like cell phones and cameras and various RF signals that are going

152-d-AM/OP

to be used by outside contractors and visitors to the plant. 152-d-AM/OP contd.

Finally, the overall problem with this report is that it is done on a cost-benefit analysis basis, which is a violation of NEPA. They actually evaluate how much the cost to the benefit to the public, to the safety of the public. That's not the way you do an environmental impact statement. So, this reliance on the cost to the industry versus the safety to the public makes this report incomplete and inadequate. So, basically, I would request that -- there'll be one more pass at this report? I don't think you're ready to do the final pass. I think you need another step. I think there's got to be another draft because you're far from there. Thank you. 152-e-NE

MR. SHAW: My name is Gary Shaw. I live about 5 1/2 miles from the plant. I've lived in this area for 16 years. My understanding of the charge of the NRC Relicensing Board is too ensure that the operators of these nuclear plants have a sufficient set of safety and maintenance systems in place to prevent environmental contamination from radioactive materials for the next 25 years. 20 years beyond the expiration of the current licenses. As we all know, Indian Point is the first nuclear plant in the country known to have leached Strontium-90 into groundwater and one of several known to be leaking Tritium. Just today, a study of lactating mothers showed that the closer to Indian Point the nursing mother resides, the higher the Strontium-90 levels in their milk. On the face of this, these results are consistent with the Radiation and Public Health Projects Tooth Fairy Project, which found Strontium-90 in the baby teeth of children residing in proximity to nuclear plants that showed higher levels when residing in closer proximity. I would hope that these findings factor into NRC deliberations. 153-a-LE

The issue here is whether the primary responsibility of the NRC is to safeguard the public health to the best of its ability or if their job is to try and figure out how much public contamination is allowable, so a for-profit publicly traded multibillion-dollar company can maximize profits. I will remind this panel that the NRC's office of Inspector General has 153-b-LE previously criticized the agency for giving undue consideration to operator profits that resulted in the near breach of containment at the Davis Bessie Plant in Ohio in 2002. From newspaper reports, we know that the severe corrosion of the Davis Bessie reactor head was discovered when a worker leaned on a control rod and it was lose. The corrosion was not discovered by design, just by luck. We also know that the entire issue of radioactive leaks at Indian Point came to light not because of any effort of the NRC inspectors or plant management oversight. The leaks were discovered during excavation in preparation for moving the overflowing nuclear waste from the spent-fuel pools so they could be placed in casks and stacked like nuclear bowling pins on a concrete slab near the banks of the Hudson River. 153-b-LE contd.

The NRC has seemed very willing to waive regulations when the operators have asked for it. A noteworthy recent example is the waiver of the one-hour fire protection requirements for HEMC insulation. Lowering the requirement to 24 minutes. To me, there is a real credibility issue about your responsibilities and your standards. Toward that end, I would like to bring up an issue I have raised at a range of NRC meetings. 153-c-OM

Indian Point has extensive underground piping that is more than three decades old. With the pipes sheathing tables circulating billions of gallons of Hudson River salt water 153-d-AM/LE/OM daily. We have had a tritiated steam leak from pipes that were supposed to be carry only non-radioactive water. I have asked the NRC multiple times to make public how the operators will judge the viability of buried piping now and for the life of the new license being considered. The important issue is to prevent leaks, not to find ways to fix leaks once they have happened. For credibility sake, this panel should make public the specific metrics being used to evaluate the effectiveness of monitoring. Specifically, I would like to know the number of linear feet there are of buried pipes with no aboveground visual access. I would like to know by what methods and what percentage of underground piping would be accessible and inspected on an ongoing basis. I would also like to know to what degree welds will be tested for integrity. If your standards are valid, they should be offered for public and peer review.

153-d-AM/LE/OM contd.

I will finish by reminding the panel that Indian Point could not get siting approval today because of population density around the plant. What you are considering is a new license, not a an extension. I will also remind everyone that in 1979, Robert Ryan, the former NRC director of the Office of State Programs labeled Indian Point one of the most inappropriate locations in existence for a nuclear plant. 30 years of population growth and aging infrastructure has not made this location any more suitable.

153-e-AM/DE

MS. SHEPARD: I'm with Westchester Citizens Awareness Network. I've been involved in some of the health studies that have been conducted in our area to measure radionuclides in baby teeth and also in milk. There are studies going on all over the world that show a correlation between occurrences of various cancers and proximity to nuclear plants. The human health studies that have been conducted in our area have been scorned and marginalize and deemed invalid by the NRC and Entergy because the samples are small. Because that's what happens when there's not enough money to collect larger samples because when grassroots organizations do testing. They don't have the money to collect samples on a widespread basis the way the government does. The way the government has in the past. The way the government collected baby teeth in the 60s and the early 70s. However, you heard today that mother’s milk and goat’s milk has been tested and with a very small sample, preliminary results are showing the presence of Strontium-90 in many of the samples. The really significant thing is, two of the samples contained detectable levels of Strontium-89, which means since Strontium-89 has a short half-life that this is not attributable to background radiation from aboveground testing from the 60s. It's not attributable to anything left over from Chernobyl. 154-a-HH/LE/MP

It's recent and it cannot be discounted.

I obviously do not share the love of nuclear power that the NRC and Entergy feel. The NRC and Entergy have an unconditional love for nuclear power. I don't have that. But if they do not agree with the laboratory measurements that have been taken by our grassroots studies that show the presence of man-made nuclides, radionuclides in the teeth and milk of area residents. And I'm talking about the wives and mothers of the children of the man who spoke tonight. The wives and the mothers of the children of the men who spoke tonight, who talked about their wives, their healthy children, living right here within this proximity probably had or currently have or will have man-made radionuclieds in their breast no. It's not nice to think about, but it's something we need to know about. If the NRC and Entergy don't like the results of the studies and have poured a lot of money into their PR machine to generate literature that refutes the studies that have been done by our hungry for money volunteer people, who are doing these studies, then please throw some money towards some studies and let's make it mandatory that human milk testing is part of any kind of environmental impact statement having to do with a nuclear plant. This is something that the government used to do support in the past and needs to be supported now. So, this is not going to go away. Any kind of man-made radionuclides that are

154-a-HH/LE/MP contd.

in teeth and milk are going to stay there until those regular and routine emissions are no longer going into the air in our area. Please, every single person here in this room who's concerned about air quality and asthma and your children's health, when you go home, look around your house and see how much energy you're wasting. Unplug your phantom electricity. Pull out your transformers. Look and see what is using up energy in your house that doesn't need to be. Turn off your computers at night and be aware and be mindful because it's everybody's responsibility to conserve energy. Thank you.

154-b-AL

MS. SHERMAN: Good afternoon. My name is Andrea Sherman and I'm a resident of the city of White Plains, Westchester County, New York. Since moving to the county in 2001, I have kept a watchful eye on news stories of the Indian Point nuclear power plant and I'm here today to lend my comments as a citizen to the discussion of its re-licensing. To be brief, the issue at hand seems to be one of risks, benefits and alternatives. Undeniably, Indian Point brings benefits of the region. It provides a source of energy to fuel our consumption, which is a precious commodity, as we know. It also brings economic benefits to its parent company Entergy. To the employees who depend on it for their livelihood and to the surrounding local towns and other communities who enjoy lower taxes and other economic benefits from having the plant in their midst. These benefits are all positive and no one is disputing that. 155-a-EC/SO

However, when one looks at the risk column, suddenly these economic benefits begin to pale in comparison to the overwhelming risks to health and safety imposed on an entire region of millions by the close proximity of such a potentially toxic entity as the Indian Point nuclear plant. Whether through unfortunate technical accident, all too common human error, unforeseeable natural disaster, terrifying attack or the aftermath of the parent company's decision someday to divest 155-b-PA itself of this asset, the devastation to both life and habitat in our region would be catastrophic and largely irreversible, certainly for this generation and possibly for generations to come. 155-b-PA contd.

Since the long-term risks to health and safety outweigh the shorter-term and mutable economic considerations, I urge, no, I plead with Entergy and our government officials to seek similar economic benefits by means of reasonable alternatives to the operation of a hazardous nuclear power plant in New York. Speaking as a citizen, my vote will follow those who recognize and act on this imperative. 155-c-AL/SA To address the concerns raised by so many of today's speakers, there are other ways to keep energy affordable and to improve air quality without exposing our region to the dangers of nuclear production. It would be morally bankrupt for our government to permit primarily economic interests to co-opt those of public health, safety and environmental integrity. Safer alternatives can be sought if there is the public and political will to do so. Thank you for allowing me to speak today. 155-d-OR

MR. SKANES: Good afternoon. I'm not going to sing to you although I did notice the grannies got about seven or eight minutes. I guess that's the trick, if you sing, you get a longer time. I'm Brian Skanes and like John Yanofsky, I wear a number of hats. Number one, I'm a 10 year resident of Mount Kisco. I'm the executive director to the Boys and Girls Club of Northern Westchester. I'm also a member of the local Rotary Club, the Business Council, the Westchester Community Association, member of the President's Council of Northern Westchester Hospital Center, but more importantly, I'm a really concerned citizen.

I have to say, I'm very encouraged about what I've heard today on the positive side. I think it's been mentioned many times and all the reasons why I too believe that we have re-license Indian Point. Especially because of, in my role as executive director of the Boys and Girls Club's, 3500 kids who come from better than the best circumstances, they really need the corporate partner that Entergy really offers our organization. It's been mentioned before, not only the Boys and Girls Club, but non-profit after non-profit after non-profit benefit from the employees who help us on our boards and come to our events. The financial support we get, and by the way, in 35 years of working in Boys and Girls Club's and 156-a-SE/SR working with all kinds of corporations, I can say without hesitation, that Entergy is the best corporation working with non-profits that I have ever seen. The non-profit summit they run every year. The opportunity to go to Yankee Stadium and be part of some marketing and public relations training and also the opportunity to receive some pro bono advertising. All these things add into a lot of good things for kids in this community and that's why I stand for and support re-licensing Indian Point. Again. Thank you.

156-a-SE/SR contd.

MR. SLEVIN: Good afternoon. My name is Jimmy Slevin. I'm a senior business agent for the Utility Workers Local 1-2. Thank you for letting me appear before you today. Local 1-2 of the UWA, which the union represents most of the workers at Indian Point, is therefore on the frontline of the debate before you today.

We are in the best position to contribute the information on the subject of most relevance to the commission. Indian Point is safe. If we had any reason to believe not, we would not let our members work there. Our members cannot only attest to the fact that the commitment to safety operations, but are an intricate part of the team that makes the facility safe. The unparalleled record of plant safety is something we are proud of. 157-a-OP

As residents of this area and as involved citizens, we are very much concerned with the physical and economic health of the community. Indian Point produces 2000 Mw of electricity, and that represents about 20 to 40% of the needs of this region. Cutting off this substantial and vital supply of power would be a body-blow to the economic health and personal well-being of every citizen. This amount of energy could not be replaced. New construction of fossil power is not feasible in the views of the prevailing environmental concerns and other time-consuming 157-b-AL/EC/SO obstacles in their construction. Green energy sources have not reached the levels of viability that allows us to rely on them in immediate or foreseeable future. 157-b-AL/EC/SO contd. Nuclear power is here and it is environmentally clean. Unlike fossil power, it does not contribute to the greenhouse effects or global warming. It does not release harmful carbon emissions into the atmosphere as fossil plants do. What it does is provide us with an inexpensive and safe electrical power. We were told in the recent past that with one of these onsets of deregulation and the unleashing of market forces in the power generation industry, there would be a glut of low-cost energy capacity for all classes of consumers. Deregulation has passed, but the promise results never followed. 157-c-AL/EC

How could anyone with the best interest of the community in mind, now demand the elimination of 2000 Mw of vital need power without the remote practical expectation that it will be replaced in our lifetime. Even if it could be, the cost would be unimaginable. We refuse to play either the blame game or engage in scare tactics, but let's be realistic, Indian Point has been a mass of this community and region. Those who would not merely tamper with its function should think long and hard about what it would do to them because it would be extremely unwisely counterproductive and blatant destruction to deny the re-licensing of Indian Point. 157-d-EC/SR I thank you again for the opportunity to share my views. Indian Point is a good neighbor. Indian Point is good for the environment and Indian Point deserves to be re-licensed. 157-d-EC/SR contd.

1
2

ML090711019

UTILITY WORKERS UNION OF AMERICA
Local 1-2, Affiliated with AFL-CIO
5 West 37th Street, 7th Floor, New York, NY 10018
(212) 575-4400 Fax:(212) 575-3852

HARRY J. FARRELL, PRESIDENT
ANDREW O'CONNELL, VICE PRESIDENT
LUCIA E. PAGANO, SECRETARY-TREASURER

SENIOR BUSINESS AGENTS
JOHN CAPRA
ROBERT FARRELL
JAMES SLEVIN

12/31/08
73FR 80440
(5)

RECEIVED

Mr. Andrew Stuyvenberg
Environmental Project Manager
Division of License Renewal, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop: O-11F1
Washington, DC 20555-0001

Re: Local 1-2's Submission to the Nuclear Regulatory Commission

Local 1-2, UWUA is the Union that represents most of the workers at Indian Point and is therefore on the front lines of the debate before you today. We are in the best position to contribute information on the subjects of most relevance to the Commission.

Indian Pt. is a safe facility. If we had any reason to believe it was not, we would not let our members work there. Our members not only can attest to the facility's commitment to safe operation but are an integral part of the team that makes the facility safe. The unparalleled record of plant safety is something we are proud of. Prudent policymaking and planning must avoid leaping to conclusions or being stampeded into rash decisions on the basis of projected and unprecedented catastrophes. One could project any number of possible worst case scenarios - such as a Level 5 hurricane--that would make any evacuation of certain communities in this State unimaginable. Coming up with constructive proposals to meet challenges such as these is one thing. Taking an axe to the ability of a community and a region to function is not the way to meet that challenge, but that is what denying relicensing to this facility will accomplish, and that is all it will accomplish. 157-e-OP

As residents of the area and as involved citizens, we are very much concerned with the physical and economic health of the community. Indian Point produces 2000 megawatts of electricity. This represents 20% to 40% of the needs of this region. Cutting off this substantial and vital supply of power would be a body blow to the economic health and personal well-being of every single resident. This amount of electricity could not be replaced. New construction of fossil plants is not feasible in view of prevailing environmental concerns and other time-consuming obstacles to their construction, and green energy sources have not reached the level of viability that allows us to rely on them in the immediate or realistically foreseeable future. Nuclear power is here and it is environmentally clean. Unlike fossil plants, it does not contribute to the greenhouse effect or global warming. It does not release harmful carbon emissions into the atmosphere as fossil plants do. What it does is provide us with inexpensive, safe electric power. We were told in the recent past that with the onset of deregulation and the unleashing of market forces in the power generation industry there would be a glut of low-cost electric capacity for all classes of consumers. Deregulation passed, but the promised results never followed. How could anyone 157-f-AL/EC/SO

UTILITY WORKERS UNION OF AMERICA

Local 1-2, Affiliated with AFL-CIO

with the best interests of the community in mind now demand that we eliminate 2000 megawatts of vitally needed power without the remotest practical expectation that it will be replaced in our lifetimes? Even if it could be, the cost would be unimaginable. We refuse to play either the blame game or engage in scare tactics, but let's get realistic. Indian Point has long been a mainstay of this community and region, and those who would not merely tamper with its functioning but would eviscerate it should think long and hard about what they would have you do, because it would be extremely unwise, counterproductive and blatantly destructive to deny relicensure to Indian Point.

157-f-AL/EC/SO contd.

This concludes my statement.

Sincerely,

James T Slevin

James T Slevin

DR. SMITH: Good afternoon. My name is Dr. Gregory Robeson Smith and I am the senior pastor of the Mother AME Mount Zion Church in Harlem. New York State's oldest church. Organized in 1796, we will celebrate our 213th year. Mother Zion, also known as the freedom church throughout its long history. Mother Zion has many of its illustrious members who were leaders in our historic fight for freedom. They included Harriet Tubman, Frederick Douglass, Sternon Tooth [sp], Paul Robeson, Madame C.J. Walker and many others who fought so valiantly to free African-Americans socially, politically and spiritually.

Today, Mother Zion is the Mother Church of the AME Zion denomination, which is located on five continents and has a membership of 1.5 million members. Public forums like this have historically granted citizens a unique opportunity to have their concerns heard by decision-makers and power brokers. From ancient Rome to Birmingham, Alabama, the people who rise to address these forums have helped shape public opinion and policy. One such policy I would like to speak to this afternoon is the re-licensing of Indian Point Energy Center and how it continues operation in the best interests of the children and the families of Harlem, who make up my congregation. Regrettably, the debate over re-licensing has taken place without input from communities like Harlem which are under siege

158-a-EJ/SR

by the dirty air, not to mention the health aspects that come along with poor air quality. The debate over re-licensing has raged on without input from those who can ill afford to pay electricity bills. This debate over re-licensing has taken place without the reassurance that the dirty air power plants built to replace Indian Point will not once again end up in our neighborhoods. It's only through conversations in communities most benefited by Indian Point like Harlem, Bronx, and Brooklyn, we can begin to fully appreciate the need for clean and reliable energy Indian Point provides.

158-a-EJ/SR contd.

Last year we sponsored such a dialogue with my fellow members of the Harlem clergy. It is through this dialogue that we learned the full scope of the crisis situation facing Harlem families if Indian Point is closed. We learned that the closing of Indian Point comes with additional threats to our air quality and drastic increases in electricity bills. There are too many cases of seniors in our neighborhoods and to many families forced to choose between heating their home and buying groceries just to justify closing Indian Point. An open Indian Point means continued clean emissions-free energy that will help improve air quality. An open Indian Point means continued affordable energy that helps keep electricity bills stable. An open Indian Point means continued reliable energy which would provide for our homes, schools, mass transit, hospitals and

158-b-AL/AQ/EC

religious

institutions. I am not only here to support Indian Point Energy Center, but I'm also here today in the spirit of corporation and unity. Thank you for allowing the to add my concerns and that of my congregation to this debate and we're hopeful that any decision reached will be one that ensures continued supply of reliable, clean and affordable electricity for all New Yorkers.

158-b-AL/AQ/EC contd.

MS. SMITH: Good afternoon. I'm Carol Smith and I'm vice-president for the Orange County Chamber of Commerce. Our chamber represents more than 2000 businesses in Orange County and the surrounding areas. It is an indisputable fact that Indian Point generates more than 2000 Mw of electricity, which has been said is enough to provide between 18 and 38% of the lower Hudson Valley's and New York City's electricity needs on any given day. More important though, is that this is clean and affordable power whose generation produces none of the greenhouse gases or other pollutants that contaminate our environment and contribute to global warming. 159-a-EC/GL

Of course, alternative sources of energy such as wind and solar power should be actively pursued, but in the meantime, it would be economically and environmentally irresponsible to close Indian Point. The Orange County Chamber of Commerce believes that Entergy should be granted the renewal of its license to operate Indian Point. Assuming that safety of our residents and security of this facility are always its paramount concerns. Since purchasing Indian Point in 2001, Entergy has invested hundreds of millions of dollars in enhanced security and safety features for the facility. We are sure they will continue to do so. 159-b-AL/SA/SR

The Indian Point Energy Center is vitally important to the economic and environmental health of the entire region. Electricity demands are rapidly increasing and no new power plants are being built or even planned. These are two additional reasons why the re-licensing of Indian Point is so important.

159-c-EC/SR

To answer those who call for Indian Point to be shutdown, a recent national Academy of Science study said that although a shutdown would be technically feasible, it would lead to significantly higher electricity bills and would worsen the volatile price swings within the natural gas market.

159-d-EC

For an environmental point of view, loss of Indian Point’s 2000 Mw of energy would result in higher levels of environmentally harmful greenhouse gas emissions because of the bulk of the replacement power would require burning the dirtier fossil fuels. We know the Nuclear Regulatory Commission will be carefully evaluating Entergy's request for the license renewal of Indian Point and this process will include a comprehensive review and evaluation of the facility. We support this license renewal and we know that Entergy will continue to operate Indian Point with impeccable high standards of quality and excellence. Thank you for the opportunity to speak.

159-e-AL/AQ/SR

IPRenewalCEmails ML090640372

From: dino sorbello [tripwave@earthlink.net]
Sent: Friday, February 27, 2009 6:05 PM
To: IndianPointEIS Resource
Subject: relicensing/NO!

Con Edison has been finding so many ways and places just right here in NYC for business, residences, public spaces etc, to curtail their electricity use that they have saved the amount of electricity equal to several coal-fired or nuclear power plants.

We NO LONGER NEED Indian Point facility. Neither does upstate New York.

In the interests of setting a good example for todays'
children, and the rest of the world, in the interests of PUBLIC SAFETY, we must close and dismantle the facility. Show them we can do it. Show the world we are strong instead of weak.

The time for Indian Point's existence has come and gone. The hazards are far too great to tolerate. It is nearly equal to an act of terrorism just to have it exist, we're NOT going for it. 160-a-AL/OR/SA

Thank You. Dino Sorbello

MS. STARKE: Good evening and thank you to the NRC. My name is Alexis Starke and I am a resident of the Hudson Valley. I am here tonight to represent myself. There is no conflict of interest in my being here tonight. I understand that people have spoken out in favor of Entergy tonight because they are scared for their jobs. I understand and I respect that. But we have a moral obligation here tonight to look at the bigger picture. I grew up in New York state and I care deeply about our environment and our majestic river, the Hudson. 161-a-GI

I am here tonight to ask the NRC not to re-license Indian Point and to begin the process of closing it. Indian Point has carelessly and incompetently damaged our environment and our river for long enough. There is nothing clean or green about Entergy or about Indian Point. I am outraged about the continual leak of radioactive water from Indian Point into our groundwater, i.e. our drinking water. And into the Hudson River, which is also our drinking water. United Water New York Suez is planning on building a Hudson River water desalination filtration plant directly across the river from Indian Point. I am outraged about residual contamination caused by plumes of contaminated groundwater that slowly leach toxic Strontium-90 and Cesium-137 into the river. 161-b-GI/LE/WA I am greatly concerned about the inefficient and shamefully shoddy storage of thousands of tons of highly toxic nuclear waste on the banks of the Hudson 161-c-RW/ST

River. This is unacceptable. Indian Point’s dry casks are vulnerable to terrorist attacks. Again, this is unacceptable. Indian Point is and always has been an environmental disaster for the Hudson Valley. It is a constant source of fear of unspeakable destruction should it be the target of terrorist attacks. Our tax dollars should not be spent in providing military protection for Indian Point, so that Entergy can continue to make huge profits. This is ridiculous. NRC, I trust you will close down Indian Point. It has been a source of fear and shame for our region for long enough. The law has been flagrantly violated by Entergy for long enough. It is time for us to start conserving energy.

161-c-RW/ST contd.

ML 090771338

IPRenewalCEmails

From: Alexis L. Starke 99 [Alexis.L.Starke.99@Alum.Dartmouth.ORG]
Sent: Tuesday, March 17, 2009 5:43 PM
Subject: Indian Point

Alexis L. Starke
153 Hudson Terrace
Piermont, NY 10968
845-359-2327
alexis.starke@alum.dartmouth.org

Dear NRC,

I am writing to you to as a resident of the Hudson Valley to comment on the relicensing of Entergy's Indian Point. I am not a member of an interested union, nor am I financially dependent on Entergy in any way. Thus, there is no conflict of interest in my writing to you. I am writing to you because I am concerned about the health and safety of my community and of our fragile environment.

I understand that many have spoken out in favor of continuing to operate this old and decaying power plant because they are afraid of losing their jobs. I understand that and I respect that. But you are under a moral obligation to look at the bigger picture. 161-d-GI/OR

I ask the NRC NOT to relicense Indian Point and to begin the much-anticipated process of closing it down immediately. Indian Point has damaged our environment and the Hudson River for long enough. There is nothing clean or green about this power plant. Entergy is interested in making as much money as cheaply as possible while the rest of us pay the price in damage to our health and environment. Entergy has launched huge glossy misleading advertisement campaigns to brainwash the public. They blackmail our communities with threats of no power and/or coal-fired powerplants. This is absurd.

Indian Point is guilty of the slaughter of billions of fish, eggs, and larvae as a result of their outdated cooling water intake system which uses billions of gallons of OUR Hudson River water daily. 161-e-AE

Indian Point is responsible for the killing of shortnose and Atlantic sturgeon. Shortnose sturgeon are endangered species.

I am outraged at the continual leak of radioactive water from Indian Point into our ground water (ie our drinking water) and into the Hudson River (which incidentally, United Water New York is planning on treating as our drinking water directly downstream from Indian Point). 161-f-LE/WA

I am outraged about residual contamination caused by plumes of contaminated ground water that slowly leach toxic strontium 90 and cesium 137 into the river.

I am greatly concerned about the inefficient, unsustainable, and shamefully shoddy sorage of thousands of tons of highly toxic nuclear waste on the banks of the Hudson River. This is unacceptable. 161-g-ST/UF

I am highly concerned about the environmental costs of the whole life of a nuclear power plant- from the mining of materials to their ungoing disposal.

Finally, Indian Point is in a most densely populated residential area, a stone's throw from New York City. It is vulnerable to terrorist attacks and poses a threat of unimaginable disaster. 161-h-DE/ST

Indian Point is an environmental disaster for the Hudson Valley. NRC, I trust that you will close it down. It is time for us to start conserving energy. 161-i-AL/OR

Thank you for your time and interest and I trust that you will do the right thing.

Yours sincerely,
Alexis L. Starke

MR. SULLIVAN: Hi, I'm John Sullivan. I live probably about 2 miles from the plant. I have been here before. I've been on the list serve for IPSEC, but I'm really here for my own self. I just want to add my voice to the fact that I believe that the license should not be extended. I think the most egregious error of the report is that it does not look into the future. The reality is we are going to have nuclear waste on this site for the next hundred years and unless that is addressed in the report, it’s incomplete.

162-a-OR/RW

I'd also like to extend the challenge to the folks that do get money from IPSEC, that are supported, that feel that -- I'm sorry, not IPSEC, from Entergy, that feel that Entergy is a good corporate citizen. People in the environmental movement, IPSEC, Riverkeeper, have proposed many things that would make the plants safer. God forbid from my point of view, if in fact the plant is re-licensed, these things should be put into place. A closed-water cooling tower. Hardened onsite storage of nuclear waste and with deterrents for terrorist attacks. Please speak to your corporate sponsor and urge them to do the right thing and not just buy good publicity. Thank you.

162-b-AL/SF/ST

IPRenewalCEmails ML090771345

From: Marie Inserra [minsjsul@yahoo.com]
Sent: Monday, March 16, 2009 8:13 AM
To: IndianPointEIS Resource
Subject: critically inadequate IP environmental report, second transmission with corrections

I am writing to urge that Entergy not be granted a renewal of the license for the Indian Point Nuclear Power Plant,

I am urging this based on the grounds that the environmental report is critically inadequate. 162-c-OR

The report which does a wonderful job of describing the topology and the surrounding flora and fauna of the plant does not at all describe the geology of the underlying rock in the area. There is no mention as as far as I can tell that the plant sits on a major fault line.

In addition no where in the report is there an analysis of the type of rock and its ability to fracture and conduct surface water to ground water. This is vitally important given the fact the Indian Point continues to leak water that contains cesium, strontium and tritium. 162-d-GW/LE/PA

It is ironic that it is not mentioned given that at several NRC sponsored meetings that I have attended Entergy officials have been allowed to portray the underlying rock as if it was a stainless steel bowl with the radioactive water merely running off to be diluted in the Hudson.

Finally it is clear with the court decisions about Yucca Mountain that any sort of solution to the nuclear waste generated by these power plants is decades off. This is especially true since Yucca mountain is already contractually full and it will not be able to take any waste generated by the Indian Point renewal.

What is becoming more apparent is that any waste generated by the renewal of the license will sit on this property for decades if not hundreds of years and will be the problem of the surrounding communities as the infrastructure of the plant further decays. To limit the scope of the report to the renewal period is to overlook the probable and real damage that these plants will do to the surrounding environment. 162-e-AM/RW

For these reasons I find the NRC environmental report critically inadequate and urge the NRC to reject the environmental report until these issues are fully explored. 162-f-OR

John Sullivan,
735 Requa Street,
Peekskill, New York

sent second time with corrections. js.

Diane Swertfager, Varsity Volleyball Coach
Hendrick Hudson High School

Hello. My name is Diane Swertfager, and I am the Varsity Volleyball Coach for the Hendrick Hudson High School Sailors, New York State Volleyball Champions for the third straight year.

I make that statement with great pride in the achievements of my team, but also with an acknowledgement that as a coach you are dependent upon the hard work and dedication of many individuals – your players, assistant coaches and support staff, parents, school leadership, fellow students, sponsors, residents and even the people cutting the field grass. If anyone in the group lacks focus or is not dedicated to winning, you cannot maintain a quality athletic program. It's impossible.

That is why I truly understand the dedication and hard work you need to run a safe, secure and successful operation as massive as Indian Point. You cannot remain on line for so many days in a row, month-after-month, providing so much power without the laser-like focus of all those employees moving in the same direction towards the same goal.

163-a-SE/SO/SR

I have had the pleasure of working with Entergy through their sponsorship of the team, and take great pride in the work they do, as I'm sure they take great pride in knowing they, too, support a winning team.

School systems – Like Hen Hud – want nothing more than the best for their students – academically, physically and emotionally. We want to ensure our students maintain healthy minds and bodies, so we offer programs that challenge them both in the classroom and on the field.

However, accomplishing this feat means one, we have the financial support and tax base for sustaining a quality education and sports programs. And, two, the students are not distracted by disruptive events in the community; events which will move a student's focus away from their studies.

At a minimum, closing Indian Point will significantly impact the Hen Hud School District's ability to maintain a high-quality education experience for all of our students. Further out, we will lose the hard-working families that are the underpinning of this community, and witness the same deterioration other

163-a-SE/SO/SR contd.

neighborhoods have endured when losing a large part of their economic and energy infrastructure.

At a time when school districts are clinging to their tax base, and wondering when the next wave of State educational cuts will hit, we can ill afford the loss of Indian Point.

We should be looking for ways to further ensure their success, so that by extension, we will successfully navigate through this deepening recession.

163-a-SE/SO/SR contd.

On behalf of my team, and all of the people who continue supporting our winning efforts, I want to say in closing that we support keeping Indian Point open for 20 more years, for the good of our schools, and the good of our community.

Thank you.

MS. TAORMINO: Good evening. My name is Michelle Taormino and I'm part of an environmental assessment class at Ramapo College in Mahwah, New Jersey. I'm also a citizen within a 30 mile radius of Indian Point and I would be affected by any major incident that would occur at the power plant. Which when reading the EIS, I found that the EIS does not include certain information. These points I'm going to go over. There's no protocol if there's a meltdown. There's no, how they would deal with a fire if a fire breaks out. There's no security included about the plant, if there's a terrorist attack or if there's a natural disaster, the fault line near the plant is not addressed either. 164-a-PA/ST

After reading the EIS, I was startled at how little information was given and what little weight the evacuation plan at Indian Point carried. Regardless of new updates, the sirens give no regard to the hearing-impaired or to those in the area who don't know what the sirens are, what they mean or know about the plan. The plan is also loosely put together with inadequate evacuation roads to handle the evacuating population. Also, certain people can opt out of the evacuation plan like EMTs and police and there's no substitution for those that will help in the evacuation plan. 164-b-EP In addition, the EIS mentioned that the leaks occurring at the plant have minimal impact on the soil in 164-c-LE/TE the area. However, studies on turtles who live in that soil were found to have Strontium-90. This suggests that more thorough studies about the soil contamination need to be conducted. Also, certain aspects of Indian Point have been not inspected and these areas like plumbing underground have not been included in the EIS regardless of why or why not, it has not been inspected. It has not been listed in the EIS. Issues like the evacuation plan are not considered in the renewal license process nor is the leakage that occurs. Certain studies prove that more analysis needs to be done before any decisions can be made.

164-c-LE/TE contd.

164-d-LR/OM

An EIS was developed to accurately review the plant and determine whether or not re-licensing should be granted. The lack of the information given in the EIS, as well as the NRC allowing the re-licensing without holding the Indian Point power plant to fix its faults prior to re-licensing and not including that they’re doing this in the EIS, makes the EIS, in turn, inadequate. Making a decision to re-license Indian Point should not be considered unless studies are thorough and are followed through with and a solid evacuation plan and incident plan is determined. You can't make a decision about the next 20 years without seriously looking at all the information and accurate information now in the present. It's not a time to overlook or look away from any present issues. You need to make a concise,

164-e-EP

clear and confident decision. More information needs to be looked at and considered. Thank you. 164-e-EP contd.

1
2

3
4

To: NRC representative: Andrew

The NRC, being one of the regulatory organizations, was developed to help make sure that nuclear power plants are obedient towards the nuclear regulations. This being said, the DSEIS, Supplement 38, for Indian Point in Buchanan, NY does not have the information needed to be able to make a confident decision to relicense Indian Point's operating permits for another 20 years. The following is a list of information the DSEIS either did not include or does not weigh as important.

First, evacuation plans are an ongoing development and thus are not considered in the permit renewal process. However, with inadequate plans for evacuation, the unlikely event that something will happen to the plant will leave thousands, millions trapped out of an effective evacuation route.
There are not enough
- roads
- routes or
- strategies

to evacuate people of different areas and effective plans to evacuate
- children
- the elderly, and
- those without transportation

are not considered in the official Indian Point Evacuation Plan.

The NRC is not giving enough heavy weight to this matter and is willing to consider permit renewal without a concrete effective, workable and viable evacuation plan. Without a solid evacuation plan, millions will suffer and perish when something goes wrong to the plant. The safety of those around Indian Point and even in the 50 mile radius should be taken into consideration when renewing Indian Point's operating permits.

This matter should be included in the DSEIS and a plan should be constructed so that Indian Point's Evacuation Plan should be developed prior to the decision of having Indian Point stay running for another 20 years.

164-f-EJ/EP

Next, the leak occurring at Indian Point has seeped into the soil and water. There is a lack of studies on the effect the leakage had to the soil.
The DSEIS mentions that the leak is not a harmful amount but other studies show that life, like that of turtles living in the soil is contaminated with Stronium-90.
This is proof that more studies need to be conducted about the effects of the leak and that something needs to be done to monitor all equipment and measure if any leakage occurs. This standard should be met prior to permit renewal so that there is motive for the plant to follow through with any leak developments. In doing so, this will help develop a well rounded system of monitoring pipes and pinpointing leaks so that any

164-g-LE/MP

future problem can be dealt with and fixed. This is especially important now that Rockland County has a plan for a desalination plant, enabling them to use the Hudson River as a drinking water source for the county.

164-g-LE/MP contd.

Lastly, the DSEIS does not extend to every area where environmental impact can occur. Secondary environmental impacts can occur outside the site-specific area. The DSEIS does not mention the environmental impact of mining for uranium, the energy source of the nuclear plant.
Mining for uranium pollutes the air and adds:

- conventional
- toxic and
- radioactive pollutants to the air.

Mining for uranium also creates:

- stockpiles of radioactive and toxic rock waste,
- pollutes surface water
- pollutes ground water, and
- harms the life, like that of people and animals who are close to or downwind of the mining sight.

The environmental impacts of mining for uranium should be weighed alongside the nuclear power plant that will be using the uranium product derived from mining.

164-h-UF

In conclusion, by right, the NRC has the power to make sure the impacts of Indian Point do not harmfully threaten the life of people, wild life, vegetation and the Earth. The DEIS should not be constructed using tunnel vision, it should include ALL information relative to Indian Point and the environment so that a decision of renewal for Indian Point to operate for the next 20 years can be comprehensively made.

164-i-GL

Sincerely,
Michelle Taormino
Citizen of Oradell, NJ
Citizen within the 50 mile radius of Indian Point

IPRenewalCEmails ML 090640357

From: Green Infrastructure LLC [tompkinsdana@aol.com]
Sent: Friday, February 27, 2009 9:01 AM
To: IndianPointEIS Resource
Subject: License Renewale

To Whom it may concern,

It is quite obvious that the Indian Point Reactor has lived out it's life. The threat of future contamination will grow over time, and the cost of that contamination is far more reaching than the benefit of having the reactor remain in existence. I urge you to decline the license renewal for the plant before a major disaster occurs. For then it will be too late, and the cost will be too high. I will be following this closely.

Thank you,
Dana J. Tompkins

165-a-OR/PA

Dana J Tompkins
President
Green Infrastructure LLC
73 College Lane
Millbrook, NY 12545 USA
Office: (845)677-4664
Cell:(845)702-4822
http://www.greeninfrastructurellc.com/

1
2
3

International Association of Heat & Frost Insulators & Allied Workers Local Union 91
3161 Albany Post Road, Buchanan, New York 10511

Phone: 914-788-0400 Fax: 914-788-0403 E-mail: awlocal91@aol.com

March 12, 2009

12/31/08

73 FR 80440

30

RECEIVED

2009 JUN -3 PM 2:46

RULES AND DIRECTIVES BRANCH USNRC

Mr. Samuel J. Collins
Regional Administrator
U.S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Dear Mr. Collins:

On behalf of Local 91 of the International Association of Heat & Frost Insulators & Allied Workers, I am writing in support of the relicensing application for the Indian Point Energy Center (IPEC). I am also requested an expedited timeline for the final review of Indian Point's application. 166-a-LR/SR

Indian Point produces 2,000 megawatts of clean, reliable, emission-free electricity. It is responsible for hundreds of good-paying union jobs, and nearly three-quarters of a billion dollars in economic impact for our region. 166-b-AL/EC/SO

Additionally, Indian Point serves as an important steward for our environment. Not only is the energy produced at Indian Point emissions-free, but the replacement options are guaranteed to harm our environment. Specifically, the replacement power would generate 14 million tons of carbon dioxide each year.

It is a sad and unfortunate that should Indian Point's energy need to be replaced, the replacement power will be paid for in both dollars and in the health of our most vulnerable citizens – the very young, the very old, and those who already suffer from respiratory illnesses. The replacement power would be generated in this very region to the detriment of most of the people in this room. 166-c-AL/HH

And in this struggling economy, it is indefensible for certain environmental activists to place the fate of some fish eggs in the same light as jobs and economic growth. More than 1,000 jobs are directly tied to Indian Point, with hundreds of them being union. To try and shut down Indian Point over the fate of Hudson River fish eggs, most of which die on their own anyway – is absurd, incomprehensible and shameful. 166-d-SO/SR

I ask you to take a common-sense approach and weigh the true benefits of Indian Point in your deliberations. Thank you.

Sincerely yours,

Michael J. Tracey
Business Manager
Local 91, International Association of Heat & Frost Insulators & Allied Workers

My name is Mike Tracey and I represent Local 91 of the Asbestos Workers and Insulators. I am pleased to join you today and urge all of you to support the relicensing of Indian Point.
Indian Point produces 2,000 megawatts of clean, reliable, emission-free electricity. It is responsible for hundreds of good-paying union jobs, and nearly three-quarters of a billion dollars in economic impact for our region. 166-e-SO/SR

Additionally, Indian Point serves as an important steward for our environment. Not only is the energy produced at Indian Point emissions-free, but the replacement options are guaranteed to harm our environment. Specifically, the replacement power would generate 14 million tons of carbon dioxide each year.

It is sad and unfortunate that should Indian Point's energy need to be replaced, the replacement power will be paid for in both dollars and in the health of our most vulnerable citizens – the very young, the very 166-f-AL/EC old, and those who already suffer from respiratory illnesses. The replacement power would be generated in this very region to the detriment of most of the people in this room. 166-f-AL/EC contd.

And in this struggling economy, it is indefensible for certain environmental activists to place the fate of some fish eggs in the same light as jobs and economic growth. More than 1,000 jobs are directly tied to Indian Point, with hundreds of them being union. To try and shut down Indian Point over the fate of Hudson River fish eggs, is absurd, incomprehensible and shameful. 166-g-AE/SO

I ask you to take a common-sense approach and weigh the true benefits of Indian Point in your deliberations. It's a fact that Indian Point is a true economic engine for our community.

Thank you for your time.

149 Convent Rd.
Nanuet NY 10954
March 13, 2009

Chief
Rulemaking, Directives and Editing Branch
Division of Administrative Services
Office of Administration, Mailstop T-6D59
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sir:

Please be advised of my concern for these environmental issues raised by Riverkeeper concerning the Hudson River and the Indian Point Nuclear Power Plant —

killing of fish, eggs and larvae due to use of Hudson River water to keep plant operating -

killing shortnose and Atlantic sturgeon - trapping in the screens

leak of radioactive water from Indian Point 2 spent fuel pool

long range storage of highly toxic nuclear waste. 167-a-AE

Hence I oppose the license renewal of the plant.

Respectfully yours, 167-b-OR/RW/SF

S. Anne Denean Brennan, SC.

The following pages contain the written comments submitted by Various Authors during the scoping period for the Indian Point Nuclear Generating Unit Numbers 2 and 3 license renewal

Comment ID
168-a-OS

Mr. Falciano

I would like to thank you very much for having my class at Indian Point. I really learned alot about nucler power, from the tour of the plant and the Presendation. I now beleive nuclear power well be the power of the future.

Thank you

1

Mr. Falciano,

I wanted to thank you for allowing us to tour the facility and experience what a nuclear power plant is like. The chance was unlike any other I have had before and really opened my eyes to the truths about nuclear energy. Once again, I would like to thank you for the opportunity your generosity afforded me.

Sincerely,
Brian Johnson

Pat,

With sincere
appreciation
and
warmest thanks.

I think the kids had a great experience and really appreciated your hospitality. In fact my son Chris said he thought you were "pretty cool". (Huge compliment)

Thanks again,

Ron

Have a Merry Christmas
+
a Happy New Year!

You're always doing something nice.

Dear Mr. Falciaro,

Thanks for showing me how your facility operates. It is a very interesting process to produce electricity. Once again thanks for everything it was a very enjoyable trip.

Sincerly,

A. Mostofi

Areen Mostofi

Dear Patrick Falciano,

Thank you for the tour of the nuclear plant. I tought the clip of the plane vanishing into the wall when the plane crashed into it was amazing. I did not imagine that the domed building was that strong. Thank you very much for your time.

—Sincerloy

Patrick Verbovsky

Thanks for
The tour of
your Nuclear
Power Plant

To Mr. Falciano,

Thanks for taking the Time to show us your place of work. It was suprising to find out how much power comes from so little energy. I also feel Safer knowing the facts of Nuclear power. Someday I might decide to become a nuclear engineer.

Sincerely,
Thomas Waller

Dear Mr. Falciano,

Thank you for inviting us to tour Indian Point
I never knew that nuclear energy sources
were so sensible and efficient. It's a shame
they're not used more widely. I commend you
for your hard work.

Sincerely,
Chris Rittendale

THANK YOU

1

1

Mr. Falciano,

Thank you very much for your Presentation of your company. I never knew a nuclear power Plant could be so simple and yet so difficult. Also the tour was very intriguing. Please allow for future classes to come and See how their energy is produced.

12/8/08

Dear Pat,

Thank you for the time and effort that you put into making our visit to Indian Point both educational and fun. Sincerely, AP Chemistry Arlington High

Thanks! Samantha Bova

Thanks -Ravi Bhalla

Thanks - Chris Nardo

Thank you! - Erica Kreines

Thanks so much! - Saumya Bhutani

Thanks - Laila Raiyan

Thank you! Jessica Ineck

Thank you

Thank you!

Thank-you! -Carolyn

Thank you! - Alex Ma

Thank you! - Brian Lei

Thank you,

Thank you

Thank-you! Kristy Stasiak

Thank you! - Kalli

1

Pat-
Many thanks
for your help! It
is wonderful allowing
students to see real world
objects that pertain to their
learning.
thanks again -
[illegible]

Thank you,
You really helped
us on our project!
We really appreciate
it. Thanks again!
Mary, Megan, Kevin
Wyatt

Dear Mr. Falciano,

Thank you very much for the tour of indian Point. I found the simulated control room especially interesting because it was so identical to the actual control room new technology can be tested in order to determine what effects it will have on the power plant before introducing it to the actual control room. I also found the information in your lecture about nuclear power plants fascinating because prior to my visit to Indian Point I had a bias against nuclear power plants, from hearing horror stories from the high level waste they create. After the lecture, however, I realized those were

1

Dear Mr. Falciano,

Thank you for your time to tour the West Point personnel on Friday, Sept. 19th. I enjoyed the opportunity, and your presentation was excellent. It was a pleasure to meet you.

Again – thank you,

Melanie Covey

Certificate of Appreciation

awarded to

Mr. Pat Falicano

For outstanding assistance given to the NE355 Advanced Nuclear Reactor Design class from the United States Military Academy. Your knowledge was instrumental in teaching the cadets about Indian Point and applied nuclear engineering. The cadets were motivated by your example to strive for more understanding in nuclear power plant operations. Your actions reflect great credit upon yourself, Indian Point, and the Entergy Corporation.

Edward P. Naessens, Jr.
Colonel, United States Army
Academy Professor,
Department of Physics

R. J. Winkel, Jr.

Raymond J. Winkel, Jr.
Colonel, United States Army
Head of the Department,
Department of Physics

Falciano, Patrick

From: Dooley, P. COL C&LS [Patricia.Dooley@usma.edu]
Sent: Friday, July 16, 2004 9:20 AM
To: Falciano, Patrick
Cc: Appleton, A. MAJ C&LS; Meyer, J. LTC CHEM
Subject: Presentation to Cadets

Mr. Falciano,

Your presentation aboard the USMA ferryboat last Sunday to the Mid-Hudson Section of the American Chemical Society was most interesting. I commend you on your ability to compete with the gorgeous scenery of the river—and win—in an enthralling talk about the Indian Point nuclear reactor.

I am including the course director and assistant course director of our Advanced General Chemistry course at USMA in the CC: by way of introduction; MAJ Appleton is responsible for arranging for and inviting speakers to give lunchtime brown-bag presentations to the freshman cadets, and I will encourage him to make contact with you about the feasibility of having you up some time this semester.

Again, thank you for a riveting and rewarding talk.

Patricia A. Dooley, Ph.D., Colonel, U. S. Army, Academy Professor

Airborne & "Old Ironsides" Signaleer

Department of Chemistry and Life Science

United States Military Academy, West Point NY 10996

845/938-3909 DSN 688-3909 Fax -2235

The ultimate weapon is an educated mind.

GO ARMY TRACK!

1/13/2005

1

Dobbs Ferry Union Free School District

DOBBS FERRY HIGH SCHOOL
Dr. Michael Kuchar, Principal

December 8, 2004

Dear Mr. Pat Falciano,

I am writing this letter of behalf of myself, my colleagues and our students as a thank you for a fantastic presentation. We are all very impressed with your knowledge and are appreciative of your time.

Your PowerPoint presentation was excellent and our students thoroughly enjoyed it. Often times our students are misinformed about nuclear energy and safety issues. I applaud you for addressing those concerns as you handled criticism with diplomacy and grace. Many of our students remarked that after your lecture, they felt more at ease about the safety of Indian Point.

Also, thanks for the "goodie bags". The students loved their gifts and we all appreciate you putting them together and bringing them along. Thanks again for you time and attention.

Kind Regards,

Justine Henry
Teacher of Science

505 Broadway, Dobbs Ferry, New York 10522 914-693-7645 . . . . Fax 914-693-1115

Falciano, Patrick

From: Libby, Earl
Sent: Monday, May 10, 2004 9:18 AM
To: McMullin, Kathy; Falciano, Patrick
Subject: John Jay High School - Chemistry Class Presentation

Kathy,
I had the opportunity to attend the presentations to the Chemistry Classes at John Jay High School by Mr. Pat Falciano on Friday 05/07/2004. Mr. Falciano is a talented presenter who well represented Indian Point Energy Center and Entergy Nuclear to that high school population. It was my pleasure to assist Pat with this outreach program.

Tx: Earl R. Libby, Ops Tech Support Supervisor
Phone: (914) 736-8514 Pager: (888) 437-5785

1

1

Falciano, Patrick

From:	Terri Campbell [tcampbell@vcmail.ouboces.org]
Sent:	Friday, April 02, 2004 12:34 PM
To:	Falciano, Patrick
Subject:	Nuclear Presentation

Thank you so much for visiting our school and sharing your presentation with us. All of the students were impressed with the material and it generated a fantastic discussion the following day. I will not forget you for next year.

Terri Campbell

Terri Lee Campbell
Science Department

Mr. Patrick Falciano
IPEC Communications GSB
450 Broadway
Buchanan, NY 10511

January 10, 2006

Dear Mr. Falciano,

Thank you for visiting Harmony Christian School on December 6, 2005. The staff and students enjoyed the excellent, informative presentation on the workings of a nuclear power plant. The subject matter presented was a benefit to our middle and high school students and also the staff that were able to attend.

We look forward to scheduling another visit with you next year. We also will be looking into scheduling a field trip to the Indian Point Energy Center for some of our high school students next year.

Respectfully,

Vivian K. Brooks

Mrs. Vivian K. Brooks
Middle School Science Dept.

Kevin J. Barry

Mr. Kevin Barry
High School Science Dept.

1

WESTPORT, CONNECTICUT

DIANE GOSS FARRELL
First Selectwoman

April 11, 2005

Ms. Kathleen McMullin
Communications Manager
Indian Point Energy Center
450 Broadway, Suite 1
Buchanan, New York 10511

Dear Kathy:

Thank you very much for your highly competent assistance relative to my tour of the Indian Point Energy Center on April 4th.

The tour was extremely interesting and impressive. Seeing the operations and facilities first hand makes for a better understanding of the safety procedures.

Thank you again for your help. Best wishes.

Sincerely,

Diane Goss Farrell
First Selectwoman

DGF:ps

Town Hall • 110 Myrtle Avenue • Westport, CT 06880 • (203) 341-1111 • Fax (203) 341-1038
E-mail: selectman@ci.westport.ct.us • Website: www.ci.westport.ct.us

William John Rock
Somers Middle School

MR. PAT FALCIANO
Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc.
Entergy Nuclear IP2, LLC
P.O. Box 249
Buchanan, NY 10511

July 26, 2005

Dear Pat,

Enclosed are copies of the pictures that you kindly took for me while on the tour of the Indian Point Nuclear Power Plant on July 19, 2005.

I also received your wonderful power point presentation as well.

I will put all of this great information to use in my classroom to help better educate our Middle School students about Nuclear Energy.

I feel that Nuclear Energy is a very important part of the solution for both our current and future energy needs.

Thank you very much,

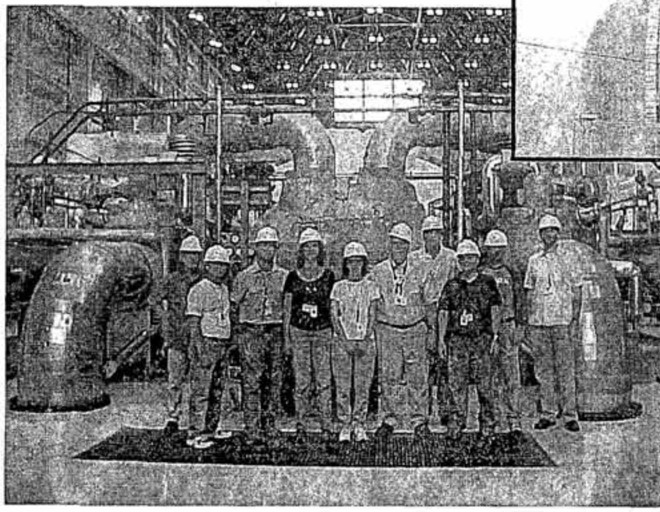
William Rock

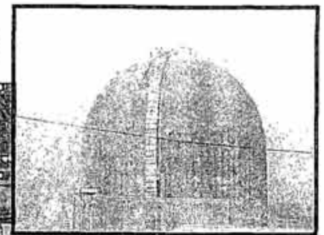
Bill Rock

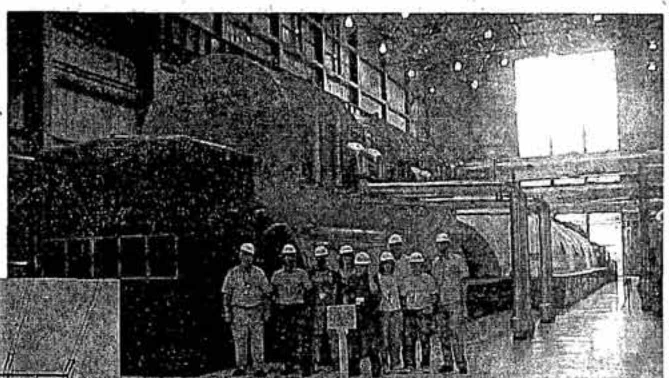
Technology Education
Teacher
Somers Middle School
Route 202
Somers, NY 10589
914-277-3399 x 650

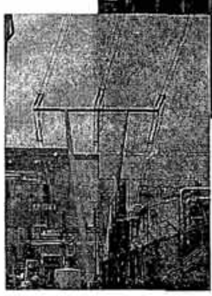
Home
30 Frances Drive
Katonah, NY 10536
914-277-5966
e-mail wjrvc@aol.com

Indian Point Pictures 2005









Dear Pat - These are the pictures
I will use to explain about my
tour thru the plant - They are excellent!
Thank you - Bill Rock

PS - COMBINED WITH YOUR VERY
WELL DONE POWER POINT PRESENTATION
I WILL BE READY AND ABLE TO
TEACH MY STUDENTS ABOUT NUCLEAR
POWER - AGAIN, THANK YOU

Falciano, Patrick

From: Dick Willstatter [RWillstatter@msn.com]
Sent: Friday, April 30, 2004 5:14 PM
To: Falciano, Patrick
Subject: Re: photos

Pat,
Thanks for sending copies of the photos of the R.M.A. men visiting Indian Point. I will certainly make copies for their enjoyment.
By the way, (wish I could have been there, really do) every single report of their visit was complementary not only of the visit but most especially of how well you (yes, you) were able to handle the job of presentation. Well done,,,, and thanks !! They way they put it is, "You are a real professional".
Dick Willstatter

----- Original Message -----
From: Falciano, Patrick
Sent: Thursday, April 15, 2004 12:49 PM
To: 'RWillstatter@msn.com'
Subject: photos

Dick,

Attached are the photos we took during the Association's visit to Indian Point. I was asked tosend them to you. One of your guys wanted to forward them to a local newspaper.

<<DSCN1201.JPG>> <<DSCN1202.JPG>> <<DSCN1203.JPG>>
Pat

1/13/2005

1

Falciano, Patrick

From: Biaglow, A. DR C&LS [Andrew.Biaglow@usma.edu]
Sent: Monday, November 15, 2004 7:59 AM
To: Falciano, Patrick
Subject: Thank You

Patrick,

Thank you for your visit on Friday. I enjoyed your talk tremendously. Indian Point seems like a fascinating place, and I am sure the cadets really enjoyed your talk as well. If possible, I would greatly appreciate a field trip to Indian Point. We would like to bring faculty and/or cadets. I do not know what has to be done on your end, but if there is a PR office that I could contact, please let me know.

I am also interested in arranging summer internships with our cadets who are studying chemical engineering. I am sure there is a world of fascinating projects for them to work on. If you are interested, I would greatly appreciate it if you could forward this message to anyone who might be interested.

I am also interested in faculty internships during summer months. If this is something you would like to discuss further, please let me know.

Thanks again, and best regards,

Andrew Biaglow
Associate Professor
Program Director for Chemical Engineering
Department of Chemistry and Life Science
United States Military Academy
West Point, NY 10996
845-938-5814
ma7196@usma.edu

1/13/2005

1

Falciano, Patrick

From: Rachel Van Der Stuyf [rvanderstuyf@bedford.k12.ny.us]
Sent: Tuesday, December 21, 2004 2:36 PM
To: Falciano, Patrick; kmcmullin@entergy.com
Subject: Re: Indian Point visit

Kathy and Pat,
Thank you for setting up the visit for us today and for being flexible regarding our time constraint. We obviously would have liked a tour of the facility and appreciate the fact that you had one set up for us.
I will contact you in the next day or two about either a follow up visit to Indian Point or a having one of you come to our school for a discussion.

Thanks again,
Rachel Van Der Stuyf
Academic Community for Educational Success

At 08:57 AM 12/20/2004, Falciano, Patrick wrote:
>Rachel,
>
>Please give me a call ASAP @ 914-271-7441.
>
>Pat Falciano

1

Norwalk Community College
188 Richards Avenue Norwalk CT 06854-1655

May 11, 2004

Jim Knubel
Vice President- Operations
Executive office
Indian Point Energy Center
295 Broadway, Suite 1
P. O. Box 249
Buchanan, New York 10511-0249

Dear Mr. Knubel:

On Behalf of NCC, my students and myself, I would like to let you know how much we appreciated your staffs professional attitude and effort in handling our "Nuclear Power Plant Field Trip."

From the very beginning, you accorded the curious students waiting to see for themselves what a Nuclear Power Plant is all about sincerity and respect. They have learned a great deal just on that. There was Pat Falciano who came to NCC on May 4 to give a talk on the Nuclear Fuel Cycle. By the way, it was very favorably televised on the local news channel 12. After clearing security on May 5 we had our visit which included a guided tour by Tom McKee, Pat Falciano and Joan Etzweiler culminating with a power point slide show by Al Genadry. All by the way were excellent hosts and made our visit very memorable from the beginning to the end. Our students were excited to learn, I could almost see them "bragging" to whoever was willing to listen and wherever they went.

It was a very successful educational trip. Thank you very much for all you did for our students and the college.

Sincerely yours,

John J. Dolhun
Associate Professor Chemistry

Cc: Pat Falciano

1

January 21, 2005

Pat Falciano
450 Broadway
Suite 1
Buchanan, NY 10511

Dear Pat,

Thank you for coming to our school and sharing information with us regarding Indian Point and the nuclear power industry. It was very helpful to our class because we were able to use the information in our research papers. We really appreciate your visit to our community, you are always welcome.

Sincerely,

Academic Community for Educational Success

STEPHANIE RUIZ

Jillian Kawicki

Andrea E.

JULIANNA CAMPOS

Elizabeth Boriskin

Nick

Camille

ACADEMIC COMMUNITY FOR EDUCATIONAL SUCCESS

FOX LANE HIGH SCHOOL

175 Railroad Avenue • Bedford Hills • NY • 10507

914 - 666 - 5983

February 28, 2006

Dear Mr. Falciano,

I would like to thank you for taking the time to show my class around Indian Point last Wednesday. I learned a lot from your PowerPoint presentation and you showed me a new point of view on nuclear power. It was nice to here a different perspective and learn things that the textbooks leave out such as actual radiation exposure, actual threat of meltdown, and actual waste the reactors produce. You must be very busy and I and my classmates truly appreciate you taking an entire day to teach us about the process of nuclear energy and its production.

Sincerely,

Alex Scaros, Senior at Hackley School

February 27, 2006

Dear Mr. Falciano,

I would like to thank you again for giving me and my classmates the opportunity to visit Indian Point. Your PowerPoint presentation was very informative and my tour, led by Joe Carlick, was incredibly interesting. Prior to the visit, I was very skeptical about nuclear energy but I have to admit you have eased many of my concerns. I now obtain a greater sense of knowledge of the power plant, as well as a greater sense of security. I am very grateful for the services that you put into the power plant which enables my house to receive electricity. Once again I would like to thank you for your time, patience, and willingness to educate me and my classmates about nuclear energy.

Sincerely,

Kristen Vecchio

Kristen Vecchio

Dear Mr. Falciano, 2/28

Thank you so much for giving us such an educational tour of Indian Point. Before our trip, I was not sure of my opinions about nuclear power, but now I feel more informed. I think that the information was well presented, but I feel that facts should be presented in a more balanced manner. I think that nuclear power is a great source of energy, and I do not agree with the ideas that all nuclear power plants should be phased out. It is safe, efficient and lessens the dependency on oil and other sources that are nonrenewable.

Thanks again,

Komal Garewal.

Jonathan Lampert

Dear Mr. Falciano,

Thank you very much for the tour and information about Nucler Point. I appreciate the time you spent and as a result of the information I recived, I have changed my view on nuclear power. I particularly found interesting the discussion on how nuclear power works, how power is generated in nuclear point. I also found interesting the discussion of safety and security at Nuclear Point. This discussion effectively cleared up the myths I had heard; essentially ~~All~~ a disaster at Nuclear Point is virtually impossible. I found the tour fascinating, specifically the tour of the simulator. It's amazing how much training you have to go through in order to work at Nucler Point.

Sincerely,
Jonathan Lampert

1

Dear Mr. Falciano and everyone involved with our trip to Indian Point,

On behalf of myself and my class, I would like to say thank you for your informative lecture, openness to questions, and overall congenial attitude that most major corporations lack when dealing with skeptical visitors. As a student who has witnessed many public relations lectures concerning how and why I should think this or that way about any given topic, I can honestly say that this particular information center was not only lucid and persuasive, but also addressed and attempted to amend one of the greatest hurdles that proponents of nuclear power face today: public ignorance. Of course, both the media and public are correct in worrying about the safety hazards complicit with nuclear power (what with the disaster at Chernobyl and the frantic, though seemingly harmless meltdown at Three Mile Island), for they are a reality, no matter what anyone says. As long as we as humans use nuclear power as a source of energy, there will be an intrinsic fear of a catastrophe (meltdown, terrorist attack) and the problem as to where and how to dispose of high-level nuclear waste. However, not only was I thoroughly impressed with the excessive attention to security and safety at the power plant, but I also learned how environmentally friendly nuclear power actually is. Who would of thought that one ~~pete~~ pellet of uranium has the same energy potential as 2000 pounds of coal?!

Thanks again,

Tom Breen

By the way, the goody bags at the end of the tour would have converted even the most stubborn anti-nuclear power activist.

1

Mr. Falciano
Thank you very much for the wonderful tour of Indian Point. I have always been intrigued by nuclear power, and so I found you talk particularly interesting. It also settled many of my concerns about nuclear power and radiation. Thank you again for taking the time to talk to us and bring us around the plant, it was greatly appreciated.
Sincerely,
Ruby Cameron

1

Dear Pat Falciano,

Thank you very much for the educational tour of Indian Point. Honestly, I was always afraid of the dangers of nuclear power plants, and easily gave into the fearful media coverage. After learning about the mechanics of the plant, the beneficial effects industrially and the friendly impacts environmentally, I have definitely become a nuclear power supporter. The containment of the radioactive material and the minute amount that could ever affect surrounding people is comforting as I live within a 10 mile radius of the plants. The lecture was both informative and interesting and I thoroughly enjoyed the presentation. Confident in my ability to defend nuclear energy, I have already found myself enlightening others with the knowledge you have bestowed me with. Thank you for the tour as well, it was a great experience and I know the information I received I will remember for life.

Just as the generous items received in my "goodie bag" say, Indian Point is *safe*, *secure* and *vital* and with my newly gained knowledge, I have evidential support!

Thank you,

Chelsea Wendlinger
(Hackley School Student)

Dear Mr. Falciano,

I just wanted to take this opportunity to thank you for allowing our school to visit Indian Point Power Plant. I was personally fascinated by the precision and intracity of the technology used at Indian Point. You gave a very well done presentation on the power plant that was entirely factually based, which I very much appreciated to clear up some rumors. Through the media I developed a biased view toward the plant; I thought if even the slightest thing were to go wrong, or if it was attacked the effects would be catastrophic. I now know that is not true.

I was very impressed with the facilities and the warm atmosphere from the technicians at the plant. I also appreciated the high level of security, and while they were not as warm as the technicians, I understand the importance of maintaining a very high level of security.

I now think that nuclear energy is viable alternative to fossil fuels. Nuclear energy creates absolutely no pollution emissions, but there are draw-backs. We have to think about thermal pollution and storage of lethal radioactive waste. But, fossil fuels are more of a problem for our atmosphere at the present moment, so I think if we created an extra storage tank for the radioactive waste, or simply find ways of making the waste inert and non-lethal, harnessing radioactive energy would be just as Entergy says, "Safe, Secure and Vital." I won't go on about what should be done, but to simply thank you for giving me the educational opportunity to see what harnessing nuclear energy is really like first hand.

With great appreciation,

Ty Smith

Ty Smith

Dear Mr. Falciano,

Thank you so much for giving us a very informative tour and presentation of Indian Point. I learned so much about the intricate workings of a nuclear power plant, especially in regard to the fuel rods and uranium pellets. I had no idea of how small they were, and how they were assembled within the reactor! Also I enjoyed learning how well constructed the containment buildings are, how little of an effect certain amounts of radiation can have on the human body, as well as how diluted the radioactive material becomes once it is two, five or ten miles away from its origin.

In addition to the information I learned during the presentation, I thoroughly enjoyed taking a tour of the power plant. It gave me an idea of how many components are included in the process of creating energy through the use of uranium. The amounts of water pumped into the plant each hour stunned me, as did size of the complex. The size of the room that contained the reactor alone was astonishing! One of the most impressive things I encountered at the plant, though, was the security. The fact that students were obliged to pass through a metal detector, a bomb detector and two sets of radioactive detectors was very reassuring, and showed the amount of technology available at the plant.

Again, I would like to thank you so much for our tour and presentation, and I know each one of us had an electrifying time at Indian Point.

Regards,

Darren Sinatro

Darren Sinatro

February 28th 2006

Dear Mr. Falciano,

I wanted to thank you for the informative lecture and tour you gave Hackley School last Wednesday. From the lecture, I found that nuclear plants, especially those as secure as Indian Point, are much safer than the public tends to think. Nuclear power is clean burning, safe, and secure. I believe that nuclear power will be very important in our futures (as rising adults) as the public learns how safe it really is. I enjoyed the tour immensely, and I loved how we had access to many sections of the plant. Thank you again for helping me understands the truth about nuclear plants and the many positive effects they have on society. Thank you!

Sincerely,

Kate Bibi

Kate Bibi

Dear Mr. Faleiano,

I just wanted to tell you how much I enjoyed my time at Indian Point. I found the lecture very informative and interesting. I learned several things about power production in general, and nuclear power in particular, that I did not know before. Actually seeing the turbines and other parts of the plants was fun. Thanks so much for taking the time to give us a tour.

Sincerely,
Sarah Hunt

Dear Mr. Fakiano,

Before our trip to Indian Point I was both Apprehensive and Skeptical. Because of the media and public opinion, I admit I had a negative view of Indian Point. However, after your presentation and the tour my group was given, I no longer have that opinion. My view of Indian point is now possitive, and I would like to thank you for that. I now know that Indian point is safe from terrorist attacks, even if a plane is used as a weapon. I now know that an incident such as Chernobyl is impossible. I now know that if there ever was a meltdown I know that we aren't doomed. And I also know Indian Point isn't polluting. All the skepticism I had about Indian point is no more and again I would like to thank you for that.

Sincerely,

1

Dear Mr. Valciano,

I am grateful to you and to your co-escorts for educating me and my class about nuclear power, and about the processes occurring at Indian Point. We all learned a great deal, and you served as a great counterbalance to the overwhelming slew of bad press that Indian Point has a tendency to generate.

Frankly, given all the negative hype about nuclear power, I half-expected to see a bunch of mad scientists trucking around weapons-grade plutonium on little handcarts everywhere. I think a fair number of my classmate were afraid that at any minute a 767 might slam into one of the containment buildings and nuke Westchester. Clearly, you can see how badly we needed education.

I think that what we learned last week goes farther than just how nuclear power works, and why Indian Point is not the threat we think it is. We also saw the people, such as yourself, working at the plant. As a twelfth grader vying for admission to college, I've been on a lot of tours lately. I wish that the students giving those college tours had been half as enthusiastic and passionate about their colleges as you and your colleagues were about nuclear power! I think that one major oversight that the public has in writing of nuclear power as evil is the quality of those working at your facility. I saw nothing but sincerity and integrity, and the dedication to keep Indian Point in top working order. I feel safe knowing that the nuclear power plant in my county is in such good hands.

Thank you again, for you have shown us a side of an issue that will only grow in importance, that nobody else could show us.

Sincerely,

1

Dear Mr. Falciano,

Thank you for taking time out of your busy schedule to educate us on the benefits of nuclear power plants. I did not know how safe they, in fact, were and how little radiation even a worker is exposed to there. The most interesting part of the entire trip for me was the video that demonstrated how virtually indestructible the transportation tanks were. Overall, the trip was very informative and gave me a new perspective on nuclear energy.

Thanks again for your time,

1

Dear Pat,

Thanks so much for taking so much time for us. The kids had a great time. They were very interesting in your talk & the plant. It was great for them to have such a pro nuclear point of view since the media gives them a con. I look forward to working with you next year!

Sincerely

1

Jonas Malpass
AP Environmental Science Class
February 27, 2006

Dear Mr. Falciano,

Thank you so much for your tour of Indian Point. The tour and lecture was very interesting and informative. The trip cleared up a lot of my fears and questions concerning nuclear energy. I learned many things while on the tour, and I am now in favor of nuclear energy.

Thank you very much for giving us your time, and touring us around Indian Point. I enjoyed myself very much.

Sincerely,

1

Dear Mr. Falciano,

Thank you so much for the opportunity to come & visit Indian Point. I learned that the plant is really much safer & more productive than I originally thought. It was an amazing experience that I will never forget. Thank you again for your willingness to educate my class about nuclear energy.

Sincerely,

February 28, 2006

Dear Mr. Falciano,

Thank you so much for the lecture and tour at Indian Point. Prior to hearing your talk, I had a bias against nuclear power and even favored closing Indian Point. I have drastically changed my view point, though, after hearing what you had to say about nuclear power. I now realize that the media takes the most extreme cases and twists the facts in order to prove their point. most people never get to hear another side, though, and I got that opportunity. You have opened my eyes to another side of nuclear power and I am more educated for it. Thank you!

Sincerely,

1

2/28/06

Dear Mr. Falciano,

Thank you so much for allowing my class and I to take a field trip to Indian Point. The experience was extremely beneficial and I learned a lot of important things about Nuclear Power Plants. Visiting the plant is an experience I will never forget. I loved seeing how everything was controlled in such an organized (and safe!) manner. It was informative and comforting at the same time. Thanks again!

Dear Mr. Falciano,

Thank you very much for allowing my class to visit Indian Point. I won't lie; I had a lot of reservations about nuclear power from what I had studied previously. You and Jim, my tour guide, put all of my concerns to rest. You were very informative throughout your presentation and as was Jim during the tour. The passion that both of you had for your job was incredible! It was really very impressive and I thank you for doing your job to power my house and therefore my computer so I could write this note!

Thanks again,

The Masters School
DOBBS

Dear Mr. Falciano,

On behalf of the entire 6th grade class, I would like to thank you for taking time out of your schedule to give a presentation on Indian Point and giving an informal discussion talk to Mrs George's students. The ideas presented in your PowerPoint have given students the tools to objectively evaluate the use of nuclear power in the U.S. We hope to continue using you as a resource to help enrich our curriculum.

Sincerely,

Scott Corn

49 Clinton Avenue | Dobbs Ferry, NY 10522-2200 | phone 914-479-6400 | fax 914-693-1230 | www.themastersschool.com

NEW ROCHELLE HIGH SCHOOL
265 CLOVE ROAD
NEW ROCHELLE, NEW YORK 10801-1247

DONALD CONETTA
PRINCIPAL

TEL: (914) 576-4502
(914) 576-4503
FAX: (914) 576-4284

JOYCE KENT
SCIENCE CHAIRPERSON

TEL: (914) 576-4596
(914) 576-4580
EMAIL: JOYCEKENT@NRED.ORG

Pat Faciano
Indian Point Station
Broadway & Bleakley
Buchanan, NY 10511
New York, NY 10032

May 29, 2008

Dear Mr. Faciano,

Dr. Archibold and her students join me in thanking you for your informative talks on nuclear energy. We are truly facing an energy crisis and your lecture made us all aware of the importance of considering alternative sources of power.

It is beneficial to involve the community in the education of our youth. Your lecture served to make the students more aware of the problems the next generation will be facing. Urging them to find solutions enabled students to think about their effect on our fragile planet.

I look forward to seeing you again soon and hope to invite you back to speak to our students next year.

Sincerely,

Joyce S. Kent

Joyce S. Kent

cc: J.Archibold
J. Pollock

AWARD-WINNING SCHOOL DISTRICT • UNITED STATES DEPARTMENT OF EDUCATION • NEW YORK STATE DEPARTMENT OF EDUCATION

1

The Legislature of Rockland County

JOHN A. MURPHY
Legislator
Town of Orangetown - District 16

Budget & Finance Committee
Government Operations Committee

August 21, 2006

Mr. Thomas Fitzpatrick
Vice President
Giuliani Partners, LLC
5 Times Square
New York, NY 10036-6530

Ms. Kathleen McMullin
Communications Manager
Entergy Nuclear Operation, Inc
Indian Point Energy Center
205 Broadway, Suite 1
Buchanan, NY 10511-0249

Mr. Patrick Falciano
Outreach Coordinator
Indian Point Energy Communications
205 Broadway, Suite 1
Buchanan, NY 10511-0249

Dear Kathleen, Patrick and Thomas:

Thank you for being such gracious and professional hosts on my recent visit.

I was so impressed by your professionalism that I am moved to suggest a similar visit by my County Legislative colleagues who may not have enjoyed an opportunity to visit the Center to date. I would also like to include the Town Board of the Town of Orangetown, New York, in which lies my County Legislative District and, where I have resided for almost 50 years.

The Rockland County Legislature - Allison-Parris County Office Building - 11 New Hempstead Road - New City, New York 10956
Tel: (845) 638-5100 - Fax: (845) 638-5675 - www.rocklandgov.com

1

August 21, 2006 Page 2

Likewise, I would love the Publisher/Editor of our highly respected weekly newspaper, the "Our Town" to be invited. It is mailed free to every home in the Town of Orangetown every week.

Very truly yours,

John Murphy

JOHN A. MURPHY
County Legislator

JAM/ms

Falciano, Patrick

From: GRAVES, ALLISON LESLEY

Sent: Friday, December 08, 2006 2:00 PM

To: Theobalds, Kenneth; Fay, Deborah; McMullin, Kathleen M; Carpino, Ronald J; Falciano, Patrick

Cc: Kansler, Michael R; HEBERT, CURTIS L; Halvorsen, Jerald V

Subject: House Committee staff – Indian Point tour follow-up

Deb, Kathy, Pat and Ron,

Thank you all for conducting and arranging the tour of Indian Point last Sunday. It was a very thorough and educational tour, and I appreciate you accommodating the House Committee staff's schedule and giving us so much of your time on Sunday. The knowledge Pat and Ron offered on the tour was fantastic. As you know, these four staffers represented both the Democratic and Republican staff of the House Homeland Security Committee – a committee that could potentially help or hurt our nuclear fleet.

In fact, I saw Colleen O'Keefe last night. Colleen was the staffer that arranged the tour. She complimented the tour and said how impressed they all were with the facility, the security measures, our employees – just overall impressed. She said, "in fact, we were talking about it this week – how safe we would all feel living next to a nuclear power plant." She went on to say how much they appreciated us conducting the tour on Sunday and that we were much more accommodating than the folks on their tour of Plum Island the next day. Job well done! Thank you for showing some of these key Hill staffers what a well-run facility Indian Point is.

Have a good weekend.

Allison

Allison Graves
Director, Federal Energy Policy
ENTERGY CORPORATION
101 Constitution Ave., NW, Suite 200 East
Washington, DC 20001
202-530-7300 (office)
202-530-7350 (fax)
202-957-4022 (cell)
agrave1@entergy.com

12/11/2006

1

Westchester Community College

State University of New York

November 7, 2007

Mr. Patrick Falciano, Outreach Coordinator
IPEC Communications
Indian Poitn Energy Center
450 Broadway
P.O. Box 249
Buchanan, NY 10511-0249

Dear Mr. Falciano,

It was a pleasure to have you speak with our Green Team on Wednesday, October 24, 2007. Your presentation was invaluable and a learning experience for all those in attendance. Thank you for clarifying the misconceptions regarding the function and safe operation of Indian Point.

I will be in touch shortly to arrange for a tour of the Indian Point Power Plant for our Green Team.

Sincerely,

Seymour Rosenfeld
Professor Engineering Technology
Green Team Mentor

SR:wal

pc: Dr. Hankin, Dean Wang

75 Grasslands Road, Valhalla, NY 10595 • www.sunywcc.edu

Westchester Community College is sponsored locally by the County of Westchester, affiliated with the State University of New York

1

SUNY ORANGE

WWW.SUNYORANGE.EDU

115 SOUTH STREET, MIDDLETOWN, NEW YORK 10940 (845) 344-6222
ONE WASHINGTON CENTER, NEWBURGH, NEW YORK 12550 (845) 562-2454

November 15, 2006

Ms. Kathy McMullin
Entergy Nuclear Northeast
Indian Point Energy Center
450 Broadway
P.O. Box 429
Buchanan, NY 10511-0294

Dear Ms. McMullin:

On a scale of 1 to 10 the recent visit of the Orange Country Community College Engineering Department to your Indian Point facility was a 10+. Mr. Charles Koesis and Mr. Patrick Falciano could not have been more welcoming and more professional. Our students have already been exposed to a fair amount of physics, chemistry, mathematics and engineering and Misters Koesis and Falciano instinctively found the correct level on which to address them. During the visit there were a few other gentlemen who assisted with hosting us but I did not get their names. I assure you that they too were first rate representatives of your company.

Our students thoroughly enjoyed the visit - a visit which reinforced both their theoretical physics/engineering courses as well as their desire to find a career in an exciting engineering field. The motivational factor that results from this quality of exposure cannot be overemphasized. The impressive expertise of Mr. Koesis and the obvious experience of Mr. Falciano served to motivate the students as well as inform them.

Thank you for making this opportunity possible.

Cordially,

John F. Cummins

John F. Cummins, Ph.D.
Chair, Science & Engineering

P.S. Should you bump into Jimmy Steets, please give him my regards
J.

1

Falciano, Patrick

From: Shu-Ping Chang [spchang@us.ibm.com]
Sent: Monday, October 30, 2006 9:50 AM
To: Falciano, Patrick
Cc: PELLEGRINOR@coned.com
Subject: Feedback from attendees of IEEE TZ, ASME, SME Oct. 17 Energy Center meeting

Dear Friend:

We have received positive feedbacks from our attendees for the visit to your facility. Attached is one of them. We would like to thank you for your assistance to make our October meeting successful. We surely will plan future activity to your center to educate more of our members.

Cheers!
SP Chang, Ph. D.
IBM T.J. Watson Research Center
19 Skyline Dr. Hawthorne, NY 10532
Phone: +1 914 784-7746 (t/l 863-7746)
spchang@us.ibm.com

----- Forwarded by Shu-Ping Chang/Watson/IBM on 10/30/2006 09:44 AM -----

"Daniel Wallance" <dwalln@yahoo.com>
10/29/2006 06:04 PM

To Shu-Ping Chang/Watson/IBM@IBMUS
cc
Subject Re: IEEE TZ, ASME, SME Oct. 17 Energy Center meeting TOMORROW

Shu-Ping,

My father and I attended the IEEE / ASME / SME meeting and tour of Indian Point. Both of us had a wonderful time and learned a great deal about the Entergy Energy center. My father actually grew up in Croton on Hudson and although not an engineer was quite impressed with the visit. Visiting an actual nuclear power plant with a tour lead by one of its control room operators is an experience that is very unique and truly impressive and we very much appreciate the effort that went into planning the event. Reflecting back on the visit I came away with a more comfortable feeling about the operation and safety of nuclear plants than before I arrived.

Hopefully there will be more of such events in the future, opportunities to visit unique facilities in the New York area.

Please share my comments with those at Entergy.

Thank you again,

Daniel

10/30/2006

1

Thank you

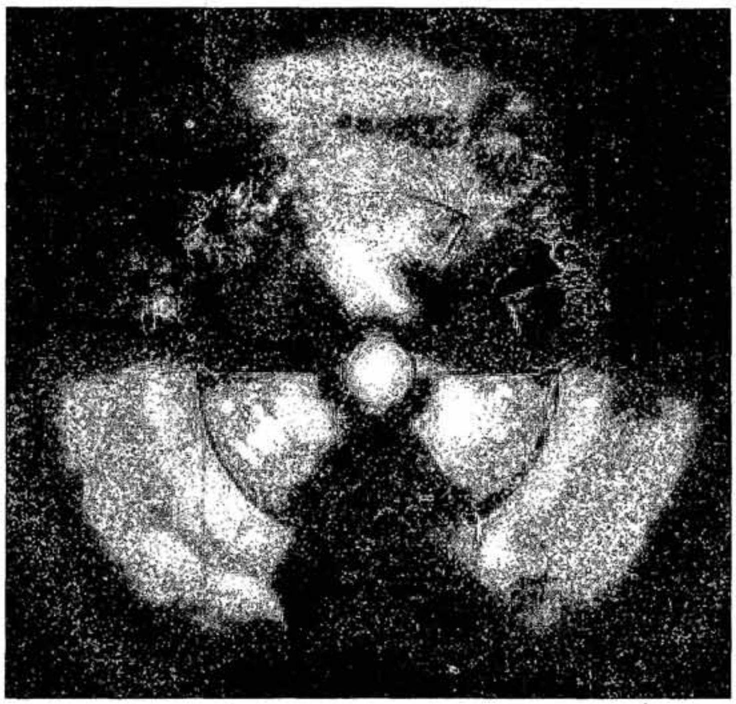
Mr. Falciano!

From

New Rochelle High School

Chemistry Students

* Thank you for teaching us. I really learned alot. Omar Coulibaly *



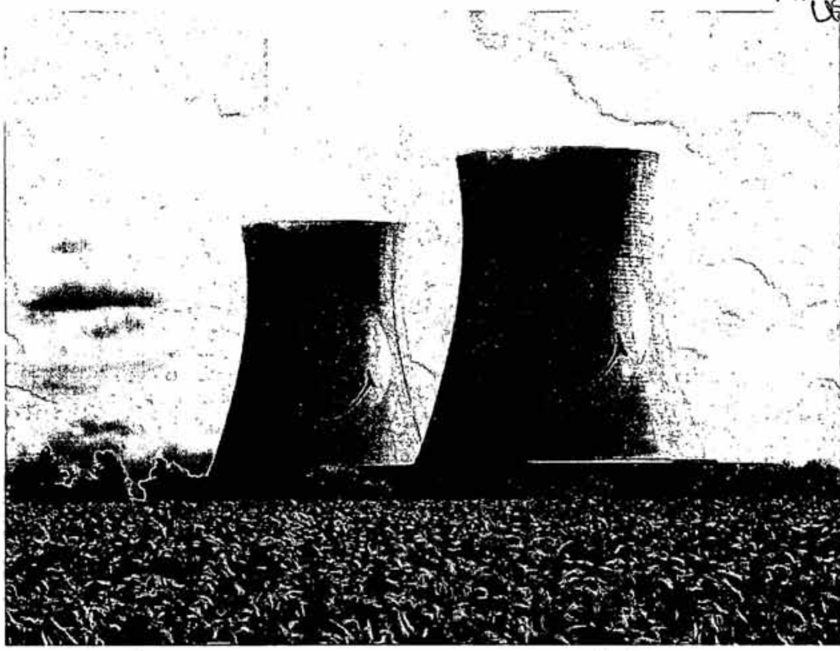
We appreciate the time you spent sharing what you know about Nuclear Power.

Patrick - Thank you for broadening my world AND that of my students as well! Judy Archibald

1

thank you for talking the time to teach us about nuclear chemistry. It was great to learn about nuclear chem from a expert.
-Crystal Cascio

Thanks -Nick



Thanks so much for coming. Your talk on nuclear power really convinced me [illegible] ere are alternatives to green energy.
- Alex Kobon

Thanks for taking time out of your schedule to come and talk to us and prove to us nuclear power is safe. By the way the kid running the powerpoint is Scott. (!!)
-Jenny Prakash

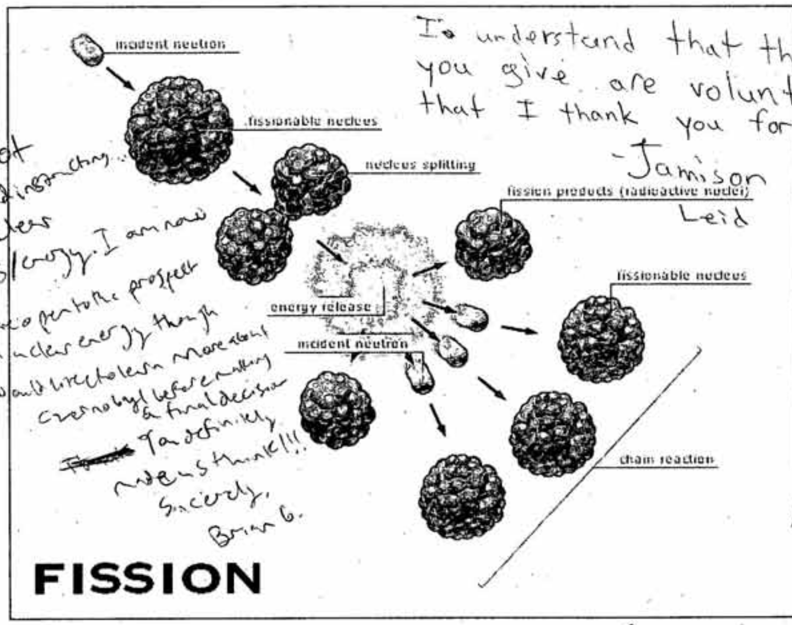
Thank you for taking out time in your schedual to come talk to us about nuclear power! Its greatly appriciated :)
-maria maffucci

Thank you for teaching us about nuclear stuff
-Danny Vargas

Thanks for coming to our class and teaching us about nuclear chemistry =)
- Chelsea

1

~~You don't know who I am,~~ ~~but I~~



I understand that these lectures you give are voluntary, and for that I thank you for your generosity
-Jamison

Thank you for visiting us !!

Leid

Thanks alot for coming and instructing us about nuclear powerplants/energy. I am now much more open to the prospect of nuclear energy though I would like to learn more about Chernobyl before making a final decision. I'm definitely ~~[illegible]~~ more ~~[illegible]~~ thankful!!! Sincerely, Brian G.

I appreciate your visit; your presentation was very informative :) [illegible]

Thank you for coming in for the visit. You for the presentation was superb. -Gloria

I Appreciate the time you took to enlighten us
- Aki Bajulanye

Thanks for coming by and teaching us!
-Charles (the Cynic)

Thanks a lot for visiting. I gained a lot of insight from your ... -Karley Ambrosell

Thanks for Coming
I appreciate you coming and teaching us about Nuclear Power
-Jabbitha Davis

thanks for coming!.
-Hannah

Thanks for giving your time to teach us about the Nuclear Power Plant. It Really changed my perspective about Nuclear Power
-Janeth Barajas

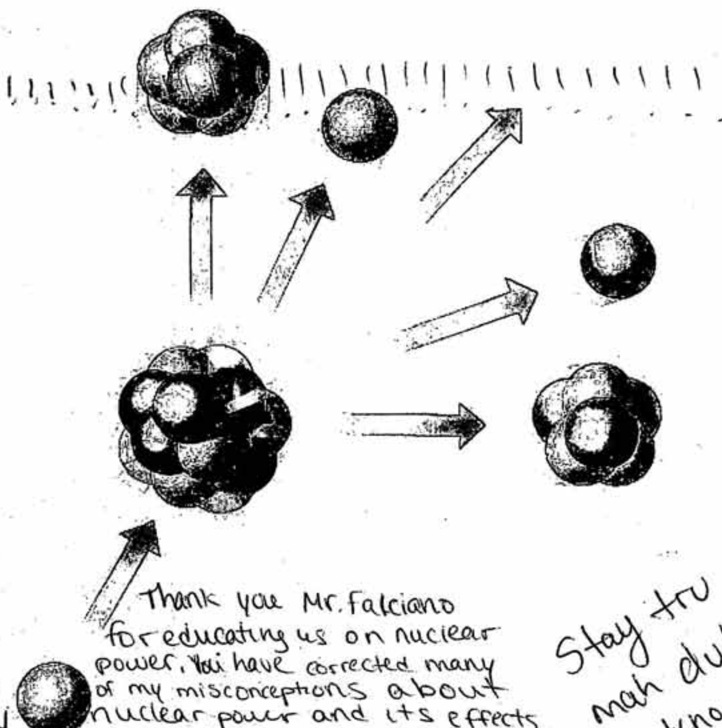
thanks for coming in !!
And giving up your time to teach us about the Nuclear Power stuffs.
- Luckajyne Neal

Thank you for coming! I've enjoyed your lessons!
~Christa George

1

Mr. Falciano,
Wow!
Love, -Steven

Mr. Falciano
Thank you For
coming to NRHS.
we learned alot!!!
you are a gangsta
Love, Alex



My name is Tess
'our presentation
as great! Thanks
or coming,

No. That ^ was
rick Mendoza but
thanks for enlight-
ning us and really
oving now safe
uclear power is.
enjoyed your whole
presentation.
-tess kukaj

Thank you Mr. Falciano
for educating us on nuclear
power. You have corrected many
of my misconceptions about
nuclear power and its effects.
It was truly interesting and
thanks for your visit! :)
- Lauren Tsuboyama

Stay tru
mah du!
you kno it!
- ya boyz
werd

We truly appreciate the
time you spent enlightening
us about Nuclear power!
I had no idea it was
so safe!

Thanks,
Nora

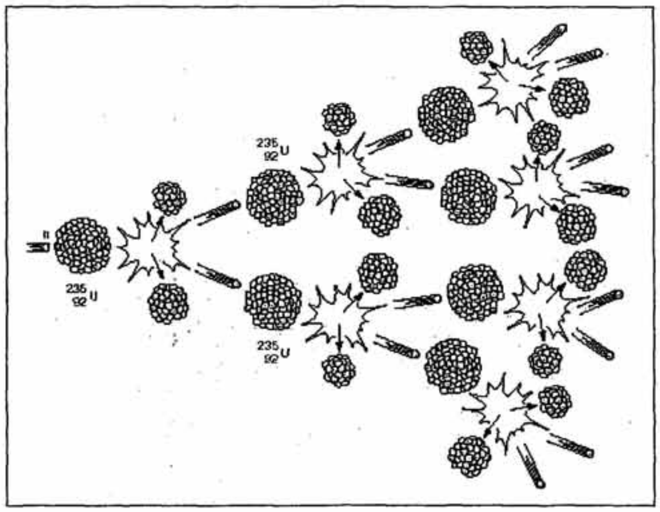
Thank you so much
for coming! You're
presentation was
great.

Sincerely,
Stefanie

Thanks alot
for showing us
how safe nuclear
power was. I
truly learned alot.
-Jaime

1

Thanks! I learned a lot!
Jessica Herzberg



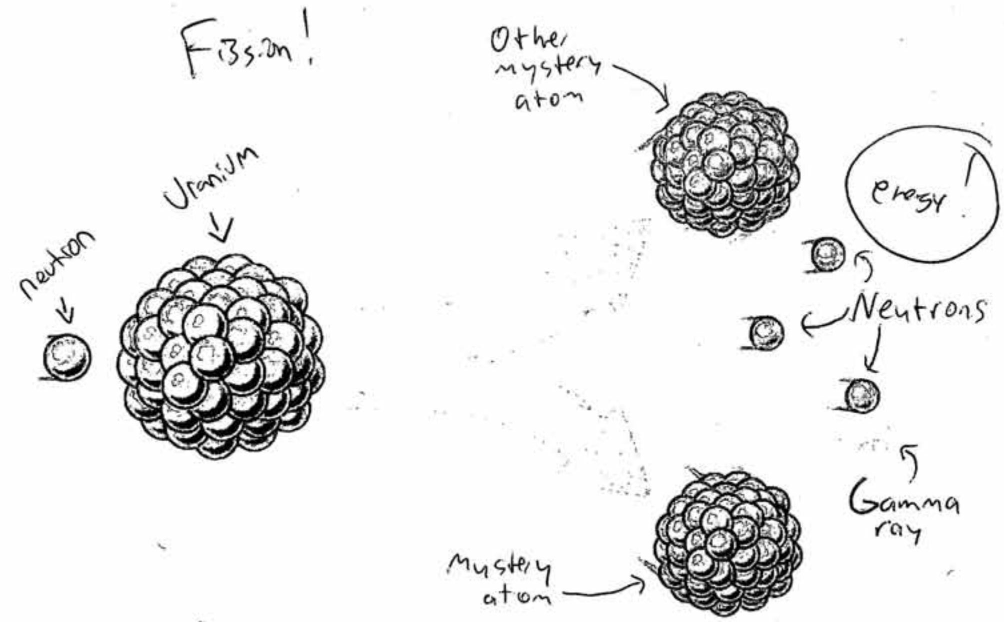
Thanks for teaching us about nuclear power! I learned a lot!
-Sarah

Thank you so much for teaching us about nuclear energy! I learned alot!
-Allison Richman

Thank you so much for taking your time to visit us and teach us alot about nuclear power!! I learned many things from you
- Hannah Kang

Thanks a lot for teaching us about Nuclear Power plants, I was really interested in the anatomy of the Nuclear Reactors!
-Brian Bradley

Thank You for taking the time to teach us about Nuclear Power! It intrigued me very much!
- Matt Molinelli



Thank you for coming and talking to us about nuclear power. I really enjoyed it and learned a lot.
-Scott McSweeney

Thank you for coming -
Aaron [illegible]

Thank you for taking time and to talk to us about nuclear energy as a reliable source of power :)
-[illegible]

Thankyou for coming and teaching us about nuclear power. -Chris

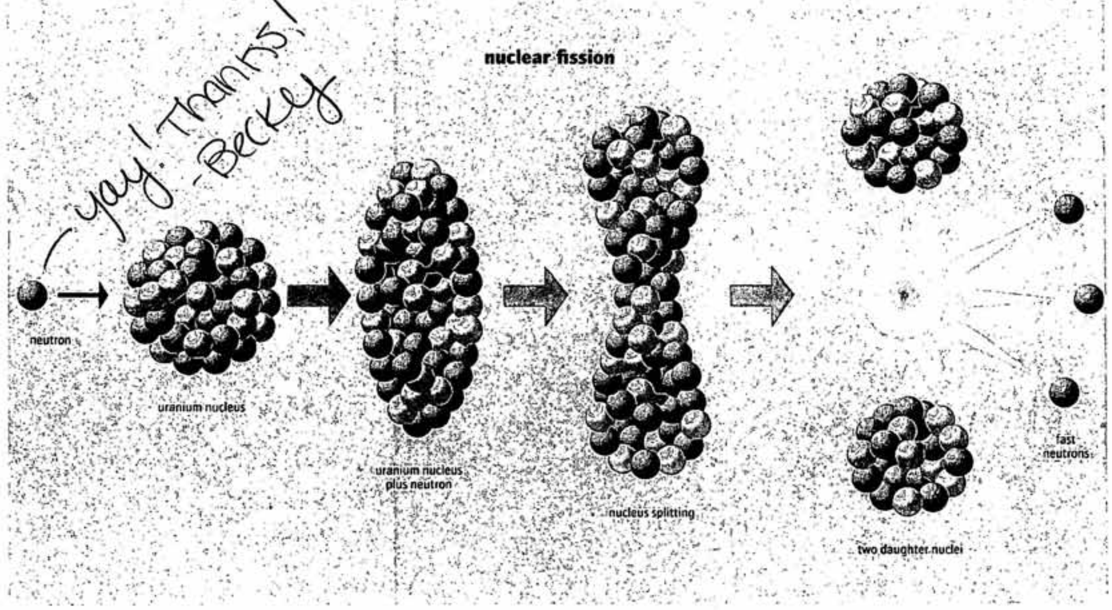
Woooo Nuclear Power

Thanks
Daniel

1

Thanks for coming,
I enjoyed your
presentation. - Mike

Thank you very much
for coming and teaching
us about nuclear power.
It was very interesting
and I learned a lot!
Thanks Again
Elizabeth Ronan



yay! Thanks!
-Becky

Thanks for coming!
It was really interesting
to learn how safe Nuclear
energy ~~is~~ is!
-Nick Pasqua

Thanks you really
convinced me that
nuclear energy is
totaly safe
-Andrew Ditabbio

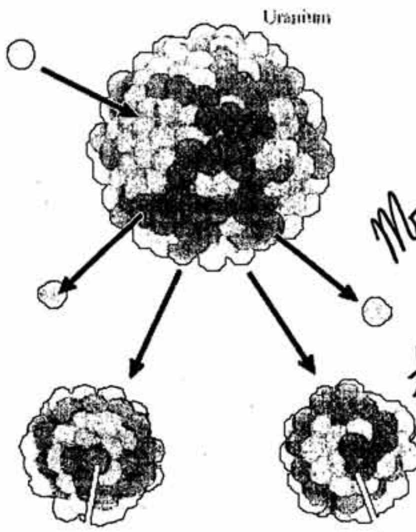
I love nuclear energy!
-Mark Schweig

Thanks for
spending time
teaching us
about nuclear
power

- Sam
Watkins

Thanks for coming
-Parr

Thank You
- Paul Williams III



Nuclear energy is
cool... And scare you!
- Corey

Mr. Falciano,
Thanks for coming
to NRHS to talk to us.
I really learned a lot
from you and enjoyed
the presentation!
- Mike

Dear Mr. Falciano,
Thank you for teaching
the class how we can
solve the energy problem,
and teaching me facts
when I want to continue
defending Nuclear power.
- Justin LaTorraca

proton
neutron
radiation

thank you for coming!
I learned a lot
- Julia

Dear Mr. Falciano,
I really enjoyed
your presentation. I
really learned a lot
about Nuclear power.
- Mia

Dear Mr. Falciano
when I came here
I thought this was
something I would
get bored. But I fund
it very entersting.
I see it to be very
simply how energe is
made. I engoyed your
spech an you were abel
To anser all my questi
Think you for comeing
- Giovanny Gomez

Dear Mr. F,
I'm glad that you were able
to clear up all the "Confusion"
about ~~...~~ nuclear power
— Max Langer

MR. VITALE: Good afternoon, my name is Paul Vitale. I'm vice president of the government relations for the Business Council of Westchester. Business Council of Westchester is Westchester’s largest business organization, representing over 1200 members ranging in size from large multinational corporations and mid-size businesses to professional firms not for profit organizations and small-business owners in every sector of the county's diverse economy. The economic situation in Westchester is increasingly distressing. As such, the closure of Indian Point, which is the backbone of Westchester County and the lower Hudson Valley's electricity network, would be economically devastating. It should be emphasized that Indian Point provides more than 75% of the electricity consumed within the lower Hudson Valley. Indian Point contributes over $50 million paid in local taxes, including sales taxes, payroll taxes, property taxes and state and local income taxes. Losing Indian Point could potentially cause major power disruptions, the loss of up to 11,000 jobs and $2.1 billion in cumulative lost wages, while Westchester's unemployment rate continues to increase. 169-a-AL/EC/SO

The closure of Indian Point could result in the doubling of the electricity rates of the second highest rates that New York homeowners and businesses currently pay. Many 169-b-AL/AQ/EC businesses in Westchester County already having trouble managing their increasing costs, including the cost of reliable electricity. The alternatives laid out to replace Indian Point do not make sense economically or environmentally for this region. Replacing Indian Point with any fossil fuel equivalent would greatly increase the carbon emissions of the region at a time when we can ill afford to do so. Indian Point has been very important to this region and our communities. The renewal of the operating license for Indian Point is crucial more than ever before. Thank you for the chance to address this audience.

169-b-AL/AQ/EC contd.

1
2

ML090780761

IPRenewalCEmails

From: Marion Walsh [marionwalsh@optonline.net]
Sent: Thursday, March 19, 2009 12:03 AM
To: IndianPointEIS Resource

To the Nuclear Regulatory Commission:

I offer the following comments to the draft plant-specific supplement to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437, regarding the renewal of operating licenses DPR-26 and DPR-64 for an additional 20 years of operation for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3), as a concerned citizen, a parent, and a resident of Cortlandt Manor since 1995. I presently serve on the Board of Education of the Hendrick Hudson School District but am commenting as a concerned individual.

I respectfully request that the Nuclear Regulatory Commission reject the conclusion that there are no environmental impacts that would preclude renewal of the operating license for the Indian Point nuclear power plant. Further, the NRC should reject the draft EIS as legally insufficient. 170-a-OR

The supplement to the Generic Environmental Impact Statement (GEIS), which is being issued for public comment that purportedly addresses the potential environmental impacts specific to the Indian Point plant site (Supplement 38 to the GEIS) , quite frankly, shocks the conscience in its superficial analysis.

I. There is no Specific Analysis of the Environmental Impact of the Continued Operation of IP2 and IP3 on Children in the area

While I recognize that children are included in the analysis of the effects of radiation on the general population, radiation risks pose the greatest risk to children. The draft EIS only mentions the following about children: 170-b-HH

"*IP2 and IP3 are located in the Hendrick Hudson Central School District, Westchester County, 10 which had an enrollment of approximately 2800 students in 2003. Including the Hendrick 11 Hudson Central School District, Westchester County has 40 school districts with a total 12 enrollment of approximately 147,000 students*".

This is inadequate.

II. The Draft EIS Does not Adequately Consider the Growth in Population

The Draft EIS has acknowledge that approximately 16,791,654 people live 8 within 50 mi (80 km) of IP2 and IP3 (Entergy 2007a). This equates to a population density of 2138persons per sq mi (825 persons per sq km). The Draft EIS has acknowledged that IP2 and IP3 are located in a high-population area. Further, county populations are expected to continue to grow in all four counties in the next decades although Westchester County's population is expected to increase at a lower rate. However, the Draft EIS does not adequately consider this population growth, particularly in planning for a severe accident. 170-c-PA/SM

III. The NRC should Reconsider Severe Accident Mitigation Alternatives

In the relicensing of an aging nuclear facility, at the very least, the NRC should be more vigilant in assessing cost measures and not engage in a pro forma, deferential analysis of the costs of safety design measures provided by the plant owner. The environmental assessment should at least basis, besides costs, for not incorporating severe accident mitigation design alternatives. 170-d-SM

Pursuant to 10 C.F. R. , § 51.30 an environmental assessment for a standard design certification must identify the proposed action, and will be limited to the consideration of the costs and benefits of severe accident mitigation design alternatives and the bases for not incorporating severe accident mitigation design alternatives in the design certification. An environmental assessment for an amendment to a design certification will be limited to the consideration of whether the design change which is the subject of the proposed amendment renders a severe accident mitigation design alternative previously rejected in the earlier environmental assessment to become cost beneficial, or results in the identification of new severe accident mitigation design alternatives, in which case the costs and benefits of new severe accident mitigation design alternatives and the bases for not incorporating new severe accident mitigation design alternatives in the design certification must be addressed.

Accordingly, I respectfully request that the NRC at the very least reconsider the benefits at least some of the following severe accident mitigation alternatives for IP2 and IP3 and not reject them only because the costs outweigh the associated benefits:
SAMA 9—Create a reactor cavity flooding system to reduce the impact of core-concrete interaction from molten core debris following core damage and vessel failure (cost beneficial in revised analysis, with uncertainties).
SAMA 28—Provide a portable diesel-driven battery charger to improve direct current (dc) power reliability. Safety-related disconnect would be used to change a selected battery. This modification would enhance the long-term operation of the turbine-driven auxiliary feed water (AFW) pump on battery depletion.
SAMA 44—Use fire water as backup for steam generator inventory to increase the availability of steam generator water supply to ensure adequate inventory for the operation of the turbine-driven AFW pump during SBO events (cost beneficial with uncertainties).
SAMA 53—Keep both pressurizer power-operated relief valve block valves open. This modification would reduce the CDF contribution from loss of secondary heat sink by improving the availability of feed and bleed (cost beneficial in revised analysis, with uncertainties).
SAMA 54—Install a flood alarm in the 480-volt (V) alternating current (ac) switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.
SAMA 56—Keep residual heat removal (RHR) heat exchanger discharge valves, motor26 operated valves 746 and 747, normally open. This procedure change would reduce the CDF contribution from transients and LOCAs (cost beneficial with uncertainties). SAMA 60—Provide added protection against flood propagation from stairwell 4 into the 480-V ac switchgear room to reduce the CDF contribution from flood sources within stairwell 4 adjacent to the 480-V ac switchgear room.
SAMA 61—Provide added protection against flood propagation from the deluge room into the 480-V ac switchgear room to reduce the CDF contribution from flood sources 33 within the deluge room adjacent to the 480-V ac switchgear room.
SAMA 65—Upgrade the alternate safe shutdown system to allow timely restoration of reactor coolant pump seal injection and cooling from events that cause loss of power from the 480-V ac vital buses.

IP3:
SAMA 30—Provide a portable diesel-driven battery charger to improve dc power reliability. Safety-related disconnect would be used to change a selected battery. This modification would enhance the long-term operation of the turbine-driven AFW pump on battery depletion.
SAMA 52—Proceduralize opening the city water supply valve for alternative AFW system pump suction to enhance the availability of AFW system.

170-d-PA/SM contd.

1
2

SAMA 53—Install an excess flow valve to reduce the risk associated with hydrogen explosions inside the turbine building or primary auxiliary building (cost beneficial in revised analysis, with uncertainties).
SAMA 55—Provide the capability of powering one safety injection pump or RHR pump using the Appendix R diesel (MCC 312A) to enhance reactor cooling system injection
12 capability during events that cause loss of power from the 480-V ac vital buses.
SAMA 61—Upgrade the alternate safe-shutdown system to allow timely restoration of reactor coolant pump seal injection and cooling from events that cause loss of power from the 480-V ac vital buses.
SAMA 62—Install a flood alarm in the 480-V ac switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.

170-d-PA/SM contd.

IV. The Ground Water Issue Requires Further Research

One of the key points on the abnormal leak and ground water monitoring program: The draft EIS states that "[*t*]*he annual calculated exposure to the maximum exposed hypothetical individual, based on application of Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluation Compliance with 10*
14 CFR Part 50, Appendix I," relative to the liquid effluent aquatic food exposure pathway is currently, and expected to remain, less than 0.1 % of the NRC's "As Low As is Reasonably Achievable (ALARA)" guidelines of Appendix I of Part 50 (3 mrem/yr (0.03 mSv/yr) total body and 10 mrem/yr (0.1 mSv/yr) maximum organ), which is considered to be negligible with respect to public health and safety, and the environment. This is by no means certain, and as noted by its own terms, is hypothetical. The NRC should require further research.

TThe National Research Council (2006) noted, for example, that ". . . the additional 2 GW required if IP2 and IP3 were to be closed could be met by some suitable combination of new generation in the New York City area, efficiency improvements and demand-side management, and new transmission capability from upstate." This is not a certain statement because the exact effects of the additional GW into the environment are unknown.

170-e-LE/WA

Conclusion

Essentially, the NRC staff has not identified any new and significant information during its independent review of the IP2 and IP3 ER, the site audit, the scoping process, or evaluation of other available information. Therefore, the NRC staff concludes that there are no offsite radiological impacts (individual effects) of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS. Essentially, the NRC is concluding that because it has not identified impacts in the past, none exist for the future. This is unsound for several reasons:
The population in the area has incaof the last twenty years is new, and the NRC, should at the very least acknowledge that the plant does pose a risk to an increased number of people if a severe accident occurs. Moreover, the radiation released from the plant poses a risk to a greater number of people.

170-f-HH/PA/UF

The NRC staff concludes that the socioeconomic impacts of plant shutdown would likely be small and have moderate effects for the Hendrick Hudson Central School District, Village of Buchanan, Town of Cortlandt, and the Verplanck Fire District. I agree with this assessment and believe that the increased safety and vitality to our area if Indian Point shuts down would more than compensate for the lost revenues. I respectfully

170-g-AL

I oppose relicensing Indian Point because I believe that the continued operation of an aging nuclear power plant in such a heavily populated area creates an unreasonable risk of harm to citizens, most of all to the most vulnerable individuals, our children. At the very least, the NRC owes a duty to those living in the shadow of IP 2 and IP3 to conduct a more thorough, searching analysis, particularly of the impacts of a severe accident as

170-h-HH/OR

1

well as day-to-day low levels of radiation. I urge you to please recognize that the health and safety of, literally, millions of citizens rely on this statement to consider all environmental impacts, including those of a catastrophic accident. The meet the requirements of the law to serve public safety and is unduly deferential to the plant owners and operators. I respectfully request that the NRC reject the Draft EIS as deficient as a matter of law and conduct further research. 170-h-HH/OR contd.

2

Marion Walsh
16 Flanders Ln.
Cortlandt Manor, NY 10567
ph: (914)739-0484

MS. WALTZER: Hi. In considering whether Indian Point should remain open or not, I'd like us to look to the past and to the future. From sitting here tonight, I realize how very important job issue is to so many people. And it's a valid issue. But I want to remind you that when we had sailboats and we went into steam boats, those sailors didn’t lose their jobs. When we had horses and went to cars, people still kept their jobs. They might have changed to something more for the future. But we still keep our jobs. They just change. 171-a-SO

The other thing I would like to remind you is that this is a human issue. These are human beings that are running Indian Point as any nuclear power plant. I'd like you to think of any realm of human endeavor. Whether it’s business, government, financial institutions, religious organizations, sports, politics, the arts, the space program, even in families. We’re human beings. And we are subject to making mistakes. To corruption. To sabotage. To blackmail. We’re vulnerable to terrorism. We make errors and so on. So I'd like to ask you, what makes you think that this aging, leaking power plant would be immune to all of these human frailties? Thank you. 171-b-PA/ST

IPRenewalCEmails

From: Jeff Wanshel [jwanshel@earthlink.net]
Sent: Wednesday, March 18, 2009 12:34 PM
To: IndianPointEIS Resource
Subject: Indian Point environmental impact comment

To the Nuclear Regulatory Commission, in re theenvironmental impact of relicensing Indian Point:

Every so often, in the moral life of those in a position of responsibility, a defining moment comes along disguised as business-as-usual.

The reactors at Indian Point have released more radioactive gases than almost any other operating nuclear facility. In so doing they have polluted the area with radioactivity. It's not a question of whether the plants have contaminated the environment, but of how much, and long-term consequences. Strontium-90 emitted by this facility has been found in fish and the bodies of citizens - mother's milk - in Westchester County and New York State. Small but continued releases, as measured at the source, may have large consequences for living organisms - cancer - due to constant exposure through repeated ingestion and internalization of radioactive particles. If the Commission cared to fund a study of radioactive contamination in living organisms surrounding the plant, it would find radioactivity moving right up the food chain. Measurements of fish and swallow eggs adjacent to another nuclear facility showed concentrations a million times radioactive content in the water. But a government body intent on subverting the intent of its charter - to protect the public - will not want to look for what it does not want to find. This facility is not only a disaster waiting to happen, it's a disgrace that has happened already. 172-a-HH/RI

Called a "nightmare" by a past NRC commissioner, the siting of these plants, in the midst of the greatest concentration of humanity of any operating facility, close to the most vital city, economically, in this country, in an area that cannot be evacuated in timely fashion, if at all, is an outrage permitted only by the willful deliberate blindness of the sitting Commission. Perhaps those who originally sited it here might now say, we couldn't foresee the future. We didn't know. The sitting committee has no such excuse. 172-b-DE/EP

As is surely known to this Commission, an Al Queda operative flatly stated Indian Point was the original 9/11 target, but that target was changed because of the scale of the damage a successful strike would entail. Thanks to long-term storage of immortal lethal toxins at the facility - the almost unimaginably radioactive contents of the spent fuel pools - no other U.S. facility has the capacity to destroy the country's economy and security via a single terrorist blow. Indian Point, and this country, were on 9/11, and are now, thanks to the NRC, living in the shadow of those planes. 172-c-ST

You took an oath to serve and protect the public. You must now find it within you to observe, not willfully obfuscating limitations that conveniently state such-and-such need not be considered so as to protect the nuclear industry, but the spirit and intent of that oath. This is not, must not be, another of the Commission's run-of-the-mill industry-yes-man rubber-stamp deliberations. This decision is vital to the health and well-being of all citizens in the tri-state area - and perhaps, if terrorism returns to these shores, the future economic well-being of every American.

Fulfill, do not willfully violate, your oath. Make the right choice. History may judge you. 172-d-LR

Respectfully,

Jeff Wanshel

IPRenewalCEmails ML 09064387

From: Roxanne Warren Architects [rwaa@verizon.net]
Sent: Friday, February 27, 2009 11:00 AM
To: IndianPointEIS Resource
Subject: close down Indian Point

to:

Chief, Rulemaking, Directives and Editing Branch
Division of Administrative Services
Office of Administration, Mailstop T-6D59,
U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001

The Indian Point nuclear plant represents an extreme danger, located so close to our major American city, New York. Not only evacuation plans are incomplete for people immediately surrounding the plant, but the plant represents a tempting target for terrorists. This is in addition to the ongoing environmental damages to the Hudson River as a habitat for fish. 173-a-AE/EP/ST

The plant should be closed down and replaced by extensive wind farms. 173-b-AL/OR

Thank you for considering my request.

Roxanne Warren, AIA
523 West 112th Street
New York, NY 10025-1680

ML090700177

IPRenewalCEmails

From:	Ellen Weininger [eeweininger@gmail.com]
Sent:	Tuesday, March 10, 2009 4:20 PM
To:	IndianPointEIS Resource
Subject:	re: Indian Point Draft EIS

Sent by email: March 10, 2009

Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Mail Stop TWB-05-B01
Washington, DC 20555-0001

Dear Panel:

The Draft EIS fails to properly and fully evaluate the long-term and cumulative effects upon human health of the planned and unplanned releases of radiation into the air, soil, groundwater and Hudson River. The Draft EIS further completely fails to look at the impact upon human health of the synergistic interactions of such radiation with other known toxins which are known to have been released into the regional environment, most notably the PCBs and mercury in the Hudson River. 174-a-HH/RI

The Draft EIS utterly and appallingly ignores the impact upon the environment and human health of keeping spent fuel and other nuclear waste on site indefinately. The evidence available strongly supports the conclusion that the Indian Point site will, de facto, become a high level nuclear waste dump for the foreseeable future. 174-b-RI

Exposure to certain environmental toxins has been linked to a growing list of health problems in children, including cancer, certain types of birth defects and developmental disabilities. Children are being exposed to an increasing number of toxins in utero, as infants and as growing children. Due to various physiological and behavioral factors, children are uniquely vulnerable to these toxins and permanent adverse health effects may result from exposure during critical windows of physiological development. 174-c-HH

The Draft EIS fails to analyze seismic hazards. This is a manifest dereliction of the NRC's duty, especially in light of recent seismic activity in the region and recent studies conducted by Columbia University's Lamont-Doherty Earth Observatory which specifically note the potential threat to Indian Point. 174-d-PA

The cost/benefit analysis of the Draft EIS is incomplete and inadequate and constitutes a violation of NEPA. It relies upon the preposterous conclusion that a major nuclear accident need not be of concern, and even if one occurred, it would not have a significant effect on the environment or public health. This flies in the face of the United States government's (including the NRC's) own former analyses. The NRC must include the postulation of a major radioactive release — the including the possibility of a meltdown and spent fuel fire – in its cost/benefit analysis. 174-e-NE/PA

The Draft EIS is defective in neglecting to evaluate the environmental risks inherent in the realities that the operator and the NRC have acknowledged that it is not feasible to fully inspect the fuel pools, the buried and embedded piping, critical electrical wiring, or the dome, where rust has already been detected. 174-f-GI/OM

The Draft EIS is defective in neglecting to evaluate the environmental risks inherent in an aging nuclear facility which has already demonstrably shown signs of deterioration. The NRC's disregard of aging as a separate crucial factor, and its reliance upon "aging management" as a failsafe for finding all potentially critical problems, not only flies in the face of standard engineering risk analysis, but is belied by the actual experience at the plant. 174-g-AM

The Draft EIS is defective in neglecting to evaluate the environmental risks created by the fireproofing exemptions given by the NRC to Indian Point. 174-h-SA

The Draft EIS is inadequate, incomplete, and cursory and fails to evaluate the options for obtaining electricity by clean, sustainable forms of energy (e.g., through solar, wind, geothermal, small hydro) or for dramatically reducing consumption (e.g., through efficiency technologies, reducing energy waste, and green buildings). The final EIS must properly evaluate the No Action Alternative. 174-i-AL

The failure of the NRC to acknowledge the above is wreckless and ill-advised and represents a complete disregard of the NRC mandate to protect human health and the environment and strongly suggests that the Draft EIS is merely a rubberstamp for Indian Point's relicensing. Substantial evidence of harm must be the trigger for action to protect innocent lives and to reject Indian Point's 174-j-OR

application for relicensing.

Sincerely,
Ellen Weininger
White Plains, New York 10606

IPRenewalCEmails ML 090720672

From: annettew8@optimum.net
Sent: Wednesday, March 11, 2009 10:12 AM
To: IndianPointEIS Resource
Subject: Do not renew their license to run Indian Point

Dear Sir or Madam,
I urge you not to renew Indian Points nuclear plant license. The management has been very lax in running the plant. There are too many people in the area who are at risk for great harm because of the accidents waiting to happen.

175-a-OP/OR/PA

Sincerely,
Annette Weininger
75 Brook Hills Circle
White Plains NY 10605

IPRenewalCEmails ML 090700183

From: Dava Weinstein [d2calstein@earthlink.net]
Sent: Monday, March 09, 2009 6:31 PM
To: IndianPointEIS Resource
Subject: Opposition to license renewal of Indian Point

Dear NRC,

We would like to register our **opposition to the license renewal of Indian Point**, and are concerned with the following environmental impacts outlined by Riverkeeper: 176-a-OR

--The slaughter of billions of fish, eggs and alrvae every year that results from Indian Point's outdated cooling water intake system, which uses billions of gallons of Hudson River water every day to keep the plant running. 176-b-AE
--The killing of shortnose and Atlantic sturgeon when they are trapped against the cooling water intake screens. Shortnose sturgeon are listed as an endangered species under the federal Endangered Species Act. 176-c-AE
--The continuing leak of radioactive water from the Indian Point 2 spent fuel pool into the groundwater and Hudson River, and the residual contamination caused by the plumes of contaminated groundwater that slowly leach toxic strontium-90 and cesium-137 into the Hudson River. 176-d-LE
--The long tern storage of thousands of tons of highly toxic nuclear waste on the banks of the Hudson River, currently housed in poorly maintained spent fuel pools and "dry casks" that are vulnerable to terrorist attack. 176-e-RW/SF/ST

We depend on regulatory bodies like yours to make our New York communities safer and more sustainable. Indian Point is too old with too many insurmountable problems to continue with its license. Thank you for your attention and we await your just action. 176-f-OR

Sincerely, Dorothy Calvani
Dava Weinstein

MR. WILSON: Thank you. Good evening. My name is Craig Wilson. I am the Executive Director of SHARE. SHARE is a non-profit coalition of organizations that are committed to ensuring the continued supply of reliable clean and affordable electricity for all New Yorkers. We're especially pleased today that we have members of SHARE that made the trip from various parts of the city: Brooklyn, many of our folks are from. May you all have a round. And some great signs too that you can show. For too long high electricity prices have placed an undue economic burden on New York's families and businesses. While poor air quality has led to high asthma rates which place our most vulnerable at risk. Right now, as we all are too well aware, we are in the midst of a most severe economic crisis since the Great Depression. Community residents, small businesses and working men and women from communities across the region are struggling. And yet there is a light at the end of the tunnel that we can see right now. Recognizing the turmoil within our economy, now is not the time to shut our source of clean, safe and affordable power for the region. 177-a-AQ/EC/SO

As much as 40% of our power, used for everything from our schools, hospitals and businesses comes from the Indian .Energy Center. If it were to be closed, it is estimated that electricity costs for small, excuse me, electricity costs for small businesses could rise as much as $10,000 annually, while 177-b-EC individual residences would pay an additional $1500 a year. Our members simply are not able to pay these dramatically higher electricity bills particularly in these economic times.

177-b-EC contd.

Beyond the financial benefits, the Indian Point Energy Center greatly reduces the amount of pollution emitted into our air. Unlike all other power plants within the region, Indian Point does not release asthma causing pollutants or greenhouse gases into the atmosphere. This is of great benefit to our air quality as nearly all the counties served by Indian Point consistently have their air-quality rated an `F` by the American Lung Association. Clearly, we need more clean energy facilities like Indian Point, not fewer.

177-c-AQ

Moreover, many of the members of our members live in low-income communities where asthma rates are four times the national average. And one in four children suffer from this serious life altering disease. Nearly one third of New York City children with asthma reside in the Bronx with neighborhoods like Hunts Point and Mont Haven having among the highest asthma rates in the country. For these reasons, SHARE and its member organizations, firmly support the continued operation of the clean, safe and secure Indian Point Energy Center. Additionally, we are committed to working with local stakeholders in the New York metropolitan area to provide to provide all New Yorkers with the clean and affordable power they deserve. Thank you.

177-d-AQ/EJ/SR

SHARE

SAFE
HEALTHY
AFFORDABLE
RELIABLE
ENERGY

WWW.SHARENY.ORG

Mr. Andrew Stuyvenberg
Environmental Project Manager
Division of License Renewal, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop 0-11F1
Washington, DC 2055-0001

RE: February 12, 2009 Public Hearing on the Relicensing of the Indian Point Energy Center

Good evening, my name is Craig Wilson and I am the Executive Director of SHARE. SHARE is a non-profit coalition of organizations committed to ensuring the continued supply of reliable, clean and affordable electricity for all New Yorkers. For too long, high electricity prices have placed an undue economic burden on New York's families and businesses, while poor air quality has led to high asthma rates which place our most vulnerable at risk.

Right now, as we are all too well aware, we are in the midst of the most severe economic crisis since the Great Depression. Community residents, small businesses and working men and woman from communities across the region are struggling. And as of right now, there isn't yet light at the end of the tunnel. 177-a-AQ/EC/SO

Recognizing the turmoil within our economy, now is not the time to shutter a source of clean, safe and affordable power for the region. As much as 40% of our power, used for everything from our schools, hospitals and businesses, comes from the Indian Point Energy Center. And if it were to be closed, it is estimated that electricity costs for small businesses would rise $10,000 annually while individual residences would pay an additional $1,500. Our members are simply not able to pay these dramatically higher electricity bills, particularly in these economic times. 177-b-EC

Beyond the financial benefits, the Indian Point Energy Center greatly reduces the amount of pollution emitted into our air. Unlike all other power plants within the region, Indian Point does not release asthma causing pollutants or greenhouse gases into the atmosphere. This is of great benefit to our air quality as nearly all of the counties served by Indian Point consistently have their air quality rated an F by the American Lung Association. Clearly, we need more clean energy facilities like Indian Point, and not fewer. 177-c-AQ

Moreover, many of members live in low-income communities where asthma rates are four times the national average and one in four children suffer from this serious, life-altering disease. Nearly one-third of New York City children with asthma reside in the Bronx, with neighborhoods like Hunts-Point and Mott Haven having among the highest rates of asthma in the country.

For these reasons, SHARE, and its member organizations, firmly support the continued operation of the clean, safe and secure Indian Point Energy Center. Additionally, we are committed to working with local stakeholders in the New York metropolitan area to provide all New Yorkers with the clean and affordable power they deserve. Thank you. 177-d-AQ/EJ/SR

445 HAMILTON AVENUE
SUITE 1102
WHITE PLAINS, NY 10601
PHONE: (914) 422-8042
FAX: (914) 422-0282

305 BROADWAY
14TH FLOOR
NEW YORK, NY 10007
PHONE: (212) 897-5842
FAX: (212) 897-5827

1

IPRenewalCEmails ML090640359

From: Leigh Withrow [leighw79@gmail.com]
Sent: Friday, February 27, 2009 3:55 AM
To: IndianPointEIS Resource
Subject: Do not relicense Indian Point.

Do Not relicense Indian Point. 20 more years of contamination will only get worse!

The continuing leak of radioactive water from the Indian Point 2 spent fuel pool into the groundwater and Hudson River, and the residual contamination caused by the plumes of contaminated groundwater that slowly leach toxic strontium-90 and cesium-137 into the Hudson River.

The long term storage of thousands of tons of highly toxic nuclear waste on the banks of the Hudson River, currently housed in poorly maintained spent fuel pools and "dry casks" that are VULNERABLE.

178-a-LE/OR/RW

Leigh Ann Withrow

MR. WOLF: Good afternoon. While I am certainly sympathetic to the comments that have been made about the environment, I believe this meeting is about the environment and specifically the environmental statement. Rather than going through the thousand of pages of material, I'd like to get back to basics. Because sometimes we're so inundated by the information that is contained in these documents that we lose sight of what we really need to consider and what the NRC needs to consider. The NRC's 2008 citizen's report states that the NRC's vision is quote excellence in regulating the safe and secure use and management of radioactive materials for public good unquote. They also say that their number one strategic goal is safety, as evidenced by the first strategic outcome, which is to quote prevent the occurrence of any releases of any radioactive materials that would result in significant radiation exposures unquote and/or quote adverse environmental impacts unquote. Which is on page 8. Their factors, which singley or certainly in combination, create an untenable environmental risk regarding the releases of radioactive material regarding Indian Point. Including but not limited to number one: the type of above ground storage of spent fuel.

179-a-SA/SF/RW

Again this report on page 7 says, typically the spent fuel from nuclear power plants is stored either in water filled pools at each reactor site or as a storage facility in Illinois unquote. And that quote several nuclear power plants have also begun not using dry-cask to store spent fuel and that the heavy metal in concrete casks rests on concrete pads adjacent to the reactor facility. My understanding is that this type of storage is not as safe as underground in water. Now, we know that a lot of this has come because Yucca Mountain cannot accept the nuclear waste that was envisioned when the plant was created. But nonetheless, we have to deal with the reality of what this means in storing these casks above ground. 179-a-SA/SF/RW contd.

Two: the unusual high number of leaks or shutdowns and other indications of mismanagement of the facility has compromised the safety for the community around it and the apparent continuation of its radioactive leaks is indicated that Indian Point is not responsibly dealing with the environmental and safety aspect of this plant. 179-b-LE/OP/SA

Three: the plant falls on a fault-line creating an earthquake risk, which means that if there is an earthquake and storage facilities are not adequate that radiation will go throughout the community. 179-c-PA

Four: again, it's not Indian Point’s initial problem because they didn't build the plant, but the fact is that it is perilously close to high population areas. 179-d-DE

Five: there is the possibility of the continuation of radioactive leaks and further contamination into the Hudson River. 179-e-LE/WA

Six: even though we're now in the year 2009, the threats that were created in 2001, still exist and are still a problem, especially when you’re talking about aboveground storage of spent nuclear waste. 179-f-RW/SF/ST

And seven: we don't know and I don't think from what I've seen that the report adequately deals with the fact that you're now going to have a plant that's 40 to 60 years old. And we don't have a very good safety record dealing with the first 40 years, and I think that the NRC needs to look at this as well. 179-g-AM

We all take risks every day. Even driving here to make this statement involved risk. But we must evaluate the risk/reward ratio and make a determination. The NRC also must make a determination as to the continued safety and viability of having Indian Point operate for another 20 years. Based on the risks outlined above as well as other risks that have been discussed in these reports, it would 179-h-OR/SA seem incumbent upon the Nuclear Regulatory Commission in its primary goal of excellence in regulating safe and secure management of radioactive materials for the public good to turn down the application for the re-licensing of Indian Point. Thank you.

179-h-OR/SA contd.

25 Main Street – Suite B
Hastings-on-Hudson, NY 10706
March 17, 2009

VIA OVERNIGHT COURIER and E-MAIL

Nuclear Regulatory Commission
11545 Rockville Pike – Room T-6D559
Rockville, MD 20852

Attn: Chairman Dale E. Klein

re: Environmental Impact Statement: License Renewal Application: DPR-26 & DPR-64
Indian Point Nuclear Generating Units 2 and 3 – Buchanan, NY (owned by Entergy)

Dear Mr. Klein:

These comments are in response to the Environmental Impact Statement (EIS) prepared as part of the re-licensing process regarding the application by Entergy for a 20 year extension to continue operating Indian Point Units 2 & 3.

It appears that the full import of some critical environmental factors is not properly considered in the EIS, and should be a vital part of the NRC's review process; the factors of particular concern include, but are not limited to:

- Close proximity to a densely populated area (24 miles north of New York City),
- Location on a fault line, which has shown recent earthquake activity,
- Potentially Attractive Target to Terrorists,
- Manner in which Nuclear Waste is stored above ground,
- Continued Operation continuing to kill aquatic species in the Hudson River,
- History of Leaks & Shutdowns about 5 times higher than the national average,
- Unknown risks attendant with additional 20 years operation for this Facility,
- No credible study of the effects of different types of 'accidents' at Indian Point on surrounding areas, especially considering the history of other nuclear accidents

179-i-OE

If the NRC ignores does not properly consider the above environmental factors, then it would seem that it cannot fulfill its self-stated vision of "Excellence in regulating the safe and secure management of radioactive materials for the public good."

I strongly urge the NRC fully consider the environmental factors, which were and which should have been discussed in the EIS, in determining whether to re-license the two Indian Point units.

Sincerely Yours,

Peter D. Wolf

ML090700178

IPRenewalCEmails

From: Patti Wood [pjw@grassrootsinfo.org]
Sent: Tuesday, March 10, 2009 4:02 PM
To: IndianPointEIS Resource
Subject: Indian Point

To Whom it May Concern:

I write with the greatest concern over the operation of the ENTERGY nuclear power plant at Indian Point. My life's work involves the protection of humans from environmental hazards and I see too many innocent people as victims of large corporations that ignore the tremendous impact they are having on local populations by operating unsafe industries.

Please consider the following points as you proceed with the licensing process:

The Draft EIS fails to properly and fully evaluate the long-term and cumulative effects upon human health of the planned and unplanned releases of radiation into the air, soil, groundwater and Hudson River. The Draft EIS further completely fails to look at the impact upon human health of the synergistic interactions of such radiation with other known toxins which are known to have been released into the regional environment, most notably the PCBs and mercury in the Hudson River. 180-a-HH/LE/RI

The Draft EIS is inadequate, incomplete, and cursory and utterly fails to evaluate the options for obtaining electricity by clean, sustainable forms of energy (e.g., through solar, wind, geothermal, small hydro) or for dramatically reducing consumption (e.g., through efficiency technologies, reducing energy waste, and green buildings). The final EIS must properly evaluate the No Action Alternative. 180-b-AL

The Draft EIS fails to properly and fully evaluate the impact of Indian Point on the aquatic ecology of the Hudson River and related waterways, especially with respect to endangered species and the coastal zone. 180-c-AE

The Draft EIS fails to evaluate the impact of global warming - including the projected warming of the Hudson River and the projected increase and severity of storms and flooding - upon Indian Point. Two examples: (1) The warming of the Hudson River will exacerbate the impact of the hot plume of water expelled by Indian Point into the river. (2) Increased storms and flooding will exacerbate the corrosion, rusting, etc. of underground piping and other systems at the plant, thereby increasing the likelihood of more accidental radiation releases such as the one discovered in February 2009. 180-d-AM/GL

The Draft EIS fails to analyze seismic hazards. This is a manifest dereliction of the NRC¹s duty, especially in light of recent seismic activity in the region and recent studies conducted by Columbia University¹s Lamont-Doherty Earth Observatory which specifically note the potential threat to Indian Point. 180-e-PA

The Draft EIS utterly and appallingly ignores the impact upon the environment and human health of keeping spent fuel and other nuclear waste on site indefinitely. The evidence available strongly supports the conclusion that the Indian Point site will, de facto, become a high level nuclear waste dump for the foreseeable future. 180-f-RW

The cost/benefit analysis of the Draft EIS is incomplete and inadequate and constitutes a violation of NEPA. Notably, it relies upon the preposterous conclusion that a major nuclear accident need not be of concern, and even if one occurred, it would not have a significant effect on the environment or public health. This flies in the face of the United States government¹s (including the NRC¹s) own former analyses. The NRC must include the postulation of a major radioactive release -- the including the possibility of a meltdown and spent fuel fire - in its cost/benefit analysis. 180-g-NE/PA

The Draft EIS is defective in neglecting to evaluate the environmental risks inherent in the realities that the operator and the NRC have acknowledged that it is not feasible to fully inspect the fuel pools, the buried and embedded piping, critical electrical wiring, or the dome, where rust has already been detected. 180-h-GI/OM

The Draft EIS is defective in neglecting to evaluate the environmental risks inherent in an aging nuclear facility which has already demonstrably shown signs of deterioration. The NRC[1]s disregard of aging as a separate crucial factor, and its reliance upon [3]aging management[2] as a failsafe for finding all potentially critical problems, not only flies in the face of standard engineering risk analysis, but is belied by the actual experience at the plant. 180-i-AM

The Draft EIS is defective in neglecting to evaluate the environmental risks created by the fireproofing exemptions given by the NRC to Indian Point. 180-j-OM

Thank you for your attention.

Patti Wood
Executive Director
Grassroots Environmental Education
52 Main Street
Port Washington, NY 11050
PH (516) 883-0887
FX (516) 944-6586
www.grassrootsinfo.org

MR. YANOFSKY: Boy, that's a tough act to follow and I'm in the performing arts. I'm violating the cardinal rule which is never follow a great act. But my name is John Yanofsky and I'm here under three auspices.

The first is I'm the executive director of the Paramount Center for the Arts, which is a non-profit organization housed in an historic theater built in 1930 located in downtown Peekskill. I'm also a board member of the Westchester Arts Council, which now goes by the name of Arts Westchester, which is a countywide organization that not only re-grants to non-profits throughout the county, but also does an extensive amount of direct services and programs out of their headquarters in downtown White Plains. And thirdly, I'm a homeowner and resident here in Peekskill.

I am here to strongly urge the renewal of the Indian Point license. The parent company of Indian Point, Entergy has been a model corporate citizen to the Paramount, to Arts Westchester, to dozens of arts organizations through out the region as well as non-profits. There are few corporations in the county who do more for the non-profit sector than Entergy. Their commitment to the quality-of-life issues that we all face is reflected in their demonstrative commitment to supporting essential programs and services that 181-a-SE/SR non-profits like the Paramount provide and serve in the community and to our residents. Specifically with respect to the Paramount, Entergy was there for our organization during a very critical period when we began our revitalization and restoration of our historic theater and they were the lead supporter of our ability to renovate a historic theater, which now draws tens of thousands of people to downtown Peekskill to support local businesses and restaurants and have become, our theater has become a major anchor to the downtown revitalization in Peekskill. We could not have accomplished that without the support of Entergy.

I've also had the personal honor and privilege to serve with several Entergy employees in my role as a board member of Arts Westchester, as well as on the Board of Trustees at the Paramount Center. In addition to volunteers and colleagues that I've come into contact with, not only through my work at the Paramount, but in other organizations who donate their time and services to the quality-of-life and improving the quality of life in our county. Entergy's support is also instrumental to the vitality of other arts organizations, as I alluded to. And certainly, given our current financial situations becomes even more desperate and dire situation. For some organization's, Entergy’s support

181-a-SE/SR contd.

really means and make the difference between staying open and closing its doors. As a business professional, as a resident of this county, someone who lives and works here and has dedicated his professional life to the ongoing improvement through culture and artistic expression, I strongly urge the NRC to re-license Indian Point for another 20 years and to keep Entergy a vital force in our communities and in the lives of our county. Thank you.

181-a-SE/SR contd.

ML090720678

IPRenewalCEmails

From: JUDITH YARME [yarmeco@aol.com]
Sent: Thursday, March 12, 2009 6:15 PM
To: IndianPointEIS Resource
Subject: re-licensing

To Whom it may Concern,

I attended a hearing of the NRC re: the re-licensing of the Indian Point plant for 20 more years. I was shocked. I thought Oh My God, the government agency meant to regulate and protect us, is in the pocket of industry.

Briefly, I don't believe that relicensing, for any period of time, should proceed before Entergy complies with all existing laws and regulations. Apparently, they have not addressed numerous leaks of radioactive material into the groundwater and into the Hudson. Now a new leak has been identified. This is strontium 90 we are talking about!

182-a-LE/OR

Daily fish kills are un-addressed, heated water being dumped back into the river is un-addressed. High and low level nuclear waste on site remains un-addressed, health concerns of citizens remains un-addressed.

182-b-AE/HH/RW/SF

More frightening still is the serious risk of terrorism against this power plant. It seems a wonderful target to those who would do us harm. It could turn New York City, and of course, a huge radius around the city, into a new Chernobyl. Clearly, there is no way to make this site, with it's stored nuclear waste, safe from an attack. And the arguments about the siren systems are ridiculous, there is no way to evacuate the area. All those close-in are already dead or dying if there is an attack, or even an accident.

182-c-EP/ST

The meeting I attended felt rigged and deceitful. There were groups of inner city people who were supporting the relicensing because they have clearly been coached that their utility rates would go up if this plant is not operating. Or more dirty coal plants will be placed in minority communities if this plant does not remain operational.

Scare tactics from the NRC? Unbelievable. They talked about the increases in the need for more energy for all the appliances we will want in the future. They belittled the options for sustainable energy.

There was scant mention of conservation, better distribution of existing power or scaling back on our thirst for more electricity.

These comments were couched in terms of the limits of alternatives.

If we are able to commit to solar, wind, wave, tidal, and other alternative energy in the future, there will be safer, cleaner and cheaper ways to provide power to the cities, particularly if we stop subsidizing dirty power, high risk power. Moving ahead with this old technology in the 21st century will take this country back in time. If Indian Point "needs" to continue, than at least only license for one year at a time, giving Entergy time to comply with the laws and fix the problems before offering them this huge 20 year extension.

182-d-AL/EJ/OR

Sincerely,
Judith Yarme, Gardiner New York

IPRenewalCEmails ML090771344

From: yaronet1@aol.com
Sent: Monday, March 16, 2009 12:54 PM
To: IndianPointEIS Resource
Cc: info@riverkeeper.org
Subject: License Renewal

I live within the 10-mile radius of Indian Point and wanted to voice my concerns regarding the license renewal of Indian Point Units 2 and 3.

As a supporter of Riverkeeper, I totally agree with all the environmental hazard concerns already raised by this organization. The impact on Hudson River fish, spent fuel pool leaks of strontium-90, cesium 137, tritium and boric acid are unacceptable. The ever-increasing amount (1,500 tons currently?) of nuclear waste stored aboveground is dangerous and would only get worse if the license is renewed. Since the new administration has decided to slash its funding and not pursue the Yucca Mountain project, what is Entergy's plan for storage? 183-a-EP/HH/PA

I'd also like to know how Entergy monitors its 239-acre underground cable system, some of which was recently submerged under water. How can Entergy possibly detect, evaluate or prevent future problems with such an aging infrastructure? 183-b-AM/OM

I urge you to PLEASE not only focus on the above risks but also on the big picture and cumulative impacts of smaller issues and not overlook human considerations in the relicensing discussion. Whenever there's an incident at Indian Point, all we hear from the NRC is that "...it's safe; nothing significant; no need to worry...". Indian Point gets a "green" light every time! Meanwhile, we live in constant fear, ready to take our potassium iodide tablets, don our gas masks and run with our backpacks; but, where can we go? The so-called "evacuation plan" is totally useless in this heavily congested area. Even without a major incident at Indian Point, there are health threats involving thyroid and childhood cancer. And, to top it off, Indian Point sits above the Ramapo fault, which is not very comforting! 183-c-EP/HH/PA

Finally, the vulnerability of Indian Point to a terrorist attack is very scary. The new administration seems to have somewhat softened its position on terrorists as well as illegal aliens. This could adversely affect Indian Point security. 183-d-ST

Since I am sure, no matter what the public says, the NRC will renew Indian Point's license, I hope, at least, there will be a NO-FLY ZONE instituted over the plant; otherwise we will be forced to continue living with this ticking time bomb in our backyards!

Helen Yaroscak-Lanzotti
Yorktown Heights, New York

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, had overall responsibility for the preparation of this supplement, assisted by staff from other NRC organizations, AECOM, and Pacific Northwest National Laboratory.

Name	Function or Expertise
U.S. Nuclear Regulatory Commission	
Andrew Stuyvenberg	Environmental Project Manager/Alternatives
Rani Franovich	Branch Chief
David Wrona	Branch Chief
Bo Pham	Branch Chief
Andy Imboden	Branch Chief
Dennis Beissel	Hydrology/Water Use
Elizabeth Wexler	Ecology
Dennis Logan	Ecology
Briana Balsam	Ecology
Jeffrey Rikhoff	Socioeconomics/Land Use/Env. Justice
Jennifer Davis	Historical/Archeological Resources
Steve Klementowicz	Radiation Protection/Human Health
Andrew Carrera	Radiation Protection/Human Health
Ekaterina Lenning	Air Quality
Robert Palla	Severe Accident Mitigation Alternatives
Tina Ghosh	Severe Accident Mitigation Alternatives
Paula Cooper	Comment Resolution
April Bebault	Comment Resolution
AECOM	
Roberta Hurley	Project Manager
Kevin Taylor	Alternatives
Stephen Duda	Ecology
Stephen Dillard	Terrestrial Ecology

Name	Function or Expertise
Ed Kaczmarczyk	Air Quality
Matthew Goodwin	Historical/Archeological Resources
Robert Dover	Alternatives/Nuclear Fuel Cycle
Nicole Spangler	Project Coordinator
Katie Broom	Project Support
Bonnie Freeman	Administrative Support
Pacific Northwest National Laboratory	
Jeffrey A. Ward	Aquatic Ecology
Valerie Cullinan	Aquatic Ecology
Lance W. Vail	Hydrology/Water Use
Sandia National Laboratory	
Joseph Jones	Severe Accident Mitigation Alternatives
Nathan Bixler	Severe Accident Mitigation Alternatives
Fotini Watson	Severe Accident Mitigation Alternatives

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to the Entergy Nuclear Operations, Inc.

Application for License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to the Entergy Nuclear Operations, Inc., Application for License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Entergy Nuclear Operations, Inc. (Entergy), and other correspondence related to the NRC staff's environmental review under Title 10, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" of the *Code of Federal Regulations* (10 CFR Part 51), of Entergy's application for renewal of the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3. All documents, with the exception of those containing proprietary information, have been placed in the NRC's Public Document Room at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. These documents are also available electronically from the Public Electronic Reading Room found on the Internet at http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records component of ADAMS. The ADAMS accession numbers for each document are included below.

April 23, 2007	Letter to NRC from Entergy forwarding the application for renewal of operating licenses for Indian Point Nuclear Generating Units 2 and 3, requesting extension of operating licenses for an additional 20 years. (Accession No. ML071207512)
April 23, 2007	Letter to NRC from Entergy forwarding a copy of reference documents used in preparing the Environmental Report (Appendix E) for the Indian Point Nuclear Generating Units 2 and 3 license renewal application. (Accession No. ML071210108)
May 7, 2007	Letter to Entergy from NRC, "Receipt and Availability of the License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3." (Accession No. ML071080133)
May 7, 2007	Letter to Ms. Patricia Thorsen, White Plains Public Library, from NRC, "Maintenance of Reference Materials at the White Plains Public Library Related to the Review of the Entergy Nuclear Operations, Inc., License Renewal Application." (Accession No. ML071070518)
May 7, 2007	Letter to Ms. Resa Getman, Hendrick Hudson Free Library, from NRC, "Maintenance of Reference Materials at the Hendrick Hudson

	Free Library Related to the Review of the Entergy Nuclear Operations, Inc., License Renewal Application." (Accession No. ML071080080)
May 7, 2007	Letter to Ms. Susan Thaler, The Field Library, from NRC, "Maintenance of Reference Materials at The Field Library Related to the Review of the Entergy Nuclear Operations, Inc., License Renewal Application." (Accession No. ML071080122)
July 25, 2007	Letter to Entergy from NRC transmitting "Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application from Entergy Nuclear Operations, Inc. for Renewal of Operating Licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3." (Accession No. ML071900365)
August 6, 2007	Letter to Entergy from NRC, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for License Renewal for Indian Pont Nuclear Generating Unit Nos. 2 and 3," and forwarding *Federal Register* notice. (Accession No. ML071840939)
August 9, 2007	Memorandum on "Forthcoming Meeting to Discuss Environmental Scoping Process for Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application." (Accession No. ML072180296)
August 9, 2007	Letter to New York State Office of Parks, Recreation, and Historic Preservation from NRC, "Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point) License Renewal Application Review (SHPO No. 06PR06720)." (Accession No. ML072130333)
August 9, 2007	Letter to Advisory Council on Historic Preservation from NRC, "Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072130367)
August 16, 2007	Letter to Mr. David Stillwell, U.S. Fish and Wildlife Service (USFWS), "Request for List of Protected Species Within the Area Under Evaluation for the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072130211)
August 16, 2007	Letter to Mr. Peter Colosi, National Marine Fisheries Service (NMFS), "Request for List of Protected Species and Essential Fish Habitat Within the Area Under Evaluation for the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072130388)
August 24, 2007	Letter to Mr. Andy Warrior, Absentee Shawnee Tribe of Oklahoma,

	"Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250103)
August 24, 2007	Letter to The Honorable Maurice John, Cattaraugus Reservation, Seneca Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250171)
August 24, 2007	Letter to Mr. Clint Halftown, Cayuga Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250394)
August 24, 2007	Letter to Ms. Nikki Owings-Crumm, Delaware Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250459)
August 24, 2007	Letter to The Honorable Jerry Douglas, Delaware Tribe of Indians, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250488)
August 24, 2007	Letter to The Honorable C.W. Longlow, Echota Chickamauga Cherokee Tribe of New Jersey, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072250534)
August 24, 2007	Letter to The Honorable Michael Thomas, Mashantucket Pequot Tribe, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260033)
August 24, 2007	Letter to Ms. Jeanne Schbotte, Mohegan Tribe, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260047)
August 24, 2007	Letter to Mr. Ray Halbritter, Oneida Indian Nation of New York, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260201)
August 24, 2007	Letter to Council of Chiefs, Onondaga Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260245)

August 24, 2007	Letter to The Honorable Dwaine Perry, Ramapough Lenape, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260491)
August 24, 2007	Letter to Mr. Mike John, Seneca Nation of Indians, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072260519)
August 24, 2007	Letter to Mr. Randy Kind, Shinnecock Tribe, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072270070)
August 24, 2007	Letter to The Honorable Harry B. Wallace, Unkechaug Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072270113)
August 24, 2007	Letter to The Honorable Leo Henry, Tuscarora Nation, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072270548)
August 24, 2007	Letter to The Honorable Roger Hill, Tonawanda Band of Senecas, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072270590)
August 24, 2007	Letter to Ms. Sherry White, Stockbridge-Munsee Community Band of Mohican Indians, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review" (Accession No. ML072270615)
August 24, 2007	Letter to Mr. Ken Jock, St. Regis Mohawk Tribal Council, "Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML072280045)
August 29, 2007	Letter to NRC from USFWS, "Indian Point Nuclear Generating Unit Nos. 2 and 3 Protected Species Response." (Accession No. ML0732307840)
October 4, 2007	Letter to NRC from NMFS regarding endangered species near Indian Point Nuclear Generating Unit Nos. 2 and 3. (Accession No. ML073340068)

October 5, 2007	Letter to NRC from New York State Department of Environmental Conservation (NYSDEC), "Indian Point Units 2 and 3 Relicensing Extension Request for Scoping Comments on SEIS." (Accession No. ML072820746)
October 10, 2007	Letter to NRC from NYSDEC, "Indian Point Units 2 and 3 Relicensing Extension Request for Scoping Comments on SEIS." (Accession No. ML072900470)
October 11, 2007	Letter to NYSDEC from NRC regarding extension request for scoping comments. (Accession No. ML072840275)
October 24, 2007	"Meeting Summary of Public Environmental Scoping Meetings Related to the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application (TAC nos. MD5411 and MD5412)." (Accession No. ML072851079)
November 8, 2007	Summary of Site Audit Related to the Review of the License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3. (Accession No. ML073050267)
November 14, 2007	Letter to NRC from Entergy, "Supplement to License Renewal Application (LRA) Environmental Report References." (Accession No. ML073330590)
November 27, 2007	Letter to NYSDEC from NRC, "Request for List of State Protected Species Within the Area Under Evaluation for the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review." (Accession No. ML073190161)
December 5, 2007	Letter to Entergy from NRC, "Request for Additional Information Regarding Environmental Review for Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal (TAC nos. MD5411 and MD5412)." (Accession No. ML073330931)
December 7, 2007	Letter to Entergy from NRC, "Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal (TAC nos. MD5411 and MD5412)." (Accession No. ML073110447)
December 20, 2007	Letter to NRC from Entergy, "Supplement to License Renewal Application (LRA)—Environmental Report References." (Accession No. ML080080205)
December 28, 2007	Letter to NRC from NYSDEC regarding rare or State-listed animals and plants, significant natural communities, and other habitats on or in the vicinity of the Indian Point site. (Accession No. ML080070085, withheld from public disclosure per request by NYSDEC)

January 4, 2008	Letter to NRC from Entergy, "Reply to Request for Additional Information Regarding Environmental Review for License Renewal Application." (Accession No. ML080110372)
January 10, 2008	Letter to NRC from Entergy, "Supplemental Response to Request for Additional Information Regarding Environmental Review for License Renewal Application." (Accession No. ML080220165)
January 30, 2008	Letter to NRC from Entergy, "Supplemental Response to Request for Additional Information Regarding Environmental Review for License Renewal Application." (Accession No. ML080380096)
February 20, 2008	Letter to NRC from Entergy, "Document Request for Additional Information Regarding Environmental Review for License Renewal Application—Electronic Copy of Impingement Data—Tables 4-1 and 4-2 of the 1990 Annual Report (EA 1991)." (Accession No. ML080580408)
February 28, 2008	Letter to NRC from NMFS, "Essential Fish Habitat Information Request for Docket Nos. 50-247 and 50-286; Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal; at the Village of Buchanan, Town of Cortlandt, Westchester County, NY." (Accession No. ML080990403)
March 7, 2008	Letter to NRC from Entergy, "Document Request for Additional Information Regarding Environmental Review for License Renewal Application—Hudson River Fisheries Program Data (Year Class Report)." (Accession No. ML080770457)
April 9, 2008	Letter to Entergy from NRC, "Request for Additional Information Regarding the Review of the License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC nos. MD5411 and MD5412)." (Accession No. ML080880104)
April 14, 2008	Letter to Entergy from NRC, "Request for Additional Information Regarding the Review of the License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC nos. MD5411 and MD5412)." (Accession No. ML080940408)
April 23, 2008	Letter to Entergy from NRC, "Revision of Schedule for the Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application (TAC nos. MD5411 and MD5412)." (Accession No. ML081000441)
April 23, 2008	Letter to NRC from Entergy, "Reply to Document Request for Additional Information Regarding Site Audit Review of License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3." (Accession No. ML081230243)

May 14, 2008	Letter to NRC from Entergy, “Reply to Request for Additional Information Regarding License Renewal Application—Refurbishment.” (Accession No. ML081440052)
May 22, 2008	Letter to NRC from Entergy, “Supplemental Reply to Request for Additional Information Regarding License Renewal Application—Severe Accident Mitigation Alternatives Analysis.” (Accession No. ML081490336)
December 19, 2008	Letter to Entergy from NRC, “Issuance of Environmental Scoping Summary Report Associated with the Staff’s Review of the Application for Renewal of the Operating Licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC Nos. MD5411 and MD5412).” (Accession No. ML083360062)
December 22, 2008	Letter to Entergy from NRC, “Notice of Availability of the Draft Plant-Specific Supplement 38 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC Nos. MD5411 and MD5412).” (Accession No. ML083390523)
December 22, 2008	Letter to U.S. Environmental Protection Agency from NRC, “Notice of Availability of the Draft Plant-Specific Supplement 38 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3.” (Accession No. ML083400180)
December 22, 2008	Letter to New York State Historic Preservation Officer (Ms. Carol Ash) from NRC, “Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review.” (Accession No. ML083400192)
December 22, 2008	Letter to National Marine Fisheries Service (Ms. Mary Colligan) from NRC, “Biological Assessment for License Renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3.” (Accession No. ML083450723)
January 12, 2009	Letter to Delaware Nation of Oklahoma (Ms. Danieala Nieto) from NRC, “Request for Comments Concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3, Draft Supplemental Environmental Impact Statement.” (Accession No. ML083500409)
February 24, 2009	Letter from National Marine Fisheries Service (Ms. Mary Colligan) to NRC, “RE: Biological Assessment for License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3.” (Accession No. ML090820316)
March 11, 2009	Letter to NRC from U.S. Environmental Protection Agency (John

	Filippelli). (Accession No. ML090860878)
April 30, 2009	Letter to National Marine Fisheries Service (Mr. Peter Colosi) from NRC, “Essential Fish Habitat Assessment for License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC Nos. MD5411 and MD5412)”. (Accession No. ML090790176)
July 1, 2009	Letter to NRC from Entergy, “Transmission of Additional Requested Information Regarding Sturgeon Impingement Data.” (Accession No. ML091950345)
November 24, 1009	Letter from Entergy to NRC, “Request for Additional Information Related to License Renewal Indian Point Nuclear Application Environmental Report - Impingement Data.” (Accession No. ML093420528)
December 11, 2009	Letter from Entergy to NRC, “License Renewal Application - SAMA Reanalysis Using Alternate Meteorological Tower Data.” (Accession No. ML093580089.)
December 17, 2009	Letter from Entergy to NRC, “Documents Related to License Renewal Application - Environmental Report.” (Accession No ML100290495)
January 14, 2010	Letter to NRC from Entergy, “License Renewal Application - Supplement to SAMA Reanalysis Using Alternate Meteorological Tower Data.” (Accession No. ML100260750)
February 2, 2010	Letter to Entergy from NRC, “Revision of Schedule for Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application.” (Accession No. ML100110063)
May 25, 2010	Letter to Entergy from NRC, “Revision of Schedule for Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application.” (Accession No. ML101260536)
May 27, 2010	Letter to NRC from Entergy, “Correction to License Renewal Application (TAC Nos. MD5407 and MD5408) Indian Point Unit Numbers 2 and 3.” (Accession No. ML101590515)
August 31, 2010	Letter to Entergy from NRC, “Revision of Schedule for Review of the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application.” (Accession No. ML101260536)
September 21, 2010	Letter to National Marine Fisheries Service (Mr. Peter D. Colosi) from NRC, “Essential Fish Habitat Consultation for License Renewal of Indian Point Nuclear Generating Unit Nos. 2 and 3 (TAC Nos. MD5411 and MD5412).” (Accession No. ML092860253)
September 27, 2010	Letter to New York State Office of Parks, Recreation and Historic

	Preservation (Ms. Ruth L. Pierpont) from NRC, "Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review (SHPO No. 06PR06720)." (Accession No. ML092860228)
October 12, 2010	Letter to NRC from National Marine Fisheries Service (Mr. Peter D. Colosi), "Re: Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal; Docket Nos. 50-247 and 50-268 [sic]; Essential Fish Habitat Consultation." (Accession No. ML102930012)
October 26, 2010	Letter to NRC from New York State Office of Parks, Recreation and Historic Preservation (Mr. Thomas B. Lyons), "Re: NRC, Indian Point License Renewal, Buchanan, Westchester County." (Accession No. ML103060210)

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

The U.S. Nuclear Regulatory Commission contacted the following Federal, State, regional, and local agencies, and Native American Tribes, during its independent review of the environmental impacts related to the application by Entergy Nuclear Operations, Inc., for renewal of the operating licenses for Indian Point Nuclear Generating Units Nos. 2 and 3:

Absentee Shawnee Tribe of Oklahoma

Cattaraugus Reservation, Seneca Nation

Cayuga Nation

Delaware Nation

Delaware Tribe of Indians

Echota Chickamauga Cherokee Tribe of New Jersey

National Marine Fisheries Service

New York State Department of Environmental Conservation

New York State Office of Parks, Recreation and Historic Preservation, Historic Preservation Field Services Bureau

Oneida Indian Nation of New York

Onondaga Nation

Ramapough Lenape, Ramapough Tribal Office

Seneca Nation of Indians

Seneca Nation Tribal Historic Preservation

Shinnecock Tribe

St. Regis Mohawk Tribal Council

Stockbridge-Munsee Community Band of Mohican Indians, Tribal Historic Preservation Office

The Mashantucket Pequot Tribe (CT)

The Mohegan Tribe (CT)

Tonawanda Band of Senecas

Tuscarora Nation

Unkechaug Nation

U.S. Environmental Protection Agency, Region 2

U.S. Fish and Wildlife Service

Appendix E

Compliance Status and Consultation Correspondence

Appendix E

Indian Point Nuclear Generating Unit Nos. 2 and 3 Compliance Status and Consultation Correspondence

Consultation correspondence related to the evaluation of the application for renewal of the operating licenses for Indian Point Nuclear Generating Units 2 and 3 (IP2 and IP3, respectively) is identified in Table E-1. Copies of the correspondence are included in this appendix.

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for SSES are listed in Table E-2.

Table E-1. Consultation Correspondence

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (R. Franovich)	State Historical Preservation Office (Office of Parks, Recreation, and Historic Preservation, R. L. Pierpont)	August 9, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Advisory Council on Historic Preservation (D. Klima)	August 9, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	U.S. Fish and Wildlife Service (D. Stillwell)	August 16, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	National Marine Fisheries Service (P. Colosi)	August 16, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Absentee Shawnee Tribe of Oklahoma (A. Warrior)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Cattaraugus Reservation, Seneca Nation (The Hon. M. John)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Cayuga Nation (C. Halftown)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Delaware Nation (N. Owings-Crumm)	August 24, 2007

U.S. Nuclear Regulatory Commission (R. Franovich)	Delaware Tribe of Indians (The Hon. J. Douglas)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Echota Chickamauga Cherokee Tribe of New Jersey (The Hon. C.W. Longlow)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Mashantucket Pequot Tribe (The Hon. M. Thomas)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Mohegan Tribe (J. Schbotte)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Oneida Indian Nation of New York (R. Halbritter)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Onondaga Nation (Council of Chiefs)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Ramapough Lenape (The Hon. D. Perry)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Seneca Nation of Indians (M. John)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Shinnecock Tribe (R. Kind)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Unkechaug Nation (The Hon. H. B. Wallace)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Tuscarora Nation (The Hon. L. Henry)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Tonawanda Band of Senecas (The Hon. R. Hill)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Stockbridge-Munsee Community Band of Mohican Indians (S. White)	August 24, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	St. Regis Mohawk Tribal Council (K. Jock)	August 24, 2007
U.S. Fish and Wildlife Service (M. VanDonsell and R. Niver)	U.S. Nuclear Regulatory Commission (R. Franovich)	August 29, 2007
Delaware Nation (D. Nieto)	U.S. Nuclear Regulatory Commission	September 5, 2007
National Marine Fisheries Service (M. A. Colligan)	U.S. Nuclear Regulatory Commission (R. Franovich)	October 4, 2007

U.S. Nuclear Regulatory Commission (R. Franovich)	New York State Dept. of Environmental Conservation (J. Pietrusiak)	November 11, 2007
New York State Department of Environmental Conservation (T. Seoane)	U.S. Nuclear Regulatory Commission (R. Franovich)	December 28, 2007
National Marine Fisheries Service (P. Colosi)	U.S. Nuclear Regulatory Commission (R. Franovich)	February 28, 2008
U.S. Nuclear Regulatory Commission (D. Wrona)	New York State Historic Preservation Office (Carol Ash)	December 22, 2008
U.S. Nuclear Regulatory Commission (D. Wrona)	National Marine Fisheries Service (M.A. Colligan)	December 22, 2008
U.S. Nuclear Regulatory Commission (D. Wrona)	Delaware Nation (D. Nieto)	January 12, 2009
National Marine Fisheries Service (M.A. Colligan)	U.S. Nuclear Regulatory Commission (D. Wrona)	February 24, 2009
U.S. Nuclear Regulatory Commission (D. Wrona)	National Marine Fisheries Service (P. Colosi)	April 30, 2009
U.S. Nuclear Regulatory Commission (D. Wrona)	National Marine Fisheries Service (P. Colosi)	September 21, 2010
U.S. Nuclear Regulatory Commission (D. Wrona)	New York State Office of Parks, Recreation and Historic Preservation (R. Pierpont)	September 27, 2010
National Marine Fisheries Service (P. Colosi)	U.S. Nuclear Regulatory Commission (D. Wrona)	October 12, 2010
New York State Office of Parks, Recreation and Historic Preservation (T. Lyons)	U.S. Nuclear Regulatory Commission (D. Wrona)	October 26, 2010

Table E-2. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for the Indian Point site

Agency	Authority	Description	Number	Expiration Date	Remarks
NRC	10 CFR Part 50	Possession License, Indian Point Unit 1	DPR-5	09/28/13	Authorizes SAFSTOR for Unit 1
NRC	10 CFR Part 50	Operating license, IP2	DPR-26	09/28/13	Authorizes operation of IP2
NRC	10 CFR Part 50	Operating license, IP3	DPR-64	12/10/15	Authorizes operation of IP3
DOT	49 CFR Part 107	IP2 Hazardous Materials Certificate of Registration	051909552037 RT	06/30/12	Radioactive and hazardous materials shipments
DOT	49 CFR Part 107	IP3 Hazardous Materials Certificate of Registration	05919552032R T	06/30/12	Radioactive and hazardous materials shipments
EPA	40 CFR Part 264	IP2 Hazardous Solid Waste Amendment Permit (1)	NYD991304411	10/14/02	Accumulation and temporary onsite storage of mixed waste for >90 days
EPA	40 CFR Part 264	IP3 Hazardous Solid Waste Amendment Permit (2)	NYD085503746	10/17/01	Accumulation and temporary onsite storage of mixed waste for >90 days
NYSDEC	6 NYCRR Part 325	IP2 Pesticide Application Business Registration	12696	04/30/12	Pesticide application
NYSDEC	6 NYCRR Part 325	IP3 Pesticide Application Business Registration	13163	04/30/12	Pesticide application
NYSDEC	6 NYCRR Parts 704 and 750	IP1, 2, and 3 SPDES Permit (3)	NY 000 4472	10/01/92[3]	Discharge of wastewaters and stormwaters to waters of the State
NYSDEC	6 NYCRR Part 704	Simulator Transformer Vault SPDES Permit	NY 025 0414	02/28/13	Discharge of wastewaters to waters of the State

Agency	Authority	Description	Number	Expiration Date	Remarks
NYSDEC	6 NYCRR Part 704	Buchanan Gas Turbine SPDES Permit	NY 022 4826	02/28/13	Discharge of wastewaters to waters of the State
NYSDEC	6 NYCRR Part 750	ISFSI Project SPDES Multi-Sector General Permit	NYR 00E 125	NA	Stormwater discharge during construction of dry cask spent fuel storage
NYSDEC	6 NYCRR Parts 200 and 201	IP2 Air Permit	3-5522-00011/00026	NA	Operation of air emission sources (boilers, turbines and generators)
NYSDEC	6 NYCRR Parts 200 and 201	IP3 Air Permit	3-5522-00105/00009	NA	Operation of air emission sources (boilers, turbines and generators)
NYSDEC	6 NYCRR Part 596	IP2 Hazardous Substance Bulk Storage Registration Certificate	3-000107	09/04/11	Onsite bulk storage of hazardous substances
NYSDEC	6 NYCRR Part 596	IP3 Hazardous Substance Bulk Storage Registration Certificate	3-000071	08/16/12	Onsite bulk storage of hazardous substances
NYSDEC	6 NYCRR Part 610	IP2 Major Oil Storage Facility [(4)]	3-2140	--	Onsite bulk storage of >400,000 gallons of petroleum products
NYSDEC	6 NYCRR Part 372	IP2 Hazardous Waste Generator Identification	NYD991304411	NA	Hazardous waste generation
NYSDEC	6 NYCRR Part 372	IP3 Hazardous Waste Generator Identification	NYD085503746	NA	Hazardous waste generation
NYSDEC	6 NYCRR Part 373	IP2 Hazardous Waste Part 373 Permit [(5)]	NYD991304411	02/28/07	Accumulation and temporary onsite storage of mixed waste for >90 days

Agency	Authority	Description	Number	Expiration Date	Remarks
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP2 Gas Turbine 1 Air Permit	#00021	12/31/12	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP2 Gas Turbine 2 Air Permit	#00022	12/31/12	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP2 Gas Turbine 3 Air Permit	#00023	12/31/12	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP2 Boiler Permit	52-4493	NA	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP2 Vapor Extractor Air Permit	VE0001	12/31/12	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP3 Vapor Extractor Air Permit (6)	NA	NA	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP3 Boiler Permit	52-6497	NA	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP3 Training Center Boiler Permit	52-6498	NA	Operation of an air contamination source
WCDOH	Chapter 873, Article XIII, Section 873.1306.1 of the Laws of Westchester County	IP3 Vapor Extractor Air Permit	--	--	Operation of an air contamination source
WCDOH	Westchester County Sanitary Code, Article XXV	IP3 Petroleum Bulk Storage Registration Certificate	3-166367	09/07/10	Onsite Bulk Storage of Petroleum Products

Agency	Authority	Description	Number	Expiration Date	Remarks
TDEC	Tennessee Department of Environment and Conservation Regulations	IP2 Tennessee Radioactive Waste-License-for-Delivery	T-NY-010-L09	12/31/10	Shipment of radioactive material into Tennessee to a disposal/ processing facility.
TDEC	Tennessee Department of Environment and Conservation Regulations	IP3 Tennessee Radioactive Waste-License-for-Delivery	T-NY-005-L09	12/31/10	Shipment of radioactive material into Tennessee to a disposal/ processing facility.

Notes:

(1) IP2 Hazardous Solid Waste Amendment Permit = Permit has been administratively continued based on conditional mixed waste exemption.

(2) IP3 Hazardous Solid Waste Amendment Permit = Permit has been administratively continued based on conditional mixed waste exemption.

(3) IP1, 2, and 3 SPDES Permit = Timely Renewal application was submitted; therefore, permit is administratively continued under New York Administrative Procedures Act.

(4) IP2 Major Oil Storage Facility = Timely renewal application was submitted; therefore, permit is administratively continued under New York Administrative Procedures Act.

(5) IPs Hazardous Waste Part 373 Permit = Timely renewal application was submitted; therefore, permit is administratively continued under New York Administrative Procedures Act.

(6) IP3 Vapor Extractor Air Permit = Application has been submitted to WCDOH, but permit has not yet been issued.

CFR = Code of Federal Regulations

DOT = U.S. Department of Transportation

EPA = U.S. Environmental Protection Agency

IP 2 = Indian Point, Unit 2

IP 3 = Indian Point, Unit 3

NRC = U.S. Nuclear Regulatory Commission

NYCRR = New York Codes, Rules, and Regulations

NYSDEC = New York State Department of Environmental Conservation

SAFSTOR = Safe Storage

SPDES = State Pollutant Discharge Elimination System

TDEC = Tennessee Department of Environment and Conservation

WCDOH = Westchester County Department of Health

August 9, 2007

Ms. Ruth L. Pierpont, Director
New York State Office of Parks, Recreation
and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, P.O. Box 189
Waterford, NY 12188-0189

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3 (INDIAN POINT) LICENSE RENEWAL APPLICATION REVIEW (SHPO NO. 06PR06720)

Dear Ms. Pierpont:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for Indian Point, which is located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is operated by Entergy Nuclear Operations, Inc. (Entergy). The application for renewal was submitted by Entergy by letter dated April 23, 2007, and supplemented by letters dated May 3, and June 21, 2007, pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

In the context of the National Historic Preservation Act of 1966, as amended, the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities specifically related to license renewal may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

On September 19, 2007, the NRC will conduct two public NEPA scoping meetings at the Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, NY. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The staff expects to publish the draft SEIS in July 2008.

R. Pierpont -2-

If you have any questions or require additional information, please contact Ms. Jill Caverly, Environmental Project Manager, by phone at 301-415-6699 or by email at jsc1@nrc.gov.

Sincerely,

/RA/
Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 9, 2007

Mr. Don L. Klima, Director
Advisory Council on Historic Preservation
Office of Federal Agency Programs
1100 Pennsylvania Ave, NW, Suite 803
Washington, DC 20004

SUBJECT: INDIAN POINT GENERATING UNIT NOS. 2 & 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Klima:

The U.S. Nuclear Regulatory Commission (NRC and the staff) is reviewing an application to renew the operating licenses for Indian Point Generating Unit Nos. 2 & 3 (Indian Point) which is located in Buchanan, New York, approximately 24 miles north of the New York City boundary line. Indian Point is operated by Entergy Nuclear Operations, Inc. (Entergy). The application for renewal was submitted by Entergy by letter dated April 23, 2007, and supplemented by letters dated May 3, and June 21, 2007, pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC's regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

The NRC staff plans to hold two public NEPA scoping meetings on September 19, 2007, at Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, New York. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m., with a repeat of the overview portions of the first meeting, and will continue until 10:00 p.m., as necessary. In addition, staff will conduct a site audit September 10-14, 2007, at Indian Point. You and your staff are invited to attend both the public meetings and the site audit. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is late July 2008.

D. Klima -2-

If you have any questions or require additional information, please contact the Environmental Project Manager, Ms. Jill Caverly at 301-415-6699 or via e-mail at jsc@nrc.gov.

Sincerely,

/RA/
Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50–268

cc: See next page

August 16, 2007

Mr. David Stillwell
Field Supervisor
U.S. Fish and Wildlife Service
New York Field Office
3817 Luker Road
Cortland, NY 13045

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 & 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. David Stillwell:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Entergy Nuclear Operations, Inc., for the renewal of the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 & 3 (Indian Point). Indian Point is located in Buchanan, New York, approximately 24 miles north of the New York City boundary line. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The proposed action is to renew the facility operating licenses for Indian Point for an additional 20 years beyond the expiration of the current operating licenses. The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The Indian Point site covers approximately 239 acres. Indian Point is bordered on the north, south and east by partially wooded privately owned land and on the west by the Hudson River. Enclosures 1 and 2 provide a general overview of the site location and site layout.

Indian Point is equipped with a once-through open-cycle cooling system that withdraws cooling water from and discharges back into the Hudson River. The intake system includes seven bays for each unit located at the shore. Six 96-inch pipes discharge water beneath the water's surface within a 40-foot wide discharge canal.

The transmission lines in the scope of NRC's environmental review for license renewal are those that were originally constructed for the specific purpose of connecting the plant to the transmission system. The transmission line corridor to the Buchanan Substation (approximately 2100 feet southeast from the reactors, just across Broadway from the facility's main entrance) is located in the industrial portion of the site, except for where the lines cross Broadway. This transmission line corridor is being evaluated as part of the environmental review process.

D. Stillwell -2-

The enclosed transmission line map shows the transmission system that is being evaluated in the SEIS. Two 345-kilovolt (kV) lines connect Indian Point to the Buchanan Substation. This corridor also includes 138-kV transmission lines that supply offsite power from the substation into Indian Point.

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests information on Federally-listed, proposed, and candidate species and critical habitat that may be in the vicinity of Indian Point and its associated transmission line rights-of-way. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public NEPA scoping meetings on September 19, 2007, at Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, New York. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m., with a repeat of the overview portions of the first meeting, and will continue until 10:00 p.m., as necessary. In addition, the NRC staff plans to conduct a site audit at Indian Point during the week of September 10, 2007. You and your staff are invited to attend both the public meetings and the site audit. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is late July 2008.

If you have any questions concerning the NRC staff's review of this LRA, please contact Ms. Jill Caverly, Project Manager, at 301-415-8450 or via e-mail at jsc1@nrc.gov.

Sincerely,

/RA/
Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosures:
1. Site Location
2. Site Layout

cc w/encls: See next page

August 16, 2007

Mr. Peter Colosi
Habitat Conservation Coordinator
National Marine Fisheries Service
One Blackburn Drive
Glouster, MA 01930

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES AND ESSENTIAL FISH HABITAT WITHIN THE AREA UNDER EVALUATION FOR THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Colosi:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Entergy Nuclear Operations, Inc. for the renewal of the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point). Indian Point is located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to marine resources and habitat. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended; the Fish and Wildlife Coordination Act of 1934, as amended; and the Sustainable Fisheries Act of 1996.

The proposed action is to renew the facility operating licenses for Indian Point for an additional 20 years beyond the expiration of the current operating licenses. The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The Indian Point site covers approximately 239 acres. Indian Point is bordered on the north, south and east by partially wooded privately owned land and on the west by the Hudson River. Enclosures 1 and 2 provide a general overview of the site location and site layout.

Indian Point is equipped with a once-through open-cycle cooling system that withdraws cooling water from and discharges back into the Hudson River. The intake system includes seven bays for each unit located at the shore. Six 96-inch pipes discharge water beneath the water's surface within a 40-foot wide discharge canal.

P. Colosi -2-

The transmission lines in the scope of NRC's environmental review for license renewal are those that were originally constructed for the specific purpose of connecting the plant to the transmission system. The transmission line corridor to the Buchanan Substation (approximately 2100 feet southeast from the reactors, just across Broadway from the facility's main entrance) is located in the industrial portion of the site, except for where the lines cross Broadway. This transmission line corridor is being evaluated as part of the SEIS process. The enclosed transmission line map shows the transmission system that is being evaluated in the SEIS. Two 345-kilovolt (kV) lines connect Indian Point to the Buchanan Substation. This corridor also includes 138-kV transmission lines that supply offsite power from the substation into Indian Point.

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests information on Federally listed, proposed, and candidate species and critical habitat that may be in the vicinity of the Indian Point site. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act. Also, in support of the SEIS preparation and to ensure compliance with Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act, the NRC requests a list of essential fish habitats that have been designated in the vicinity of the Indian Point site.

On September 19, 2007, the NRC staff plans to hold two public NEPA scoping meetings at the Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. The NRC staff plans to conduct a site audit at the Indian Point site during the week of September 10, 2007. You and your staff are invited to attend both the public meetings and the site audit. In addition, your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is July 2008.

If you have any questions concerning the NRC staff review of this LRA, please contact Ms. Jill Caverly, Project Manager at 301-415-6699 or jsc1@nrc.gov.

Sincerely,

/RA/
Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosures:
As stated

cc w/encls: See next page

August 24, 2007

Mr. Andy Warrior
Director, Cultural Preservation
Absentee Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Warrior:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Absentee Shawnee Tribe of Oklahoma. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Absentee Shawnee Tribe of Oklahoma to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

A. Warrior -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Absentee Shawnee Tribe of Oklahoma may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

A. Warrior -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Maurice John, President
Cattaraugus Reservation, Seneca Nation
140 Rt. 438
Irving, NY 14081

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear President John:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Cattaraugus Reservation, Seneca Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Cattaraugus Reservation, Seneca Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

M. John -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Cattaraugus Reservation, Seneca Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

M. John -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Mr. Clint Halftown
Representative
Cayuga Nation
P.O. Box 11
Versailles, NY 14168

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Halftown:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Cayuga Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Cayuga Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Cayuga Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

C. Halftown -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Ms. Nikki Owings-Crumm
Environmental Director
Delaware Nation
P.O. Box 825
Andarko, OK 73005

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Owings-Crumm:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Delaware Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Delaware Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

N. Owings-Crumm -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Delaware Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

N. Owings-Crumm -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Jerry Douglas, Chief
Delaware Tribe of Indians
Delaware Tribal Headquarters
170 North East Barbara
Bartlesville, OK 74006

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Douglas:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Delaware Tribe of Indians. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Delaware Tribe of Indians to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Delaware Tribe of Indians may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

J. Douglas -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable C.W. Longlow, Chief
Echota Chickamauga Cherokee Tribe
of New Jersey
1164 Stuyvesant Avenue
Irvington, NJ 07111

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Longlow:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Echota Chickamauga Cherokee Tribe of New Jersey. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Echota Chickamauga Cherokee Tribe of New Jersey to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

C.W. Longlow -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Echota Chickamauga Cherokee Tribe of New Jersey may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

C.W. Longlow -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Michael Thomas, Chairman
Mashantucket Pequot Tribe
110 Pequot Trail
P.O. Box 3180
Mashantucket, CT 06339

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chairman Thomas:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Mashantucket Pequot Tribe. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Mashantucket Pequot Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

M. Thomas -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Mashantucket Pequot Tribe may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

M. Thomas -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Ms. Jeanne Schbotte
Mohegan Tribe
5 Crow Hill Road
Uncasville, CT 06382

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Schbotte:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Mohegan Tribe. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Mohegan Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Mohegan Tribe may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

J. Schbotte -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Mr. Ray Halbritter, Nation Representative
Oneida Indian Nation of New York
Genessee Street, Ames Plaza
Oneida, NY 13421

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Halbritter:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Oneida Indian Nation of New York. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Oneida Indian Nation of New York to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

R. Halbritter -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Oneida Indian Nation of New York may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

R. Halbritter -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Council of Chiefs
Onondaga Nation
258 C Route 11a
Onondaga Nation
Nedrow, NY 13120

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Council Members:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Onondaga Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Onondaga Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

Council of Chiefs -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Onondaga Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Dwaine Perry, Chief
Ramapough Lenape
Ramapough Tribal Office
189 Stag Hill Road
Mahwah, NJ 07430

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Perrry:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Ramapough Lenape. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Ramapough Lenape to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

D. Perry -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Ramapough Lenape may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

D. Perry -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Mr. Mike John
Conservationist
Seneca Nation of Indians
P.O. Box 231
Salamanca, NY 14479

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. John:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Seneca Nation of Indians. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Seneca Nation of Indians to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

M. John -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Seneca Nation of Indians may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

M. John -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Mr. Randy Kind, Chairman
Shinnecock Tribe
Rte 27-A, Montauk Hwy
Southhampton, NY 11968

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chairman Kind:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Shinnecock Tribe. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Shinnecock Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Shinnecock Tribe may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

R. Kind -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Harry B. Wallace, Chief
Unkechaug Nation
P.O. Box 86
Mastic, New York 11950

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Wallace:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Unkechaug Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Unkechaug Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

H. Wallace -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Rd. in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Unkechaug Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

H. Wallace -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

The Honorable Leo Henry, Chief
Tuscarora Nation
5616 Walmore Road
Lewiston, New York 14092

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Henry:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Units No. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Tuscarora Nation. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Tuscarora Nation to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Tuscarora Nation may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

L. Henry -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

DISTRIBUTION: See next page

August 24, 2007

The Honorable Roger Hill, Chief
Tonawanda Band of Senecas
7027 Meadville Road
Bason, New York 14013

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Hill:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Units No. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Tonawanda Band of Senecas. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Tonawanda Band of Senecas to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

R. Hill -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Tonawanda Band of Senecas may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

R. Hill -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Ms. Sherry White
Tribal Historic Preservation Officer
Stockbridge-Munsee Community Band of
Mohican Indians
W13447 Camp 14 Road
Bowler, WI 54416

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. White:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the Stockbridge-Munsee Community Band of Mohican Indians. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the Stockbridge-Munsee Community Band of Mohican Indians to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

S. White -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the Stockbridge-Munsee Community Band of Mohican Indians may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington D.C. 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

S. White -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

August 24, 2007

Mr. Ken Jock
Council Member
St. Regis Mohawk Tribal Council
412 State Route 37
Akwesasne, NY 13655

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Jock:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Entergy Nuclear Operations (Entergy) for the renewal of the operating licenses for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point), located in Buchanan, NY, approximately 24 miles north of the New York City boundary line. Indian Point is in close proximity to lands that may be of interest to the St. Regis Mohawk Tribal Council. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, Section 51.28(b), the NRC invites the St. Regis Mohawk Tribal Council to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966 through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for Indian Point will expire in September, 2013, and December, 2015. Entergy submitted its application for renewal of the Indian Point operating licenses in a letter dated April 23, 2007, as supplemented by letters dated May 3 and June 21, 2007.

The NRC is gathering information for an Indian Point site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The supplement will contain the results of the review of the environmental impacts on the area surrounding the Indian Point site related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others), and will contain a recommendation regarding the environmental acceptability of the license renewal action.

K. Jock -2-

To accommodate interested members of the public, the NRC will hold two public scoping meetings for the Indian Point license renewal supplement to the GEIS on Wednesday, September 19, 2007, at The Colonial Terrace, located at 119 Oregon Road in Cortlandt Manor, NY. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) is publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The accession number for the LRA is ML071210507. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

The Indian Point LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. In addition, the Hendrick Hudson Free Library, located in Montrose, NY, the Field Library, located in Peekskill, NY, and the White Plains Public Library located in White Plains, NY, have agreed to make the LRA available for public inspection.

The GEIS, which documents the NRC's assessment of the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site, can also be found on the NRC's website or at the NRC's PDR.

Please submit any comments that the St. Regis Mohawk Tribal Council may have to offer on the scope of the environmental review by October 12, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPointEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

K. Jock -3-

The staff expects to publish the draft supplement to the GEIS in July 2008. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft supplemental environmental impact statement (SEIS). A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for Indian Point is planned for April 2009. If you need additional information regarding the environmental review process, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or at jsc1@nrc.gov.

Sincerely,

/RA Christian Jacobs for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: See next page

Delaware Nation

Environmental Programs

P.O. Box 825
Anadarko, OK 73005
405 / 247-2448 x 137
Fax: 405 / 247-9393

RECEIVED

2007 SEP 12 AM 9: 57

RULES AND DIRECTIVES BRANCH USNRC

5/11/07
72 FR 26850

2

September 5, 2007

U.S. Nuclear Regulatory Commission
Chief of Rules and Directives Branch
Division of Administrative Services
Mail Stop T-6D59
Washington, D.C. 20555-0001

Re: Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application Review

Dear Sir:

I am writing in regard to your letter dated August 24, 2007 requesting comments concerning the Indian Point Nuclear Generating Unit Nos. 2 and 3 license renewal application review. As mentioned in the environmental report, the Delaware people were one of the aboriginal entities located in the Hudson-Mohawk Basin in the early 17th century and should have been one of the initial consulting parties. As one of the aboriginal entities, we are very interested in being a part of the review process not only for cultural preservation but for environmental protection as well.

In order for Delaware Nation personnel to be thoroughly informed about this project and to provide comments we would like to request status as a consulting party. With this status, we are confident that you would be able to forward a copy of all formal documents sent to all consulting parties prior to the August 24, 2007 letter we received. It is important to the Delaware Nation that all cultural sites are properly maintained and the environmental impacts be reviewed before further action is taken.

Thank you for contacting the Delaware Nation to be included in the review of this application renewal. We look forward to your quick response and receipt of the documents requested to continue a productive relationship with your organization. If you have any questions or require additional information, you may contact Mrs. Danieala Nieto, Acting Director of Environmental Programs and/or Ms. Tamara Francis, Cultural Preservation Director by telephone at (405) 247-2448 or by fax at (405) 247-9393.

Sincerely,

Danieala Nieto

Danieala Nieto, Air Program Coordinator and Acting Director
Delaware Nation of Oklahoma Environmental Programs

cc: Tamara Francis, Cultural Preservation Director
Orvel Gibson, Tribal Administrator

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = Bo Pham (bmp)

Jill Caverly - Indian Point Nuclear Generating Unit Nos. 2 and 3 Protected Species Response

From: <MaryEllen_VanDonsel@fws.gov>
To: <jsc1@nrc.gov>
Date: 08/29/2007 11:06 AM
Subject: Indian Point Nuclear Generating Unit Nos. 2 and 3 Protected Species Response

Please see the attached file for our response from the U.S. Fish and Wildlife Service.

MaryEllen VanDonsel
U.S. Fish and Wildlife Service
3817 Luker Road
Cortland, NY 13045
Phone: 607-753-9334
Fax: 607-753-9699

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New York Field Office
3817 Luker Road
Cortland, NY 13045
Phone: (607) 753-9334 Fax: (607) 753-9699
http://www.fws.gov/northeast/nyfo

Project Number: 70193

To: Rani Franovich Date: 8-29-07

Regarding: Indian Point Nuclear Generating Units 2 and 3

Town/County: Buchanan / Westchester

We have received your request for information regarding occurrences of Federally-listed threatened and endangered species within the vicinity of the above-referenced project/property. Due to increasing workload and reduction of staff, we are no longer able to reply to endangered species list requests in a timely manner. In an effort to streamline project reviews, we are shifting the majority of species list requests to our website at http://www.fws.gov/northeast/nyfo/es/section7.htm. Please go to our website and print the appropriate portions of our county list of endangered, threatened, proposed, and candidate species, and the official list request response. Step-by-step instructions are found on our website.

As a reminder, Section 9 of the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) prohibits unauthorized taking* of listed species and applies to Federal and non-Federal activities. Additionally, endangered species and their habitats are protected by Section 7(a)(2) of the ESA, which requires Federal agencies, in consultation with the U.S. Fish and Wildlife Service (Service), to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. An assessment of the potential direct, indirect, and cumulative impacts is required for all Federal actions that may affect listed species. For projects not authorized, funded, or carried out by a Federal agency, consultation with the Service pursuant to Section 7(a)(2) of the ESA is not required. However, no person is authorized to "take"* any listed species without appropriate authorizations from the Service. Therefore, we provide technical assistance to individuals and agencies to assist with project planning to avoid the potential for "take," or when appropriate, to provide assistance with their application for an incidental take permit pursuant to Section 10(a)(1)(B) of the ESA.

Project construction or implementation should not commence until all requirements of the ESA have been fulfilled. If you have any questions or require further assistance regarding threatened or endangered species, please contact the Endangered Species Program at (607) 753-9334. Please refer to the above document control number in any future correspondence.

Endangered Species Biologist: Robyn A. Niver RAN

*Under the Act and regulations, it is illegal for any person subject to the jurisdiction of the United States to ***take*** (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these), import or export, ship in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any endangered fish or wildlife species and most threatened fish and wildlife species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. "Harm" includes any act which actually kills or injures fish or wildlife, and case law has clarified that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish or wildlife.

New York State Department of Environmental Conservation
Office of General Counsel, 14th Floor
625 Broadway, Albany, New York 12233-1500
FAX: (518) 402-9018 or (518) 402-9019
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

October 5, 2007

Via e-mail and Regular First Class Mail

Mr. Bo Pham
Senior Project Manager - Indian Point Relicensing Application
Division of License Renewal
Mail Stop 0-7B1
United States Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Re: Indian Point Units 2 and 3 Relicensing
Extension Request for Scoping Comments on SEIS

Dear Mr. Pham:

The State of New York respectfully requests an extension until October 31, 2007, in which to file written Scoping Comments on the draft Supplemental Environmental Impact Statement (SEIS) that the Nuclear Regulatory Commission (NRC) is preparing in conjunction with the relicensing application filed by Entergy Nuclear Operations, Inc., for the Indian Point nuclear power plants (Indian Point 2 and Indian Point 3) in Buchanan, New York.

The State has been working diligently to prepare its comments. As you know, the Department of Environmental Conservation has assumed the role of coordinating with other State Executive Agencies on the relicensing application. The Executive Agencies are also working closely with the State Attorney General's Office on the relicensing application. The additional time will allow for more efficient coordination on the scoping comments.

Moreover, the NRC has extended the deadline until November 30, 2007, in which to file a Request for a Hearing/Petition for Leave to Intervene on the relicensing application. The State is thus in the process of identifying environmental issues to raise as contentions. Without question, that process is related to the drafting of comments on the SEIS. Extending the deadline to file Scoping Comments will more closely coordinate with the State's efforts on the Request for a Hearing/Petition for Leave to Intervene.

Finally, Joan Matthews, the lead counsel for the State Executive Agencies, has had a significant family medical emergency since Labor Day, which only this week appears to be resolving, allowing her to once again devote her full attention to this matter.

Please feel to contact either one of us if you have any questions about this request.

Respectfully submitted,

JOAN LEARY MATTHEWS
Senior Attorney for Special Projects
New York State Department of
Environmental Conservation
518-402-9190
jlmatthe@gw.dec.state.ny.us

JOHN SIPOS
Assistant Attorney General
New York State Department of Law
Environmental Protection Bureau
The Capitol
Albany, NY 12224
518-402-2251
john.sipos@oag.state.ny.us

New York State Department of Environmental Conservation
Office of General Counsel, 14th Floor
625 Broadway, Albany, New York 12233-1500
FAX: (518) 402-9018 or (518) 402-9019
Website: www.dec.ny.gov

Alexander B. Grannis
Commissioner

October 10, 2007

Via e-mail and Regular First Class Mail

Mr. Bo Pham
Senior Project Manager - Indian Point Relicensing Application
Division of License Renewal
Mail Stop 0-7B1
United States Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Re: Indian Point Units 2 and 3 Relicensing
Extension Request for Scoping Comments on SEIS

Dear Mr. Pham:

Thank you for your telephone call yesterday in response to the State of New York's request to submit scoping comments by October 31, 2007, on the above matter. This letter is to confirm that the State will submit its scoping comments by October 31, 2007, and that the NRC will consider these comments. These written comments will be in addition to the oral comments that the New York Department of Environmental Conservation and the New York Department of Law provided at the scoping session on September 19, 2007. We very much appreciate this accommodation.

Respectfully submitted,

JOAN LEARY MATTHEWS
Senior Attorney for Special Projects
New York State Department of
Environmental Conservation
518-402-9190
jlmatthe@gw.dec.state.ny.us

JOHN SIPOS
Assistant Attorney General
New York State Department of Law
Environmental Protection Bureau
The Capitol
Albany, NY 12224
518-402-2251
john.sipos@oag.state.ny.us

EDMS #280184

October 11, 2007

Joan Leary Matthews
Senior Attorney for Special Projects
New York State Department of Environmental Conservation
Office of General Counsel, 14th Floor
625 Broadway
Albany, NY 12233-1500

Dear Ms. Matthews:

I am responding to your letter of October 5, 2007, in which you requested an extension until October 31, 2007, to file written scoping comments for the environmental impact statement that the U.S. Nuclear Regulatory Commission (NRC) will be preparing as part of its review of the Indian Point Nuclear Generating, Unit Nos. 2 and 3, license renewal application.

The NRC staff has considered your request, but has determined that an extension of the comment period is not warranted. As you know, a Notice was published in the *Federal Register* on August 10, 2007, inviting members of the public to attend the environmental scoping meeting scheduled for September 19, 2007, and providing an opportunity for interested persons to submit written scoping comments during a two-month period following publication of the Notice (72 FR 45075). As stated in the *Federal Register*, written scoping comments should be submitted no later than October 12, 2007, to be considered in the scoping process. Numerous comments have been submitted to the NRC, during the scoping meeting and in writing, and we anticipate further written comments before the end of the comment period. Nonetheless, the NRC will consider comments received after such date, to the extent that it is practicable to do so. We encourage you to submit your written scoping comments at your earliest opportunity.

Thank you for your interest and participation in the license renewal process.

Sincerely,

/RA by Jill Caverly for/
Bo M. Pham, Senior Project Manager
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

cc: See next page

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

OCT -4 2007

Docket 50-247
50-286

Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mailstop T-6D59
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: 72 FR45075-6 (August 10, 2007)

To Whom It May Concern:

These comments are submitted by the Protected Resources Division (PRD) of NOAA's National Marine Fisheries Service (NMFS) regarding the application for renewal of Facility Operating Licenses DPR-26 and DPR-64 for an additional 20 years of operation at Indian Point Nuclear Generating Unit Nos. 2 and 3. A request for comments related to the Nuclear Regulatory Commission's (NRC) intent to prepare an Environmental Impact Statement (EIS) and conduct the scoping process pursuant to the National Environmental Policy Act (NEPA) was published in the Federal Register on August 10, 2007.

A population of federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occurs in the Hudson River. Additionally, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are also present in the Hudson River. Atlantic sturgeon are considered a Candidate Species as NMFS has initiated a status review for this species to determine if listing as threatened or endangered under the ESA is warranted. A status review report was completed by the status review team in February 2007. NMFS is currently reviewing the report and other available information to determine if listing under the ESA is warranted. A listing determination, and, if listing is warranted, any accompanying proposed rule(s), is expected to be published by NMFS in 2008. If it is determined that listing is warranted, a listing determination and final rule listing the species could be published within a year from the date of publication of the listing determination or proposed rule. The Status Review report is available at: *http://www.nero.noaa.gov/prot_res/CandidateSpeciesProgram/AtlSturgeonStatusReviewReport.pdf.*

NMFS has several concerns regarding the potential for the continued operation of the Indian Point facility to affect sturgeon. NMFS' primary concern is the likelihood of impingement of sturgeon on screens or racks at plant intakes. Information provided in the application by Dynegy for an Endangered Species Act (ESA) Section 10(a)(1)(B) permit for their Roseton and Danskammer plants indicated that from 1972-1998, 37 shortnose sturgeon were impinged at Indian Point Unit 2 and from 1976-1998, 26 shortnose sturgeon were impinged at Indian Point Unit 3. It is NMFS understanding that no monitoring of the intakes has occurred since screening and a fish return system were installed in 1998. While the screening and fish return system were designed to minimize entrainment and reduce the levels of injury and mortality associated with impingement, no studies have been conducted to demonstrate the effectiveness of these systems for sturgeon. While NMFS has no information on likely impingement rates since 1998, we also have no information that suggests it no longer occurs. Shortnose sturgeon impinged on intake screens or racks experience high levels of injury and/or mortality.

Sturgeon yolk sac larvae (YSL) and post yolk sac larvae (PYSL) have been documented in the vicinity of Indian Point. Given that two distinct distributions of YSL and PYSL have been identified in the river (above RM 120 and RM 48 to 110), it is assumed that the larvae in the lower river grouping are Atlantic sturgeon. As such, entrainment is a significant concern for Atlantic sturgeon in this area of the river.

The best available information suggests that unauthorized take (as defined in Section 9 of the ESA) has occurred in the past at the Indian Point facility and may continue to occur. Additionally, Atlantic sturgeon eggs and/or larvae are likely to be present in this region of the river and may be subject to entrainment in the facility's intakes. Both shortnose and Atlantic sturgeon may also be affected by the discharge of heated effluent, chlorine, and other pollutants or antifouling agents.

Section 7(a)(2) of the ESA states that each Federal agency shall, in consultation with the Secretary, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species must undergo section 7 consultation. The relicensing of Indian Point by the NRC is a federal action that will require section 7 consultation. If it is determined through consultation between the NRC and NMFS that the action is likely to adversely affect any listed species (i.e., if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effects are not: discountable, insignificant, or beneficial) then a formal consultation, resulting in the issuance of a Biological Opinion and accompanying Incidental Take Statement would be required.

Any NEPA documentation prepared by NRC relating to the relicensing of this facility should contain an assessment of the facility's impact on shortnose and Atlantic sturgeon. Additionally, NMFS expects the NRC to initiate section 7 consultation with NMFS on the effects of the proposed action on listed species. In order to conduct a consultation, NMFS will need a complete project description and a complete assessment of the facility's impacts on listed species. NMFS expects that this assessment will include an estimate of the number of shortnose sturgeon likely to be impinged and/or entrained at the facility's intakes over the life of the proposed 20 year license. This information should be submitted to NMFS along with a request for concurrence with NRC's determination of effects and justification for that determination.

My staff looks forward to working cooperatively with the NRC during the relicensing process. Should you have any questions regarding shortnose sturgeon or the section 7 process in general, please contact Pat Scida, Endangered Species Coordinator (978-281-9208 or Pasquale.Scida@noaa.gov). For questions specific to Atlantic sturgeon, please contact Kim Damon-Randall, Proactive Conservation Program Coordinator (978-281-9300 x6535).

Sincerely,

Mary Colligan

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

Cc: Nash, NRC
Crocker, Damon-Randall - F/NER4
Rusanowsky, Colosi – F/NER3
Lindow, F

File Code: Sec 7 NRC Indian Point Relicensing
PCTS: T/NER/2006/07100

November 27, 2007

Ms. Jean Pietrusiak
New York State Department of the Environment
NYDEC-DFWMR
NY Natural Heritage Program – Information Services
625 Broadway, 5th Floor
Albany, NY 12233-4757

SUBJECT: REQUEST FOR LIST OF STATE PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Pietrusiak:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Entergy Nuclear Operations, Inc. (Entergy), for the renewal of the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point). Indian Point is located in Buchanan, New York, approximately 24 miles north of the New York City boundary line. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The proposed action is to renew the facility operating licenses for Indian Point for an additional 20 years beyond the expiration of the current operating licenses. The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The Indian Point site covers approximately 239 acres. Indian Point is bordered on the north, south and east by partially wooded, privately owned land and on the west by the Hudson River. Enclosures 1 and 2 provide a general overview of the site location and site layout.

Indian Point is equipped with a once-through open-cycle cooling system that withdraws cooling water from, and discharges water back into, the Hudson River. The intake system includes seven bays for each unit located at the shore. Six 96-inch pipes discharge water beneath the river's surface within a 40-foot wide discharge canal.

The transmission lines in the scope of NRC's environmental review for license renewal are those that were originally constructed for the specific purpose of connecting the plant to the transmission system. The transmission line corridor to the Buchanan Substation (approximately 2100 feet southeast from the reactors, just across Broadway from the facility's main entrance) is located in the industrial portion of the site, except for where the lines cross Broadway. This transmission line corridor is being evaluated as part of the SEIS process.

The enclosed transmission line map shows the transmission system that is being evaluated in the SEIS. Two 345-kilovolt (kV) lines connect Indian Point to the Buchanan Substation. This

J. Pietrusiak - 2 -

corridor also includes 138-kV transmission lines that supply offsite power from the substation into Indian Point.

To support the SEIS preparation process, the NRC requests information on state-listed, proposed, and candidate species and critical habitat that may be in the vicinity of Indian Point. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

If you have any questions concerning the NRC staff's review of this license renewal application, please contact Ms. Jill Caverly, Environmental Project Manager, at 301-415-6699 or by e-mail at jsc1@nrc.gov.

Sincerely,

/RA Bo Pham for/

Rani Franovich, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosures:
1. Site location map
2. Site layout map

cc w/encls: See next page

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.us

Alexander B. Grannis
Commissioner

December 28, 2007

Rani Franovich
U. S. Nuclear Regulatory Commission
Projects Branch 2, Division License Renewal
Washington, DC 20555-0001

Dear Ms. Franovich:

In response to your recent request, we have reviewed the New York Natural Heritage Program databases with respect to an Environmental Assessment for the proposed License Renewal Application - Indian Point Nuclear Generating Units 2 and 3, area as indicated on the map you provided, located in Town of Buchanan.

> Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and should not be released to the public without permission from the New York Natural Heritage Program.

This project location is adjacent to a designated Significant Coastal Fish and Wildlife Habitat. This habitat is part of New York State's Coastal Management Program (CMP), which is administered by the NYS Department of State (DOS). Projects which may impact the habitat are reviewed by DOS for consistency with the CMP. For more information regarding this designated habitat and applicable consistency review requirements, please contact:

Jeff Zappieri or Vance Barr - (518) 474-6000
NYS Department of State
Division of Coastal Resources and Waterfront Revitalization
41 State Street, Albany, NY 12231

The presence of rare species may result in your project requiring additional permits, permit conditions, or review. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should NOT be substituted for on-site surveys that may be required for environmental impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

Sincerely,

Tara Seoane

Tara Seoane
Information Services
NY Natural Heritage Program

cc: Reg. 3, Fisheries Mgr.
Peter Nye, Endangered Species Unit, Albany
Shaun Keeler, Bureau of Fisheries, Albany
Chris Hogan, Environmental Permits, 4th floor, Albany

Enclosure (report containing a list of rare or State-listed plants and animals) withheld by NRC as sensitive information per New York Natural Heritage Program request.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

FEB 28 2008

Ms. Rani Franovich
Branch Chief, Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Essential Fish Habitat Information Request for Docket Nos. 50-247 and 50-286; Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal; at the Village of Buchanan, Town of Cortlandt, Westchester County, NY

Dear Ms. Franovich:

Reference is made to your information request regarding essential fish habitat (EFH) designated in the vicinity of the Indian Point Nuclear Generating Station (Indian Point). Your letter indicates that the Nuclear Regulatory Commission is in the process of preparing a supplemental environmental impact statement (SEIS) under the provisions of Title 10 of the Code of Federal Regulations Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS is being prepared in conjunction with a request by Entergy Nuclear Operations, Inc. for the renewal of the operating licenses for the two operating units at Indian Point. This proposed renewal would extend the current operating licenses 20 years beyond their current expiration dates, and would cover the use and continued maintenance of Units Two and Three and appurtenant transmission lines that connect Indian Point to the nearby Buchanan Substation.

The facilities lie on the eastern shore of the Hudson River in Westchester County, approximately 24 miles north of the New York City limits. The industrial portions of the site occupy approximately 239 acres bounded to the north, east, and south by private property and by the Hudson River on the west. Entergy Nuclear Northeast owns all three units at the site. At this time, only Units Two and Three are operational, and Unit One is intact but has been decommissioned. The operating units feature Westinghouse pressurized water reactors that are cooled by water drawn from the Hudson River via a once-through, open-cycle cooling system. The intake system includes seven bays for each unit. Thermally-enriched water subsequently is returned back into the river through six, 96" pipes that empty into the plant's 40' wide discharge canal.

The Buchanan reach of the Hudson River is tidally-dominated and tends to exhibit mesohaline or oligohaline salinity ranges that vary seasonally. Salinity influences the distribution and function of aquatic communities, which comprise a wide variety of diadromous and resident fishes, a diverse forage species including a wide array of insects, crustaceans, and other invertebrates. While not intended to be an exhaustive list, it should be noted that the fish community includes American eel (*Anguilla rostrata*), striped bass (*Morone saxatilis*), white perch (*Morone americana*), blue crab (*Callinectes sapidus*), bay anchovy (*Anchoa mitchilli*), Atlantic silversides (*Menidia menidia*), hogchoker (*Trinectes maculates*), American shad (*Alosa sapidissima*), tomcod (*Microgadus tomcod*), blueback herring (*Alosa aestivalis*), and alewife (*Alosa* *psuedoharengus*) which use the general project reach for a variety of habitat functions, notably spawning and nursery habitat, resting and seasonal concentration areas.

Atlantic sturgeon (*Acipenser oxyrinchus*), a candidate species for listing under the Endangered Species Act (ESA) as announced in the Federal Register on October 16, 2006 (71 FRN 61002), also occur in the Hudson River. The term "candidate species" refers to (a) species that are the subject of a petition to list as threatened or endangered; (b) species for which NMFS has determined that listing pursuant to section 4 (b)(3)(A) of the ESA may be warranted; and (c) those species are not the subject of a petition but for which NMFS has announced the initiation of a status review in the Federal Register. The notice of availability of the status review for the Atlantic sturgeon was published in the Federal Register on April 3, 2007 (72 FRN 15865). A copy of the report can be downloaded from the following website: www.nero.noaa.gov/prot_res/candidatespeciesprogram/csr.htm.

The Atlantic Sturgeon Status Review Team (SRT) has determined that the Hudson River and Delaware River Atlantic sturgeon stock constitute a distinct population segment (DPS) called the New York Bight DPS. The SRT has also concluded that the New York Bight DPS was likely (>50 % chance) to become endangered within the next 20 years. NMFS is currently considering the information in the status report to determine if action under the ESA is warranted. The SRT also identifies several different stressors that may impact the Atlantic sturgeon populations including dams for flood control and hydropower generation, water quality degradation, dredging, and blasting.

Federally endangered shortnose sturgeon (*Acipenser brevirostrum*) may be found in the Hudson River in the vicinity of Indian Point. Any federal action, such as the approval, funding, or implementation of a project by a federal agency that may affect a listed species must undergo consultation pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended. Once specific projects are identified and project plans are developed, the NRC should submit its determination of effects, along with justification for the determination and a request for concurrence, to the attention of the Endangered Species Coordinator, NMFS, Northeast Regional Office, Protected Resources Division, One Blackburn Drive, Gloucester, MA 01930.

In addition, EFH has been designated in the Hudson River mixing zone for a variety of federally managed fishery resources. These include certain life stages of the red hake (*Urophycis chuss*), winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scopthalmus aquosus*), bluefish (*Pomatomus saltatrix*), Atlantic butter fish (*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*), Atlantic sea herring (*Clupea harengus*), and the black sea bass (*Centropristus striata*). Information regarding these designations may be found at our regional website (http://www.nero.noaa.gov/hcd/index.html#efh). This information is intended as a generic guide that lists the EFH species within an area and is not intended for use on its own. The actual EFH descriptions, the species habitat preferences, and life history parameters are provided in Guide to EFH Descriptions. The Councils' Fishery Management Plans (FMPs) also should be referred to for more extensive information regarding EFH.

Section 305(b)(2) of the MSA requires all federal agencies to consult with NMFS on any action authorized, funded, or undertaken by that agency that may adversely affect EFH. Included in this consultation process is the preparation of an EFH assessment to provide necessary information on which to consult. Our EFH regulation at 50 CFR 600.905 mandates the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure. The level of detail in the EFH assessment should be commensurate with the potential impacts of the proposed project. It should also evaluate all of the direct, indirect, individual, and cumulative impacts on EFH.

The required contents of an EFH assessment include: 1) a description of the action; 2) an analysis of the potential adverse effects of the action on EFH and the managed species; 3) the NRC's conclusions regarding the effects of the action on EFH; 4) proposed mitigation, if applicable. Other information that should be contained in the EFH assessment, if appropriate, includes: 1) the results of on-site inspections to evaluate the habitat and site-specific effects; 2) the views of recognized experts on the habitat or the species that may be affected; 3) a review of pertinent literature and related information; and 5) an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

In order to allow us to evaluate fully the project's impacts on EFH and federally managed species, additional information on the impacts of continued plant operation, especially with regard to the once-through cooling water intake from the river and water release back to the river. This information will allow us to develop EFH conservation recommendations to further minimize impacts on EFH and federally managed species. Depending upon the expected impacts and the construction schedule, additional best management practices or seasonal work restrictions may be appropriate EFH conservation recommendations

Thank you for your inquiry regarding habitat uses by resources of concern in the Indian Point area. We appreciate the opportunity to provide you with this preliminary coordination information. Should you wish to discuss these comments further, please contact Diane Rusanowsky at (203) 882-6504.

Sincerely,

Peter Colosi, Jr.

Peter D. Colosi, Jr.
Assistant Regional Administrator
for Habitat Conservation

dr: 08_indian_point_spl.doc

cc: F/NER4 – Milford
F/NER3 – Protected Resources
USACE – NAN
USFWS – Cortland

December 22, 2008

Ms. Carol Ash
State Historic Preservation Officer
Parks, Recreation & Historic Preservation
Agency Building #1
Empire State Plaza
Albany, NY 12238

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Ash:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3), which are located in Westchester County in the village of Buchanan, New York, approximately 24 miles north of New York City. IP2 and IP3 are operated by Entergy Nuclear Operations, Inc. (the licensee).

As part of its review of the proposed action, the NRC staff has prepared a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437. The SEIS includes analyses of relevant environmental issues, including potential impacts to historic and archaeological resources from extended operation and refurbishment activities associated with license renewal. In accordance with our letter to you dated August 9, 2007, a copy of the draft SEIS is enclosed. Pursuant to Title 36 of the *Code of Federal Regulations*, Chapter 800.8(c), we are requesting your comments on the draft SEIS and on our preliminary conclusions regarding historic properties.

As stated in our letter dated August 9, 2007, the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The staff views the APE for the IP2 and IP3 license renewal as including the IP2 and IP3 site and the immediate environs.

The NRC staff has conducted an environmental audit at the site and has reviewed historic and archaeological records. The NRC staff also contacted 15 Native American Tribes identified as having potential interest in the proposed undertaking. The NRC staff is transmitting a copy of the draft SEIS to the Delaware Nation for their review and comment.

In the context of the National Environmental Policy Act of 1969, under which the draft SEIS was prepared, the NRC staff's preliminary determination is that the impact of license renewal on historical and archaeological resources is small. Under the provisions of the National Historic Preservation Act of 1966, the NRC staff's preliminary determination is that no historic properties will be affected by the proposed action.

C. Ash - 2 -

Please note that the period for public comment expires on March 18, 2009. If your office requires additional time, or if there are any other questions regarding this correspondence, please have your representative contact the Environmental Project Manager, Mr. Andrew Stuyvenberg, at 301-415-4006 or Andrew.Stuyvenberg@nrc.gov.

Sincerely,

/RA/

David J. Wrona, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-247 and 50-286

cc w/o encl.: See next page

December 22, 2008

Ms. Mary A. Colligan
Assistant Regional Administrator for Protected Resources
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
One Blackburn Drive
Gloucester, MA 01930-2298

SUBJECT: BIOLOGICAL ASSESSMENT FOR LICENSE RENEWAL OF THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3

Dear Ms. Colligan:

The Nuclear Regulatory Commission (NRC) staff has prepared a biological assessment (BA), which is included in Appendix E of the enclosed draft Supplemental Environmental Impact Statement (SEIS). The SEIS is the site-specific supplement to the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437. This report evaluates whether the proposed renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3 (Indian Point) operating licenses for a period of an additional 20 years would have adverse effects on listed species. The proposed action (license renewal) is not a major construction activity.

In a letter dated August 16, 2007, the NRC requested that the National Marine Fisheries Service (NMFS) provide lists of Federally listed endangered or threatened species and information on protected, proposed, and candidate species, as well as any designated critical habitat, that may be in the vicinity of Indian Point and its associated transmission line right of ways. The NMFS responded to the NRC request in a letter dated October 4, 2007, and indicated that the Federally listed endangered shortnose sturgeon (*Acipenser brevirostrum*) and the candidate species Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) should be considered for potential impacts of license renewal and operation.

The NRC staff found that renewal of the operating license of Indian Point to include another 20 years of operation could adversely affect the population of shortnose sturgeons in the Hudson River through impingement and thermal impacts. At this time, the NRC staff cannot quantify the extent to which the population could be affected.

The NRC staff is preparing an essential fish habitat (EFH) assessment to evaluate whether the proposed renewal of the Indian Point operating licenses for a period of an additional 20 years would have adverse effects on habitats. This assessment is performed in accordance with the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 16 U.S.C. 1801 et seq.) to identify the importance of habitat protection to healthy fisheries. The NRC staff will transmit the EFH assessment under a separate cover letter.

M. Colligan - 2 -

We are requesting your concurrence with our determination. In reaching our conclusion, the NRC staff relied on information provided by the applicant, on research performed by NRC staff, and on information from NMFS (including a current listing of species provided by the NMFS). If you have any questions regarding this BA or the staff's request, please contact Mr. Andrew Stuyvenberg, Environmental Project Manager, at 301-415-4006 or by e-mail at Andrew.Stuyvenberg@nrc.gov.

Sincerely,

/RA/

David J. Wrona, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos.: 50-247 and 50-286

cc w/o encl.: See next page

Ms. Danieala Nieto
Air Program Coordinator and Acting
Director
Delaware Nation of Oklahoma
Environmental Programs
P.O. Box 825
Anadarko, OK 73005

SUBJECT: REQUEST FOR COMMENTS CONCERNING THE INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Nieto:

The U.S. Nuclear Regulatory Commission (NRC) staff is seeking input for its environmental review of an application to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3), which are located in Westchester County in the village of Buchanan, NY, approximately 24 miles north of New York City. IP2 and IP3 are operated by Entergy Nuclear Operations, Inc.

As part of its review of the proposed action, the NRC staff has prepared a draft site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437. This draft document includes analyses of relevant environmental issues, including potential impacts to historic and archaeological resources from extended operation and refurbishment activities associated with license renewal. By letter dated December 22, 2008, NRC staff transmitted the draft SEIS to interested parties, including your organization.

In your letter to us dated September 5, 2007, you requested that all formal consultation documents be sent to you as a consulting party. Appendix C of the draft SEIS contains a chronology of formal correspondence associated with the license renewal environmental review for IP2 and IP3, and Appendix E contains copies of consultation correspondence.

In accordance with Title 10 of the *Code of Federal Regulations* Part 51, Section 73, we request your comments on the draft SEIS and on our preliminary conclusions contained therein. Please submit any comments that you may have on the draft SEIS by March 18, 2009. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at IndianPoint.EIS@nrc.gov. All relevant comments will be addressed in the final SEIS.

The NRC will hold two public meetings to receive oral comments on the IP2 and IP3 license renewal draft SEIS on February 12, 2009; both will be at the Colonial Terrace, 119 Oregon Road, Cortlandt Manor, New York 10567. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m. and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. Both meeting sessions will be

D. Nieto - 2 -

transcribed and any comments received at the meetings will be handled using the same process as written comments provided by mail or e-mail.

The IP2 and IP3 license renewal application, the draft SEIS, and other relevant documents are available on the internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/indian-point.html. The staff expects to publish the final SEIS – which will include responses to relevant comments received on the draft SEIS – in February 2010.

Please note that the period for public comment expires on March 18, 2009. If you and your organization have any questions regarding this correspondence, please contact the Environmental Project Manager, Mr. Andrew Stuyvenberg, at 301-415-4006 or Andrew.Stuyvenberg@nrc.gov.

Sincerely,

/RA/

David J. Wrona, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos.: 50-247 and 50-286

cc w/o encl: See next page

Received 3/13/2009

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

FEB 24 2009

David J. Wrona, Branch Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Program
US Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Biological Assessment for License Renewal of the Indian Point Nuclear Generating Unit Nos. 2 and 3

Dear Mr. Wrona:

This correspondence responds to a letter dated December 22, 2008 (received January 2, 2009) regarding the initiation of formal consultation for the proposed renewal by the US Nuclear Regulatory Commission (NRC) of the Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) operating licenses for a period of an additional 20 years pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended. The current operating licenses for these units expire on September 28, 2013 (IP2) and December 12, 2015 (IP3). Consultation with NOAA's National Marine Fisheries Service (NMFS) regarding the proposed license renewal is appropriate as the action may adversely affect the federally endangered shortnose sturgeon (*Acipenser brevirostrum*). Accompanying your letter was a Biological Assessment (BA) evaluating the impact of the proposed renewal on federally endangered shortnose sturgeon (*Acipenser brevirostrum*), as well as a copy of the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 39 Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3 Draft Report*. NMFS has completed an initial review of the BA and draft EIS and has determined that we have not received all of the information necessary to initiate consultation. To complete the initiation package, we will require the information outlined below.

Section 4 of the BA contains life history and status information for shortnose sturgeon. Several corrections are necessary in this section. In the Hudson River, shortnose sturgeon spawn when water temperatures are between 8 and 15°C, which typically occurs in April. Recent information suggests that the population estimate calculated by Bain, and included in the BA, likely overestimates the number of shortnose sturgeon in the Hudson River. Dr. Katherine Hattala, a biologist with the State of New York, has examined the data used by Bain and determined that a more appropriate estimate is approximately 30,000 adult shortnose sturgeon.

Section 4.3.2 of the BA assesses the impact of impingement on shortnose sturgeon. The BA contains a summary of the available information on impingement of shortnose sturgeon (Table 2). NMFS requests that NRC staff provide the following information in regards to Table 2: (a) for each year, indicate the level of monitoring effort (e.g. weekly for six months, etc.); (b) for each year when there is no number recorded, indicate whether that was due to a lack of monitoring, or due to a lack of capture; (c) indicate the date of impingement; and, (d) indicate the size and condition (i.e., alive, injured or dead) of the impinged fish. It is our understanding that no impingement monitoring has been conducted since traveling Ristroph-type screens were installed at the facility in 1991. As noted in the BA, the lack of information makes it difficult to predict the effects of relicensing and an additional 20 years of operation on shortnose sturgeon. If the NRC is not able to require the applicant to conduct monitoring in support of relicensing, NMFS requests that the NRC provide an estimate, based on the best available scientific information, of the likely number of shortnose sturgeon impinged at the facility with the traveling Ristroph-type screens in use. NMFS expects that the NRC could use the existing impingement data in conjunction with data on the effectiveness of Ristroph-type screens to calculate this estimate. As noted in the BA, another important factor is the mortality rate of impinged sturgeons. NMFS requests that NRC provide an estimate of the mortality rate for impinged shortnose sturgeon. NMFS expects this rate could be calculated based on available mortality rate data for other similar species and/or other facilities where similar screen types have been installed.

Section 4.3.3 of the BA discusses thermal impacts. As noted in the BA, without a model of the thermal plume it is extremely difficult to predict what the level of exposure to elevated water temperatures is for shortnose sturgeon. If NRC is unable to require that the applicant conduct modeling of the thermal plume in support of relicensing, NMFS requests that the NRC use the best available scientific information to estimate the likely temporal and spatial extent to which shortnose sturgeon will be exposed to water temperatures where adverse effects are likely (i.e., greater than 28°C).

It is NMFS understanding that the proposed action is the relicensing of the facility with no modification to the existing intakes. However, in the DEIS, the NRC discusses alternatives including cooling towers. NMFS seeks clarification as to the process by which the NRC will determine whether the installation of cooling towers, or other measures, will be required of the applicant. NMFS also seeks clarification regarding the current requirements of the National Pollutant Discharge Elimination System (NPDES) Permit issued by the State of New York and the potential outcome of the adjudication process currently ongoing regarding this permit, as well as the potential for the State NPDES permit to require cooling towers.

The formal consultation process for the proposed action will not begin until we receive all of the requested information or a statement explaining why that information cannot be made available. We will notify you when we receive this additional information; our notification letter will also outline the dates within which formal consultation should be complete and the biological opinion delivered. My staff is available to discuss these information needs with NRC staff. I look forward to continuing to work with you and your staff during the consultation process. If you have any questions or concerns about this letter or about the consultation process in general, please contact Julie Crocker at (978) 282-8480.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

cc: Crocker, F/NER3 (hardcopy)
Damon-Randall, Hartley – F/NER3 (pdf)
Rusanowsky– F/NER4 (pdf)
Logan – NRC (pdf)

File Code: Sec 7 NRC Indian Point Nuclear Plant Relicensing

PCTS: F/NER/2009/00619

3

April 30, 2009

Mr. Peter D. Colosi
Assistant Regional Administrator
for Habitat Conservation
National Marine Fisheries Service
Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930-2237

SUBJECT: ESSENTIAL FISH HABITAT ASSESSMENT FOR LICENSE RENEWAL OF INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 (TAC NOS. MD5411 AND MD5412)

Dear Mr. Colosi:

In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, the U.S. Nuclear Regulatory Commission (NRC) is requesting initiation of an Essential Fish Habitat (EFH) consultation regarding the proposed action of license renewal for the Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) for a period of an additional 20 years. Enclosed is the NRC staff's EFH assessment, as well as a copy of the draft site-specific Supplement 38 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS).

IP2 and IP3 are located on the eastern bank of the Hudson River at river mile 43 (river kilometer 69), in the Village of Buchanan, in upper Westchester County, New York. IP2 and IP3 are equipped with a once-through heat dissipation system that withdraws cooling water from and discharges it to the Hudson River. Water for cooling and service water is withdrawn from the Hudson River via two separate intake structures. After circulating through the condensers, cooling water is returned to the Hudson River via a discharge channel to the south of the intakes.

As described in the EFH Assessment, the NRC staff identified 8 species that have EFH designated in the vicinity of IP2 and IP3. The NRC staff has determined that there may be adverse individual or cumulative effects on EFH in the project area for one or more life stages of 5 of these species from the proposed license renewal. The NRC staff has determined that continued operation of the IP2 and IP3 cooling system, with its existing mitigation measures, is expected to have an overall minimal adverse effect on EFH within the Hudson River ecosystem.

P. Colosi - 2 -

In reaching these conclusions, the NRC staff relied on information provided by the applicant, on research and statistical analysis performed by NRC staff, on information from the Fish and Wildlife Service, and on information from National Marine Fisheries Service. If you have any questions regarding the enclosed draft supplement to the GEIS, the EFH Assessment, or the staff's request, please contact Mr. Andrew Stuyvenberg, Project Manager, at 301-415-4006 or by e-mail at andrew.stuyvenberg@nrc.gov.

Sincerely,

/RA/

Brian E. Holian, Director
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosure:
As stated

cc w/encl: See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 21, 2010

Mr. Peter D. Colosi
Assistant Regional Administrator
for Habitat Conservation
National Marine Fisheries Service
Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930-2237

SUBJECT: ESSENTIAL FISH HABITAT CONSULTATION FOR LICENSE RENEWAL OF INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 (TAC NOS. MD5411 AND MD5412)

Dear Mr. Colosi:

By letter dated April 30, 2009, the staff of the U.S. Nuclear Regulatory Commission (NRC) requested initiation of an Essential Fish Habitat (EFH) consultation regarding the proposed action of license renewal for the Indian Point Nuclear Generating Unit Nos. 2 and No. 3 (IP2 and IP3), in accordance with Sections 305(b)(2) and (b)(4) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), 16 U.S.C. Section 1855(b). With its letter of April 30, the NRC staff forwarded a copy of the NRC staff's EFH assessment and the NRC staff's draft site-specific Supplement 38 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (Draft SEIS) concerning IP2/IP3 license renewal. The NRC staff also sent copies of the letter, the EFH assessment, and the Draft SEIS to the Milford Laboratory on May 13, 2009, as requested by Ms. Diane Rusanowsky, Fishery Biologist in the NOAA/NMFS Habitat Conservation Division, Milford Field Office, in her e-mail message of March 18, 2009. NRC staff subsequently attempted to contact her on several occasions to obtain her comment, without success.

As described in the EFH assessment, the NRC staff identified eight species for which NMFS has designated EFH in the vicinity of IP2 and IP3. The NRC staff has determined that there may be adverse individual or cumulative effects on EFH in the project area for one or more life stages of five of these species resulting from the proposed license renewal. The NRC staff further determined that continued operation of the IP2 and IP3 cooling system, with its existing mitigation measures, is expected to have an overall minimal adverse effect on EFH within the Hudson River ecosystem. In reaching these conclusions, the NRC staff relied on information provided by the applicant, research and statistical analysis performed by NRC staff, and information from the U.S. Fish and Wildlife Service and NMFS. The NRC staff also considered additional mitigation measures in its EFH assessment and in the body of the Draft SEIS.

More than 20 months have passed since the NRC staff issued the Draft SEIS for IP2/IP3 license renewal, and more than one year has elapsed since NRC staff issued the EFH assessment. Comments on the Draft SEIS were due within 75 days, while NMFS comments on the NRC staff's EFH assessment were due within 30 days after notification of the EFH assessment, in accordance with 50 *Code of Federal Regulations* Section 600.920(h)(4); further, this period exceeds the 60-day time period which would have been allotted for expanded consultation on the EFH assessment, under 50 C.F.R. § 600.920(h)(4)(i)(4). The NRC staff requested comments on its EFH assessment from NMFS and the Milford Laboratory staff, but has received no comments to date from either NMFS or the Milford Laboratory staff on either the NRC staff's EFH assessment or the Draft SEIS for IP2/IP3 license renewal.

In view of the time that has passed since the NRC staff initiated consultation with NMFS under Section 305(b) of the Magnuson-Stevens Act, and in the absence of any comments by NMFS on the EFH assessment, the NRC staff considers that it has fulfilled its responsibilities for consultation under the Magnuson-Stevens Act. Nonetheless, the NRC staff requests that any comments from NMFS on the EFH assessment be submitted within 15 days of the date of this letter so that the NRC staff may consider those comments.

If you have any questions, please contact Mr. Andrew Stuyvenberg, Environmental Project Manager, at 301-415-4006 or by e-mail at Andrew.Stuyvenberg@nrc.gov.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 27, 2010

Ms. Ruth L. Pierpont, Director
Field Services Bureau
New York State Parks, Recreation & Historic
Preservation
Peebles Island P.O. 189
Waterford, NY 12188-0189

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 LICENSE RENEWAL APPLICATION REVIEW (SHPO NO. 06PR06720)

Dear Ms. Pierpont:

As you know, the staff of the U.S. Nuclear Regulatory Commission (NRC) is reviewing an application to renew the operating licenses for Indian Point Nuclear Generating Units No. 2 (IP2) and No. 3 (IP3), which are located in Westchester County, in the Village of Buchanan, New York, approximately 24 miles north of New York City. IP2 and IP3 are operated by Entergy Nuclear Operations, Inc. (Entergy).

On August 9, 2007, the NRC staff wrote to you, informing you of the application, the staff's determination of the area of potential effect (APE), the environmental scoping process that would be conducted and the schedule for review. On December 22, 2008, the NRC staff transmitted to Ms. Carol Ash, the New York State Historic Preservation Officer (SHPO), a copy of the draft Supplemental Environmental Impact Statement (Draft SEIS) for license renewal of IP2 and IP3. In that letter, the NRC staff informed the SHPO that it had made a preliminary determination that the impact of IP2/IP3 license renewal on historical and archaeological resources is "Small," and that no historic properties will be affected by the proposed action. Further, the NRC staff requested the SHPO's comments on the Draft SEIS and the Staff's preliminary conclusions regarding historic properties, and noted that the period for public comment would expire on March 18, 2009. The NRC staff subsequently communicated with Mr. Kenneth Markunas of your office regarding this matter, by telephone and in e-mail messages transmitted on June 30 and September 10, 2009.

To date, the NRC staff has received no comments from your agency regarding the conclusions in the Draft SEIS; the letter of December 22, 2008, to Ms. Carol Ash; or the follow-up e-mails and telephone communications between NRC staff and Mr. Kenneth Markunas of your office. While the formal comment period for the IP2 and IP3 Draft SEIS closed on March 18, 2009, the NRC staff forwarded copies of consultation letters and a hard copy of the Draft SEIS to Mr. Markunas in July 2009, in order to be sure that your agency was aware of the proposed action as well as the NRC staff's conclusions, and to be sure that the letter and Draft SEIS reached the appropriate review staff.

As stated in NRC's letter of December 22, 2008, in the context of the National Environmental Policy Act of 1969 (under which the Draft SEIS was prepared), the NRC staff's preliminary determination is that the impact of license renewal on historical and archaeological resources is small. As further stated in that letter, under the provisions of the National Historic Preservation Act of 1966 (NHPA), the NRC staff's preliminary determination is that no historic properties will be affected by the proposed action. The NRC staff also sought comments from the Delaware

R. Pierpont - 2 -

Nation of Oklahoma – which had requested consulting party status – in a letter dated January 12, 2009. The Delaware Nation of Oklahoma submitted no comments on the Draft SEIS.

The NRC staff is aware of your letter dated December 14, 2006, to James A. Thomas of Enercon Services (Entergy's contractor) indicating that the proposed renewal project "will have No Adverse Effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places." That letter also indicated that your agency had reviewed the project in accordance with Section 106 of the NHPA. While that letter did not address the Draft SEIS for IP2/IP3, its conclusions appear to be consistent with the NRC staff's preliminary determination, recited above, that the impact of IP2/IP3 license renewal on historical and archaeological resources is small, and that no historic properties will be affected by the proposed action.

Pursuant to 36 *Code of Federal Regulations* (CFR) Section 800.4(d)(1)(i), your agency was required to object to the NRC staff's findings within 30 days. Inasmuch as the comment period for the Draft SEIS closed long ago, and no comments have been received from your office regarding the Draft SEIS or the potential impacts of IP2/IP3 license renewal on historical and archaeological resources, the NRC staff considers that it has fulfilled its consultation responsibilities under Section 106 of the NHPA, as stated in 36 CFR § 800.4(d)(1)(i). Nonetheless, if your agency has any comments on the staff's conclusions under NHPA, the NRC staff requests that your agency respond within 15 days of the date of this letter so the comments may be considered by NRC staff.

If you or your staff have any other questions regarding this correspondence, please have your representative contact the Environmental Project Manager, Mr. Andrew Stuyvenberg, at 301-415-4006 or Andrew.Stuyvenberg@nrc.gov. Thank you for your time and attention.

Sincerely,

David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

cc: Distribution via Listserv

Received 10/18

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

OCT 12 2010

Mr. Brian E. Holian, Director
Division of License Renewal
Office of Nuclear Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Mr. David J. Wrona, Chief
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Indian Point Generating Unit Nos. 2 & 3 License Renewal; Docket Nos. 50-247 and 50-268; Essential Fish Habitat Consultation

Dear Messrs. Holian and Wrona:

The National Marine Fisheries Service [NMFS] has reviewed the essential fish habitat [EFH] assessment and supplemental information provided within the United States Nuclear Regulatory Commission's [NRC] 'Generic Environmental Impacts Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3' [dGEIS], and its attendant appendices. These documents evaluate the proposed renewal of the operating licenses for Indian Point Energy Center's Units 2 [IP2] and 3 [IP3] for a period of twenty years. The documents include a brief description and analysis of adverse effects to a variety of diadromous and estuary-dependent fishes, crustaceans and other invertebrates, as well as EFH that is designated in the immediate project vicinity. We will elaborate on the affected resources and our concerns regarding continued operations at IP2 and IP3 under present conditions in subsequent sections of this letter. However, upon our review of the available information, NMFS does not reach all of the same conclusions as the NRC with respect to adverse effects that relicensing IP2 and IP3 would have on fishery resources and their habitats. We appreciate the opportunity to provide comments at this time in accordance with Mr. Wrona's letter of 21 September 2010.

The current licenses for the two Indian Point nuclear generation facilities are due to expire in 2013 and 2015, respectively. Because IP2 and IP3 withdraw and discharge water into the Hudson River, a navigable surface water body, their operations are subject to Clean Water Act oversight. In New York, this oversight is administered by the New York State Department of Environmental Conservation, which issues Clean Water Act §401 Water Quality Certificate [WQC] decisions under its State Pollutant Discharge and Elimination System [SPDES] program. The New York State Department of State also has a bearing on these proceedings in that it is responsible for any decisions relating to the consistency of the proposed action with the state's Coastal Management Program. Entergy Corporation [Entergy], the current owner-operator of the Indian Point Energy Center [Indian Point] generating units, has made application for the necessary state and federal authorizations and has requested that they are issued to run concurrently. Since these state actions may effect EFH, the NMFS is invoking its option to share our comments and recommendations to the involved state agencies on their activities as provided by the EFH implementing regulations. We do so here by including them in the service list for this correspondence.

The dGEIS and EFH assessment prepared by the NRC evaluate the proposed action of the license renewal for IP2 and IP3 and form the base documentation for consultation between NRC and the National Marine Fisheries Service [NMFS]. The authorities under which we engage in consultation include the

NRC's environmental protection regulations in Title 10, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions", of the Code of Federal Regulations (10 CFR Part 51), which implement the National Environmental Policy Act of 1969, as amended (NEPA); the Fish and Wildlife Coordination Act (FWCA) , the Endangered Species Act (ESA), and the requirements of our EFH regulation at 50 CFR 600.905 of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), which mandates the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure. The comments provided in this letter pertain to the FWCA and MSFCMA coordination issues that are part of your NEPA and relicensing processes.[1] To summarize briefly, these documents acknowledge that operating once-through cooling systems at Indian Point has resulted in adverse environmental impacts, yet both documents nonetheless conclude with NRC's preliminary determination that the adverse effects associated with license renewal would have only minimal impacts on both living aquatic resources themselves and on EFH designated for federally managed species in the immediate Indian Point area. NRC's analysis of impacts relies upon comparing near field impacts that would occur in the immediate project vicinity versus all EFH designated for a particular species. We frame the issue differently, and instead consider both the adverse effects to the local fishery stocks emanating from the Hudson and the unusually high potential capacity of the mid-Hudson for recruitment of estuary-dependent fishes and production of forage species as important defining issues that lead us to a different conclusion.

Project Background:

The Indian Point Energy Center [Indian Point] is a three-unit power station located on the east shore of the Hudson River in the Village of Buchannan, Town of Cortlandt, Westchester County, New York. Only two of the generating units are operating. Indian Point Unit 1 was permanently shut down in 1974 because the emergency core cooling system did not meet regulatory requirements and therefore posed an unacceptable public risk; IP2 and IP3 continue to operate and are the subjects of upcoming license renewals requested by Entergy. Indian Point has a long presence in the Hudson and is one of the facilities included in the 'Hudson River Settlement Agreement' [HRSA] agreed among the U.S. Environmental Protection Agency and five New York electric utility companies in a controversy regarding coastal habitat and water uses, fish kills and ecological damage in the Mid-Hudson region.

Under the HRSA, the power plant owners and operators made several concessions to stakeholders representing various environmental interests in exchange for them agreeing to withhold imminent pursuit of forced installation of closed-cycle cooling at Indian Point and several other once-through cooled power plants in the mid-Hudson region. In particular, Consolidated Edison abandoned its plans for developing a major pumped storage [hydroelectric] facility at Storm King Mountain, and the various plant operators agreed to collect data and analyze impacts their facilities were having on living aquatic resources for a period of ten years. Subsequent modifications to the HRSA extended the study period by another decade and have allowed these plants to continue withdrawing about a trillion gallons of river water or more per year. Total river water consumption is dependent upon how many days each plant is operating annually and at what output level. Scheduled outages at Indian Point and more sporadic operation of the fossil fueled plants are all determining factors in terms of the actual water consumption levels at any given time. The biological and ecological effects of these withdrawals are somewhat seasonal in that they reflect the biomass and species assemblage present at the time that the water withdrawals are taking place. The extended study period included implementing a variety of measures that partially mitigated for impingement and entrainment impacts, but these individually and cumulatively did not achieve the level of impact reduction that would result from installing closed cycle cooling at Indian Point.

The Indian Point generating units alone consume about 2.5 billion gallons of water *per day* for their pressurized-water reactors. To meet this need, Indian Point relies upon the Hudson River as a cooling water source and heat sink. Water is withdrawn directly from the river through batteries of seven intake

[1] ESA issues have been coordinated in consultation with our counterparts in the Northeast Regional Office's Protected Resources Division and we do not address them here.

2

bays into each generating unit and distributed to once-through condensers and auxiliary cooling systems. Cooling water is drawn into the plants by variable- or dual-speed pumps. As it first enters, the withdrawn water is skimmed of floating debris and subsequently passed over modified, vertical Ristroph traveling screens designed to protect aquatic life by retaining water and minimizing vortex stress. These modified screens attempt to reduce, but do not eliminate, impingement mortality. A high pressure spray-wash system removes debris from the front of the traveling screen mechanism and a low pressure spray-wash system flushes impinged fishes off the screen and into a sluice system that returns them to the Hudson River.

Under the HRSA, the former owners of Indian Point conducted impingement monitoring between 1975 and 1990 using a variety of techniques; however, neither the previous nor the current owner-operators have performed validation studies to evaluate the actual performance of the modified traveling screens. The EFH assessment Table 6 contains impingement data for IP2 and IP3 collected between 1981 and 1990. Revised data populating this table were provided to the NRC in December, 2009. Upon NMFS' request, these data were provided for our use on October 01, 2010 and were used in our review. Entrained organisms are not removed from the cooling water stream and instead are carried into and through the plants' cooling systems, as they are first collected by the circulating pumps, and subsequently passed through the plant intakes into the condenser tubes used to cool the turbine exhaust steam. Within the condensers, the organisms are subjected to mechanical damage and shear stress, thermal shock, and exposure to chlorine, industrial chemicals and biocide residues. Both the entrained organisms and heated effluent streams then exit the generating plant and are returned to the Hudson River through a shared discharge channel. According to the dGEIS, the prior Indian Point owner-operators periodically conducted entrainment loss studies for IP2 and IP3 since the early 1970s. The most recent data of this nature reported in the dGEIS are from 1990.

Environmental Setting:

The Hudson River Estuary supports an unusually large and diverse assemblage of fish and shellfish, and has long been recognized as a valuable national and regional resource. That is in part because the Hudson makes large contributions not only to local aquatic resource communities, but also to coastal and offshore fisheries that are supported by prey and other nutrients emanating from the estuary. Some of these fishery resources are managed by on an inter-state basis by the Atlantic States Marine Fisheries Commission [ASMFC] and others are managed federally pursuant to the Magnuson-Stevens Fishery Conservation and Management Act [MSFCMA] or the Endangered Species Act [ESA]. All of these aquatic organisms as well as non-managed species such as forage species and other lower trophic level organisms receive consideration under the federal Fish and Wildlife Coordination Act [FWCA] as NOAA trust resources.

More than 200 fish species have been recorded from within the entire Hudson watershed, and approximately two thirds of these occur in the estuary itself for all or part of their life cycles. More specifically, the Buchanan reach of the Hudson River is a tidally-dominated habitat that serves as a migratory corridor, spawning habitat, and nursery area for an unusually diverse species assemblage of resident or diadromous fishes, crustaceans, shellfish, and many lower trophic level prey items (Smith and Lake 1990). Ambient salinity conditions vary seasonally, and generally tend to lie in the mesohaline or oligohaline ranges. The immediate project reach is within the EFH designations for the Hudson-Raritan estuary and is significant with respect to the resources under the stewardship of the agencies mentioned above. As is true of other estuarine habitats, local temperature and salinity regimes, water depth, bottom type, sediment load and current velocities all influence the distribution and function of aquatic communities.

Evidence suggests that northeast coast estuaries have lost much of their rich former fishery productivity because of habitat degradation or loss, but lack of absolute species abundance data for early historical periods prior to significant human disturbances makes this conclusion somewhat inferential. Yet the linkage is supported by strong evidence, particularly that stock sizes for most estuarine dependent fishery resources under the jurisdiction of the Atlantic States Marine Fisheries Commission, New England or Mid-

Atlantic Management Councils, or the states of New York and New Jersey fishery management agencies, are not currently over fished, but fall below historic levels (NEFMC 1998; ASMFC 2005). This observation suggests that the Hudson River's ability to support and produce living aquatic organisms has been compromised over the years by lost habitat quality and quantity as humans have dredged, filled, and withdrawn river water for a myriad of uses, resulting in conflicts of use with fishery resources.[2]

As described above in the Project Background section of this letter, water withdrawals for once-through cooling systems that serve the mid-Hudson power plants has been a major conflict of use that has gone unresolved for decades. A total of five units remain in operation in the mid-Hudson: IP2, IP3, Bowline Point, Danskammer, and Roseton Generating Stations. All of these plants use one-through cooling systems. In the interim since the most recent relicensing was completed for the Indian Point plants, most fish species have experienced declines, and essential fish habitat [EFH] has been designated in order to better manage adverse anthropogenic effects on fisheries. For the immediate Indian Point area, designated EFH includes acreage that produces organisms that are under direct federal stewardship as well as prey items for species further downriver and offshore. The Hudson River is an important regional source for both harvested stocks and prey, so reductions in its productivity are of great significance to fishery ecology and fishery management.

Given the immense natural productive potential of the Hudson River Estuary, and taking into consideration the staggering numbers of organisms that are lost directly, indirectly and cumulatively through continued operation of electric generating stations that continue to use once-through cooling technology in the Mid-Hudson reach,[3] the National Marine Fisheries Service [NMFS] suggests that the current Indian Point relicensing process is an appropriate and opportune time to apply the Clean Water Act § 316(a) and 316 (b) provisions regarding large power generation facilities. We note that the Indian Point generating units comfortably fit under the criteria for being required to ensure that the location, design, construction, and capacity for cooling water intake structures reflect the best technology available [BAT] to protect aquatic organisms from being killed or injured by impingement or entrainment. We provide further rationale for this conclusion in the following sections of this letter.

General Comments on NRCs Exposition of Environmental Impacts of Operation in the dGEIS:

Nuclear power plant system operation may create a number of habitat disturbances that range from minor to major risk to aquatic resources. The evaluation of these impacts would have been enhanced by a more expanded discussion rather than being distilled to a series of summaries on pp. 4-3 to 4-6. These bullets address topics related to a variety of predominantly physical impacts that the NRC dismisses based upon prior experience at other nuclear plants or on the basis of information presented elsewhere in the EIS. We suggest that the NRC reconsider their evaluation before the GEIS and supplement is finalized. Several of these bullets mention subjects which have a potential bearing on EFH and other aquatic resources of concern, and some modifications would demonstrate adequate support for its conclusions. For instance, on page 4-3, the NRC considers altered currents at intake and discharge structures and finds:

> "Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term".

---

[2] We note that the U.S. EPA generally has determined that operation of industrial scale cooling water intakes results in a wide spectrum of undesirable and unacceptable adverse effects on aquatic resources including entrainment and impingement; disrupting the food chain; and losses to aquatic populations that may result in reductions in biological diversity or other undesirable effects on ecosystem structure or function. See 66 Federal Register 65,256, 65,292 (December 18, 2001), 69 Federal Register 41,576, 41,586 (July 9, 2004). In addition,

[3] Described in NYSDEC's April 2, 2010 denial of Entergy's water quality certificate and also in the NRC's Supplement 38 to the generic Environmental Impact Statement for the proposed re-licenseing of IP2 and IP3

Given the large volumes of water consumed at Indian Point each day and the relatively narrow configuration of the Hudson River at the project reach, it seems plausible that under full operation, the plant *could* induce noticeable changes in the current regime or perhaps induce changes in the local erosion and accretion rates that have unintended adverse effects such as losses of submerged aquatic vegetation, chronic disturbances that discourage settlement of tiny prey items, and similar effects. Although NRC regulations do not compel the project proponents to provide plume modeling or field studies, our EFH regulations compel us to assume the worst case scenario that the effluent is creating a barrier to migrating fishes and other unacceptable environmental conditions that would adversely affect the amount and quality of available EFH. We understand that the plant operators have been using various measures to partially mitigate for these effects, but the lack of a detailed study that 1) evaluates the impacts of once-through cooling at Indian Point and the three other generating units ***and*** 2) clearly demonstrates that the measures they have been implementing are functionally equivalent to the installation of closed-cycle cooling leaves their position on the Clean Water Act § 316(a) and 316 (b) provisions as unsupported assertions. After several extensions of the HRSA, the situation remains fundamentally unchanged with regard to fish stocks and the plants are potential triggers for lost EFH in the form of direct habitat loss compounded by lost productivity in designated EFH.

There is similar concern in the statements for many of the other bullets in this section of the dGEIS, notably as regards the potential release of chemical or thermal pollution [and attendant adverse impacts to fishery resource movements, etc.]; entrainment of phytoplankton and zooplankton; induction of low dissolved oxygen; and other line items that would reduce the quality and quantity of designated EFH as described in the implementing regulations for the MSFCMA. As such, it is difficult for us to dismiss these topics so easily as problems that could be thoroughly assessed in our overall FWCA and EFH coordination. Along these same lines, existing entrainment study results from IP2 and IP3 collected from 1981-1987 do not seem to include hard data or discussion of the entrainment implications for fish eggs and larvae, copepods and other invertebrate prey items that are described clearly as prey in the EFH vignettes included for red hake, winter flounder, windowpane, bluefish and Atlantic butterfish. While Section H.1.2 of the dGEIS and its corresponding subsections do provide a short discussion of entrainment, and even casually observe that a wide variety of phytoplankton, zooplankton, and early life stages of fish and shellfish are vulnerable to becoming drawn into the generating plants via the cooling water stream, the review documents do not provide a thorough analysis of impacts to EFH with respect to their operations. Losses of this nature would have at least indirect and cumulative adverse effects on EFH not just in the mid-Hudson region, but extending into the marine portions of the coastal zone.

Coincidentally, the discussion noted in the foregoing paragraph touches upon the controversial nature of how different stakeholders view entrainment survival, which has a bearing on how a disagreement like the Hudson River power plant example can take deep root, intensify and perpetuate. For entrainment, the NRC documents note a wide range of perceptions on how different stakeholders view the potential for entrainment survival. As these documents suggest, the most conservative estimates consider entrainment 100% fatal, while some of the power companies suggest that some species or life stages could fare considerably better based upon 96-hour survival studies. The NRC correctly acknowledges in the dGEIS that the latter studies do not take into account indirect losses that arise to organisms becoming injured, disoriented or less able to forage in the event that they are fortunate enough to survive entrainment initially, and conclude for the purposes of their assessment that such losses are unknown. Consequently, NMFS does not see justification in the gDEIS to support a conclusion that impingement effects are not significant, or that any mitigation attempted to date has been as effective as the BAT for industrial scale operations, namely, closed-cycle cooling. This calls into question any progress claimed to have been made in implementing the HRSA in part because it gives the appearance that the various Indian Point operators did not follow through completely on their commitments under the HRSA. Moreover, it appears the operators are content to continue under the *status quo* without demonstrating that their mitigation to date has been functionally equivalent to best available technology as required under CWA §316(b).

5

NRCs Evaluation of Impacts on Aquatic Resources from Operation of the Cooling Water Intake:

The *intake* impacts for once-through cooling systems largely surround physical habitat loss associated with construction of the intakes themselves as well as the inability of aquatic species from being successfully able to use habitat within the volumes of water withdrawn from the source supply. These impacts may include changing particular ecological features such as local hydrological patterns as suggested in the foregoing section, but the preponderance of the impacts usually are associated with organism impingement and entrainment.

Impingement impacts tend to accrue to larger species and life stages that cannot pass through the impingement screens nor avoid the intake current, but become trapped on cooling water screens and sometimes cannot escape before suffering exhaustion, injury or even mortality. For the subject re-licensing proposal, we note that the most recent study results reported in the dGEIS and EFH assessment are decades old, with the most recent information collected in 1990. This fact concerns us on two counts: 1) the data may not accurately depict contemporary habitat usage of the mid-Hudson region by fishes, invertebrates, and other aquatic life, and 2) the project proponents have not evaluated the effectiveness of adaptive measures that have been implemented since the original HRSA was put into place. For instance, installation of the modified Ristroph traveling screens as a means of addressing some of the impacts associated with impingement injury and mortality was predicated on assumptions made in a limited pilot study. The review materials suggest that the actual performance of this gear has not been demonstrated *in situ*. This is an important consideration because gear does not always perform the same in the field as it does in a laboratory setting and its effectiveness can vary based upon the living aquatic resource assemblages it encounters in different geographic settings. Thus, we are left without empirical data to estimate the effectiveness of installing the modified screens and other mitigation measures against closed-cycle cooling. While the new gear may or may not have improved a less than ideal situation, neither NRC nor Entergy can definitively state how effectively the new screen designs are performing as a means of justifying an additional license renewal that permits continued use of once-through cooling in a potential license renewal.

Unlike impingement impacts, which tend to exhibit some selective characteristics in that they largely accrue to larger taxa or more mature life stages, entrainment of organisms into the cooling water source stream are relatively indiscriminate and may adversely affect *any* organism that fits through the screens and cannot counter the suction force of the intake. While the review material indicate that the IP2 and IP3 cooling systems have been retrofitted with dual-speed and variable-flow pumps in order that intake flows can be regulated to some degree to provide some level of mitigation or protection, we note that the dGEIS also indicates that using planned seasonal outages or maximum pump speeds does not eliminate the losses of fishes and other organisms to entrainment.

Regarding these collective intake impact matters, NMFS disagrees with the NRCs approach to presenting and analyzing the impingement and entrainment data. We particularly dispute the NRCs decision to attempt correlating overall *population level* trends with operation of the Indian Point nuclear generating facilities. First of all, analyzing the data over the entire range of a species instead of a more meaningful population segment does not follow the spirit of the National Environmental Policy Act nor the implementing regulations for EFH in the MSA because it ignores real and obvious impacts that could adversely affect a local stock. It is rare for the preponderance of a particular species be extirpated unless it already is endangered or threatened, but it certainly is quite plausible that a more local segment of an otherwise healthy population could be effectively decimated in an acute event or after years of suffering chronic or cumulative impacts. Thus, when considering the impacts of cooling water withdrawal on more local stock contributions emanating from the Hudson River and potentially recruiting to a greatly dispersed coastal fishery, the effects of cooling withdrawal even from a limited portion of the total available habitat (as it is construed in the dGEIS) could be quite profound. Finally, we are critical of this type of data transformation because it also has great potential for creating undesirable artifacts because it assumes all fishery habitats, regardless of their geographic location, size, and ecological condition, are equally valuable to the living resources that they support. The scientific literature is replete with studies that organisms do not use habitats uniformly over their ranges, and this observation is borne out in our own status and trends data that have been used to select closed areas or to make similar resource management decisions for certain federally managed fishery resources.

In concluding Section 4.1.5 of the dGEIS, upon which the NRC relies to support its overall EFH conclusions, the NRC posits that "impingement and entrainment from the operation of IP2 and IP3 are likely to have an adverse effect on aquatic ecosystems in the lower Hudson River during the period of extended operation", and goes so far as to name several potential mitigation options, but neither arrives at the specific conclusions that the units should be retrofitted with closed-cycle cooling systems, nor selects particular alternatives that they would recommend in lieu of closed-cycle cooling.

NRCs Evaluation of Impacts on Aquatic Resources from Operation of the Cooling Water Discharge:

As disclosed in the dGEIS, the *discharge* of heated water into the Hudson River can manifest a variety of lethal and sublethal effects on aquatic life, influence local ecological conditions, and create barriers to fish migrations. Direct effects tend to be thought of as mortalities that occur when an individual is exposed to conditions beyond their upper thermal tolerance limits. Indirect effects can result in changes to reproductive behaviors, changes in growth rate or survival of young, blocking migratory movements, altered predator-prey relationships, and similar community level disruptions. Oversight of these matters is regulated under a SPDES permit, which imposes effluent limitations, monitoring requirements, and other conditions to ensure that all discharges are in compliance with New York state code and the CWA. The most recent SPDES permit sets a maximum discharge temperature of 110^{0}F, and limits daily average discharge temperatures not to exceed 93.2^{0}F for a set number of days from mid-April through June. These terms have changed over a series of four consent orders since the original SPDES was let.

The NRC bases its evaluation of thermal effects on the status of the SPDES permits for Indian Point. According to the applicant's assessment, IP2 and IP3 are in compliance with terms of a SPDES permit issued by the State of New York as well as further mitigation required under the fourth HRSA consent order. The New York State Department of Environmental Conservation (NYSDEC), which maintains regulatory oversight over this arrangement, concludes that under certain circumstances, modeling demonstrates that discharges from the operating units at Indian Point allow greater than the four degree (F.) over ambient temperature limit, or a maximum of 83^{0}F, whichever is less, in certain estuary cross sections specified under New York State regulations. These matters have been, and remain, in dispute among the plant operators and the NYSDEC, culminating in the state denying a water quality certificate in April, 2010. An ongoing proceeding with the DEC has not resolved the problem, and the NRC notes in the dGEIS that the matter may not be concluded before the NRC issues its final SEIS.

The lack of a thermal study proposed by the NYSDEC or an alternative proposed by the applicant leaves the NRC in the position of having to use existing information to determine the appropriate thermal impact. This resulted in their finding that continued operations with once-through cooling and various mitigation measures would have a small to moderate effect, depending on the extent or magnitude of the plume, the sensitivity of aquatic life stages that were present, and related criteria. In addition to thermal discharges, the NRC considered the potential for plant operations resulting in other impacts to aquatic resources, and concluded that impingement and entrainment are likely to have adverse effects. The significance and extent of these impacts remain in dispute among the involved parties. The project proponents hold that existing operations adequately mitigate impingement and entrainment effects because dual- and variable-speed pumps as well as modified Ristroph were installed at IP2 and IP3, but the efficacy of these and related measures has not been verified by studies. The NYSDEC disagrees with their position, and has concluded that closed cycle cooling is the BAT to address the Hudson River utilities' impacts to aquatic resources. The NRC considered several additional mitigation options and determined that wedgewire screening systems are not feasible; and marine life exclusion systems and/or behavioral deterrents potentially would require further study.

We realize that the ongoing dispute between the plant operator and the State have hampered the NRC's ability to present a full analysis of additional mitigation options available for the existing cooling system, and its potential utility for conserving or protecting EFH functions and values. Nevertheless, we maintain that our analysis of the severity of the project impacts on NOAA trust resources is compelling, and that our conservation recommendations are necessary and appropriate to address the project impacts.

Essential Fish Habitat Comments:

Eight federally managed species with EFH designations within the mixing zone of the Hudson River estuary were identified in the NRCs EFH assessment. Of these, according to NRCs assessment, "there may be adverse individual or cumulative impacts on EFH in the project area for red hake larvae, winter flounder larvae, windowpane juveniles and adults, bluefish juveniles, and Atlantic butterfish juveniles and adults". However, the NRC went on to say in its preliminary EFH determination that they were of the opinion that none of these impacts would rise to a level of concern because "the proportion of EFH affected by IP2 and IP3 is small compared to EFH for the total managed stock". The NRC also proposed that continued operations of the open-cycle cooling systems for these units could continue in a renewed license scenario provided that appropriate mitigation measures were implemented to reduce thermal effluent as well as entrainment and impingement effects.

While the review materials include examples of measures that have been (or could be) implemented to reduce mortalities, it neither advocates a *particular* approach nor evaluates the effectiveness of those measures for protecting and conserving designated EFH or other fishery resource uses. We also note that because the EFH evaluation relies on comparing the immediate project waterfront against the total EFH designated coastally for selected species and life stages, it does not give adequate consideration to the fact that occupation and use of EFH is not uniform. The EFH designations are made on the basis of habitat that is supporting particular species and generic life stages, but does not currently discriminate more finely as to how that habitat is used within a designation. As an example, early juvenile life stages tend to focus on occupation of inshore nurseries and later [but still juvenile] fishes may be using coastal and offshore EFH that better meet their needs. Thus, we do not consider it appropriate to suggest that EFH for a one or two year old juvenile fish is equally suitable for supporting current young of the year juveniles.

Constraining the analysis of impacts to the immediate Indian Point reach and comparing that information against the habitat available to support the entire population and not the stocks originating from the Hudson River, erroneously creates the setting for not being able to find any impacts to EFH. A more appropriate analysis extends the view of entrainment, impingement and thermal discharge impacts to include the mortalities and reduced productivity of forage species, diadromous species, and resident fishes; to assess their impacts on coastal fisheries including species for which EFH is designated downstream; and to discuss how the lost productivity out of the mid-Hudson represents a net reduction in forage opportunities for offshore and downstream resources. This latter class of impacts is quite relevant in this situation and is not analyzed by the NRCs review materials. Nonetheless, the NRCs EFH assessment concluded that there may be adverse individual or cumulative effects of the proposed action on red hake larvae, winter flounder larvae, windowpane juveniles and adults, bluefish juveniles, and Atlantic butterfish juveniles and adults. However, in making this judgment, the NRC did not specify particular impacts of concern in the EFH assessment itself. Extrapolating from the dGEIS, NMFS notes that the primary impacts of concern regarding fishery resources and their habitat generally, and for EFH in particular, that would be associated with continued operations using an open-ended cooling system would be organism loss and habitat degradation. We could not enumerate these impacts based upon the materials provided for our review, but note that at over 2 billion gallons of water consumed per day, the amount of prey available to fishes in particular would be significantly diminished through entrainment alone.

While we recognize the impediments associated with lack of newer studies and related information, NMFS does not agree with some of the methods that the NRC used or assumptions that it made in performing its fish impact evaluations. According to the review materials provided, operating IP2 and IP3 as they currently are leads to direct impacts to EFH species and their prey in the mid-Hudson region. We also note that the EFH assessment and associated analyses were configured too narrowly to capture the breadth and implications that continued operations would have on living aquatic resources and their habitats both in the mid-Hudson and to coastal fisheries. As noted above, we are particularly concerned with the potential for Indian Point operations leading to reduced production or availability of prey, which constitutes an indirect or cumulative adverse effect that diminishes the quality of designated EFH as defined in the MSFCMA. Similarly, it is our opinion that a proper cumulative effects analysis for this situation should have included the adverse effects associated with operations at all of the mid-Hudson power plants that rely on Hudson River water to feed once-through cooling systems. We are not alone in this conviction. According to the NYDECs Final Draft Fact Sheet NY-0004472, dated November, 2003, regarding Indian Point's Surface Water Renewal Permit Action, "Pursuant to Section 316(b) of the CWA, and 6 NYCRR Section 704.5, the Department has determined that the site-specific best technology available (BTA) to minimize adverse environmental impact of the Indian Point Units 1, 2 and 3 cooling water intake structures is closed-cycle cooling." NMFS agrees with New York that a closed-cycle cooling system would significantly limit the amount of intake flow and thereby reduce impacts associated with especially impingement and entrainment. It is our opinion that implementing this measure is in the best interest of fishery resources and also is the most appropriate option for meeting our mutual EFH mandates while allowing continued electric generation at IP2 and IP3 in an otherwise sensitive ecological area.

Essential Fish Habitat Recommendations:

To minimize the impacts on EFH, pursuant to Section 305(b)(4)(A) of the MDFCMA, NMFS recommends that the following conservation recommendations be adopted in conjunction with the proposed federal action:

Implement the best available practicable technology to mitigate impingement, entrainment, and thermal impacts. The BAT for Indian Point would be reconfiguring the facilities by replacing the once-through cooling system with a state-of-the-art, closed-cycle design. A closed cycle cooling system would minimize water intake rates and return little to no heated water back into the Hudson River. The reduced water withdrawals and greatly diminished, perhaps even non-existent, plume associated with a closed-cycle cooling system would avoid and minimize what NMFS considers to be highly significant mortalities of billions of aquatic organisms and their attendant impacts to coastal fisheries.

Please note that Secton 305(b)(4)(B) of the MSFCMA requires that the NRC provide NMFS with a detailed written response to the EFH conservation recommendation, including a description of the measures adopted by the NRC for avoiding, mitigating, or offsetting the impact of the project on EFH. In the case of a response that is inconsistent with NMFS' recommendation(s), Section 305(b)(4)(B) o the MSFCMA also indicates that the NRC must explain its reasons for not following the recommendation(s). Included in such reasoning would be the scientific justification for any disagreements with NMFS over the anticipated effect of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects pursuant to 50 CFR 600.920(k).

Please note that a distinct and further EFH consultation must be re-initiated pursuant to 50 CFR 600.920(1), if new information becomes available or the project is revised in such a manner that it affects the basis for the above EFH conservation recommendation.

Endangered Species Act:

The federally listed, endangered SNS and the candidate species for listing Atlantic sturgeon may be present in the project area. The NRC is currently in consultation with NMFS NEROs Protected Resources Division pursuant to Section 7 of the ESA and the NRC will conclude the ESA consultation with our colleagues in this Division of NMFS. The contents of the above EFH and FWCA coordination does not replace or supersede any negotiations that you may have conducted or will conduct with our PR division, and only pertains to our mutual obligations under the FWCA and MSFCMA.

Should you have any question regarding these comments or need additional information, please contact Diane Rusanowsky at diane.rusanowsky@noaa.gov; 203-882-6504

Sincerely,

Peter Colosi

Peter D. Colosi, Jr.
Assistant Regional Administrator
For Habitat Conservation

New York State Office of Parks, Recreation and Historic Preservation

The Governor Nelson A. Rockefeller Empire State Plaza • Agency Building 1, Albany, New York 12238
www.nysparks.com

David A. Paterson
Governor

Carol Ash
Commissioner

October 26, 2010

David J. Wrona
Chief, Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: NRC
Indian Point License Renewal
Buchanan, Westchester County

Dear Mr. Wrona:

Thank you for your letter dated September 27, 2010 to Ruth Pierpont regarding the license renewal of the Indian Point Nuclear Power Generating Units 2 and 3. The New York State Historic Preservation Office (SHPO) previously commented on this matter under Section 106 of the National Historic Preservation Act by letter dated March 24, 2009 (copy attached). As noted in that letter, SHPO's comments "do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act . . . ." The New York State Office of Parks, Recreation and Historic Preservation therefore appreciates this opportunity to comment upon a specific impact upon one of our irreplaceable facilities that does not appear to have been addressed in the draft Supplemental Environmental Impact Statement (DSEIS).

As noted in section 2.2.9 of the DSEIS, Stony Point Battlefield State Historic Site is located just south of and directly across the Hudson River from the Indian Point facility. This historic site is directly associated with the July 16, 1779 battle of Stony Point where General Anthony Wayne and a small elite force of the Continental Army captured the British garrison stationed at the point. This event marked the last major conflict of the Revolutionary War in the northern theater. The 45-acre park is characterized by surviving 18th century earth works and an early 19th century navigational light house. The site was designated a National Historic Landmark by the United Stated Department of the Interior on January 20, 1961. This is the Nation's highest historical site recognition status.

According to the Department of the Interior "National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. Today, fewer than 2,500 historic places bear this national distinction." The DOI goes on to state: "National Historic Landmarks are exceptional places. They form a common bond between all Americans. While there are many historic places across the nation, only a small number have meaning to all Americans--these we call our National Historic Landmarks." As such, the Stony Point Battlefield is an irreplaceable asset to the people of New York State and the Nation.

The DSEIS in Chapter 5.2 purports to assess the impacts of a Severe Accident and the feasibility of Mitigation Alternatives, but ignores the impact of such an accident upon Stony Point Battlefield and fails to consider the implementation of alternatives to mitigate such impacts. Any loss, temporary or otherwise, of the public's access to this place would significantly diminish the Nation's lexicon of tangible historic resources associated with the American Revolutionary War. Stony Point Battle Field Historic Site is a significant historic and cultural asset to the people of New York State and the Nation and we request that any potential impacts to this site be fully assessed in the environmental analysis of the relicensing of Indian Point.

If you should have any questions regarding these comments I can be reached at (518) 474-0409.

Sincerely,

Thomas B. Lyons
Director of Resource Management

cc: Tom Alworth

Enclosure

NEW YORK STATE

New York State Office of Parks, Recreation and Historic Preservation

David A. Paterson
Governor

Carol Ash
Commissioner

The Governor Nelson A. Rockefeller Empire State Plaza • Agency Building 1, Albany, New York 12238
www.nysparks.com

March 24, 2009

Tim Basham
Enercon Services Inc.
6525 N. Meridian, Suite 400
Oklahoma City, Oklahoma 73116

Re: NRC
Entergy Indian Point Units 2 and 3 Operating License Renewal
450 Broadway
Town of Buchanan, Westchester County
06PR06720

Dear Mr. Basham:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

It is our understanding that the potential Cooling Tower Construction locations are being studied for feasibility as a requirement by the NYSDEC. If the cooling towers will need to be constructed at a later date, further consultation will be necessary.

The proposed scope for the Phase IB methodology should include determining the Area of Potential Effect (APE), evaluating and documenting the vertical/horizontal disturbances and testing using the Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State and the 2005 NYSHPO Phase I Archaeological Report Format Requirements. A geomorphologist should determine the need for deep testing if there is the potential for buried deposits. Testing may be necessary to determine fill depth and/or disturbance of original soil.

Finally, the visual effect will have to be assessed as part of the project if the cooling towers will be built.

Page 2
06PR06720

For further correspondence regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above. If you have any questions, please call me at (518) 237-8643, extension 3288.

Sincerely,

Cynthia Blakemore

Cynthia Blakemore
Historic Preservation Program Analyst

cc. James Thomas, Enercon Services
James Briscoe, Enercon Services (vial e-mail)
Dara Gray, IPEC (via e-mail)

Appendix F

GEIS Environmental Issues Not Applicable to Indian Point Nuclear Generating Station Unit Nos. 2 and 3

Appendix F

GEIS Environmental Issues Not Applicable to Indian Point Nuclear Generating Unit Nos. 2 and 3

Table F-1 lists those environmental issues identified in NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (hereafter referred to as the GEIS), issued 1996 and 1999,[1] and in Table B-1 of Appendix B to Subpart A of Title 10, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the *Code of Federal Regulations* (10 CFR Part 51), that are not applicable to Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to IP2 and IP3

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered thermal stratification of lakes	1	4.2.1.2.3, 4.4.2.2	IP2 and IP3 do not discharge into a lake.
Water use conflicts (plants with cooling pond or cooling towers using makeup water from a small river with low flow)	1	4.3.2.1, 4.4.2.1	IP2 and IP3 have a once-through cooling system.
Water use conflicts (plants with cooling towers and cooling ponds using make-up water from a small river with low flow)	2	4.3.2.1 4.4.2.1	This issue is related to heat-dissipation systems that are not installed at IP2 and IP3.

(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include both the GEIS and its Addendum 1.

AQUATIC ECOLOGY (FOR ALL PLANTS)			
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER-BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.2.2.1.2, 4.4.3	This issue is related to heat-dissipation systems that are not installed at IP2 and IP3.
Impingement of fish and shellfish	1	4.2.2.1.3, 4.4.3	This issue is related to heat-dissipation systems that are not installed at IP2 and IP3.
Heat shock	1	4.2.2.1.4, 4.4.4	This issue is related to heat-dissipation systems that are not installed at IP2 and IP3.
GROUND WATER USE AND QUALITY			
Ground water use conflicts (potable and service water, and dewatering; plants that use <100 gpm)	1	4.8.1.1, 4.8.1.2	IP2 and IP3 do not use ground water for any purpose.
Ground water use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1, 4.8.1.2	IP2 and IP3 do not use ground water for any purpose.
Ground water use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3	This issue is related to heat-dissipation systems that are not installed at IP2 and IP3.
Ground water use conflicts (Ranney wells)	2	4.8.1.4	IP2 and IP3 do not have or use Ranney wells.
Ground water quality degradation (Ranney wells)	1	4.8.2.2	IP2 and IP3 do not have or use Ranney wells.
Ground water quality degradation (saltwater intrusion)	1	4.8.2.1	IP2 and IP3 do not use groundwater for any purpose.

Ground water quality degradation (cooling ponds in salt marshes)	1	4.8.3	IP2 and IP3 do not use cooling ponds.
Ground water quality degradation (cooling ponds at inland sites)	2	4.8.3	IP2 and IP3 do not use cooling ponds.
HUMAN HEALTH			
Microbial organisms (occupational health)	1	4.3.6	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.
Microbiological organisms (public health; plants lakes or canals, cooling towers, or cooling ponds that discharge to a small river)	2	4.3.6	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to a heat-dissipation system that is not installed at IP2 and IP3.

References

Code of Federal Regulations, Title 10, "Energy," Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

U.S. Nuclear Regulatory Commission, NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Volumes 1 and 2, May 1996.

U.S. Nuclear Regulatory Commission, NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Main Report," Section 6.3, "Transportation," Table 9.1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants," Final Report, Volume 1, Addendum 1, August 1999.

Appendix G

U.S. Nuclear Regulatory Commission Staff Evaluation of Severe Accident Mitigation Alternatives for Indian Point Nuclear Generating Unit Nos. 2 and 3 in Support of License Renewal Application Review

Appendix G

U.S. Nuclear Regulatory Commission Staff Evaluation of Severe Accident Mitigation Alternatives for Indian Point Nuclear Generating Unit Nos. 2 and 3 in Support of License Renewal Application Review

G.1 Introduction

Entergy Nuclear Operations, Inc. (Entergy) submitted an assessment of severe accident mitigation alternatives (SAMAs) for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) as part of the environmental report (ER) (Entergy 2007). Entergy based its assessment on the most recent probabilistic safety assessment (PSA) for IP2 and IP3 (a site-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code), and on insights from the Individual Plant Examination (IPE) (Con Ed 1992 and NYPA 1994) and the Individual Plant Examination of External Events (IPEEE) (Con Ed 1995 and NYPA 1997) for each unit. In identifying and evaluating potential SAMAs, Entergy considered SAMAs that addressed the major contributors to core damage frequency (CDF) and large early release frequency (LERF) at IP2 and IP3, as well as SAMA candidates for other operating plants that have submitted license renewal applications. Entergy identified 231 candidate SAMAs for IP2 and 237 SAMAs for IP3. This list was reduced to 68 (IP2) and 62 (IP3) unique SAMAs by eliminating SAMAs that are not applicable at IP2 and IP3 because they have design differences, they have already been implemented at IP2 and IP3, or they are similar in nature and could be combined with another SAMA candidate. Entergy assessed the costs and benefits associated with each of the potential SAMAs and concluded in the ER that several of these were potentially cost beneficial.

Based on a review of the SAMA assessment, the U.S. Nuclear Regulatory Commission (NRC) issued requests for additional information (RAIs) to Entergy in letters dated December 7, 2007 (NRC 2007), and April 9, 2008 (NRC 2008). Key questions concerned major changes to the internal flood model in each of the PSA updates; PSA peer review comments and their resolution; MACCS2 input data and assumptions (including core inventory, evacuation modeling, and offsite economic costs); assumptions used to quantify the benefits for certain SAMAs; reasons for unit-to-unit differences for certain risk contributors and estimated SAMA benefits; and further information on several specific candidate SAMAs and low-cost alternatives, including SAMAs related to steam generator tube rupture (SGTR) events. Entergy submitted additional information by letters dated February 5, 2008 (Entergy 2008a), and May 22, 2008 (Entergy 2008b). In response to the RAIs, Entergy provided clarification of the internal flooding analysis changes in each PSA model version; additional information regarding the peer review process and comment resolution; details regarding the MACCS2 input data, including results of a sensitivity analysis addressing loss of tourism and business; additional explanation and justification for the assumptions in each analysis case; descriptions of plant-specific features that account for differences in risk and SAMA benefits between units; and additional information regarding several specific SAMAs, including SGTR-related SAMAs. Entergy's responses addressed the NRC staff's concerns and resulted in the identification of several additional potentially cost-beneficial SAMAs and the elimination of one previously identified cost-beneficial SAMA. Subsequent to issuance of the Draft Supplemental Environmental Impact Statement (DSEIS), Entergy identified an error in the Indian Point site meteorology file used to calculate offsite consequences of severe accidents, and submitted a SAMA re-analysis based on the corrected meteorological data (Entergy 2009). The SAMA re-analysis resulted in the identification of several additional potentially cost-beneficial SAMAs beyond those identified in the ER and the DSEIS.

An assessment of SAMAs for IP2 and IP3 is presented below.

G.2 Estimate of Risk for IP2 and IP3

Entergy's estimates of offsite risk at IP2 and IP3 are summarized in Section G.2.1. The summary is followed by the NRC staff's review of Entergy's risk estimates in Section G.2.2.

G.2.1. Entergy's Risk Estimates

The two distinct analyses that are combined to form the basis for the risk estimates used in the SAMA analysis are (1) the IP2 and IP3 Level 1 and Level 2 PSA models, which are updated versions of the IPE (Con Ed 1992 and NYPA 1994) and IPEEE (Con Ed 1995 and NYPA 1997) for each unit, and (2) supplemental analyses of offsite consequences and economic impacts (essentially a Level 3 PSA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent IP2 and IP3 Level 1 and Level 2 PSA models available at the time of the ER, referred to as the IP2 Revision 1 PSA model (April 2007) for IP2 and the IP3 Revision 2 PSA model (April 2007) for IP3. The scope of the PSA models does not include external events.

The baseline CDF for the purpose of the SAMA evaluation is approximately 1.79×10^{-5} per year for IP2 and 1.15×10^{-5} per year for IP3. The CDF is based on the risk assessment for internally initiated events, including internal flooding. Entergy did not include the contributions from external events within the IP2 and IP3 risk estimates; however, it did perform separate assessments of the CDF from external events and did account for the potential risk reduction benefits associated with external events by multiplying the estimated benefits for internal events by a factor of approximately 3.8 for IP2 and 5.5 for IP3. This is discussed further in Sections G.2.2 and G.6.2.

The breakdown of CDF by initiating event is provided in Table G-1 for IP2 and IP3. For IP2, loss of offsite power sequences, including station blackout (SBO) events and internal flooding initiators are the dominant contributors to CDF. For IP3, internal flooding initiators, loss-of-coolant accidents (LOCAs), SGTR events, and anticipated transient without scram (ATWS) events are the dominant contributors to CDF.

There are several significant differences between the two Indian Point units that account for differences in the risk contributions shown in Table G-1. These differences include:

The pressurizer PORV block valves are normally closed in Unit 2, and normally open in Unit 3. Thus, the ability to use the PORVs for feed and bleed cooling in LOOP and partial power loss events is greater at Unit 3, resulting in a lower CDF for LOOP events in Unit 3.

There are differences in the internal flooding sources and building configurations (e.g., ingress and egress paths). These physical differences together with differences in the method for calculating failure frequencies result in higher flood CDF frequencies in Unit 2.

In Unit 2, DC control power for EDGs and other loads on emergency 480 VAC busses is supplied from either normal or emergency backup supplies, with automatic switching between supplies. Unit 3 does not have this backup capability. This results in a lower CDF contribution from loss of DC power events in Unit 2.

Table G-1. IP2 and IP3 Core Damage Frequency (Entergy, 2007)

Initiating Event	IP2		IP3	
	CDF (Per Year)	**% Contribution to CDF**	**CDF (Per Year)**	**% Contribution to CDF**
Loss of offsite power [1]	6.7×10^{-6}	38	1.2×10^{-7}	1
Internal flooding	4.7×10^{-6}	26	2.2×10^{-6}	20
LOCA	1.5×10^{-6}	8	2.2×10^{-6}	19
Transients [1]	1.2×10^{-6}	7	8.5×10^{-7}	7
ATWS	9.9×10^{-7}	6	1.5×10^{-6}	13
SBO	8.5×10^{-7}	5	7.2×10^{-7}	6
SGTR	7.2×10^{-7}	4	1.6×10^{-6}	14
Loss of component cooling water (CCW)	5.8×10^{-7}	3	1.1×10^{-7}	<1
Loss of nonessential service water	3.0×10^{-7}	2	2.8×10^{-7}	2
Interfacing systems LOCA (ISLOCA)	1.5×10^{-7}	<1	1.5×10^{-7}	1
Reactor vessel rupture	1.0×10^{-7}	<1	1.0×10^{-7}	<1
Loss of 125 volts (V) direct current (dc) power	5.8×10^{-8}	<1	1.0×10^{-6}	9
Total loss of service water system	4.4×10^{-8}	<1	5.4×10^{-7}	5
Loss of essential service water	1.9×10^{-10}	<1	1.8×10^{-8}	<1
Total CDF (internal events)	**1.79×10^{-5}**	**100**	**1.15×10^{-5}**	**100**

[1] Contributions from SBO and ATWS events are noted separately and are not included in the reported values for loss of offsite power or transients.

The current Level 2 PSA models are based on the IPE models, with updates to reflect changes to the plant and modeling techniques, including a 3.3 percent and 4.8 percent power uprate for IP2 and IP3, respectively; inclusion of additional plant damage states (PDSs) to improve the Level 1–Level 2 PSA interface; and updated accident progression and source term analyses using a later version of the Modular Accident Analysis Program (MAAP) computer code. The Level 1 core damage sequences are placed into one of 57 PDS bins that provide the interface between the Level 1 and Level 2 analyses. The Level 2 models use a single containment event tree (CET) with functional nodes representing both systemic and phenomenological events. CET nodes are evaluated using supporting fault trees and logic rules.

The result of the Level 2 PSA is a set of nine release categories with their respective frequency and release characteristics. The results of this analysis for IP2 and IP3 are provided in Tables

E.1-9 (IP2) and E.3-9 (IP3) of the ER. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints binned into the release category. Source terms were developed for each of the nine release categories using the results of MAAP 4.04 computer code calculations. The release characteristics for each release category were obtained by frequency-weighting the release characteristics for each CET endpoint contributing to the release category (Entergy 2007).

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for these analyses include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within an 80-kilometer [50-mile] radius) for the year 2035, emergency response evacuation modeling, and economic data. The magnitude of the onsite impacts (in terms of cleanup and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC 1997a).

In its SAMA analysis, as revised, Entergy estimated the dose to the population within 80 kilometers (50 miles) of the IP2 and IP3 site to be approximately 0.87 person-sievert (Sv; 87 person-rem) per year for IP2, and 0.95 Sv (95 person-rem) per year for IP3. The breakdown of the total population dose by containment failure mode is summarized in Table G-2, based on information provided in Entergy's SAMA re-analysis submitted subsequent to issuance of the DSEIS (Entergy 2009). SGTR events and late containment failures caused by gradual overpressurization by steam and noncondensable gases dominate the population dose risk at both units.

Table G-2. Breakdown of Population Dose by Containment Failure Mode (Entergy 2009)

Containment Failure Mode	IP2 Population Dose (Person-Rem[1] Per Year)	IP2 Percent Contribution	IP3 Population Dose (Person Rem[1] Per Year)	IP3 Percent Contribution
Intact containment	<0.1	<1	<0.1	<1
Basemat meltthrough	4.1	5	2.4	3
Gradual overpressure	28.3	32	16.8	18
Late hydrogen burns	3.6	4	2.1	2
Early hydrogen burns	8.6	10	3.2	3
Invessel steam explosion	0.6	<1	0.2	<1
Reactor vessel rupture	4.1	5	1.5	2
ISLOCA	6.6	8	4.2	4
SGTR	31.5	36	64.4	68
Total	**87.4**	**100**	**94.8**	**100**

[1] A “rem” (Roentgen equivalent man) is a standard unit used to measure the dose equivalent (or effective dose) of radiation, which combines the amount of energy from ionizing radiation that is deposited in human tissue, along with the medical effects of the particular type of radiation (alpha, beta, gamma or neutron) involved . As defined in 10 CFR 20.1004, a rem is a dose-equivalent quantity of radiation equal to the absorbed dose in “rads” (radiation absorbed dose). A “person-rem” is the total dose (in rems) received by a population. One person-rem = 0.01 Sv.

G.2.2 Review of Entergy's Risk Estimates

Entergy's determination of offsite risk at IP2 and IP3 is based on the following four major elements of analysis:

(1) The Level 1 and Level 2 risk models that form the bases for the IPE submittals (Con Ed 1992, NYPA 1994) and the IPEEE submittals (Con Ed 1995,NYPA 1997);

(2) The major modifications to the IPE models that have been incorporated in the IP2 and IP3 2007 PSA updates;

(3) Adjustments to the IPEEE seismic and fire risk results to represent recent plant changes, updated failure probabilities, and more realistic assumptions;

(4) The MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PSA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of Entergy's risk estimates for the SAMA analysis, as summarized below.

The NRC staff's reviews of the IP2 and IP3 IPE submittals are described in the NRC reports dated August 14, 1996 (NRC 1996) and October 20, 1995 (NRC 1995), for IP2 and IP3, respectively. Based on its review of the IPE submittals and responses to RAIs, the NRC staff concluded that the IPE submittals met the intent of Generic Letter (GL) 88-20; that is, the licensee's IPE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities. Although no vulnerabilities were identified in the IPE, several plant improvements were identified. These improvements have either been implemented at the site or addressed by a SAMA (Entergy 2007). These improvements are discussed in Section G.3.2.

There have been three revisions to the IP2 PSA model and two revisions to the IP3 PSA model since the respective IPE submittals. A comparison of the internal events CDF between the IPE submittals and the current PSA models indicates a decrease of approximately 45 and 75 percent for IP2 and IP3, respectively (from 3.13×10^{-5} per year to 1.79×10^{-5} per year for IP2 and from 4.40×10^{-5} per year to 1.15×10^{-5} per year for IP3). A description of those changes that resulted in the greatest impact on the internal-event CDF is provided in Sections E.1.4 and E.3.4 of the ER (Entergy 2007) and in response to a staff RAI (Entergy 2008a) and is summarized in Tables G-3a and G-3b for IP2 and IP3, respectively.

Table G-3a. IP2 PSA Historical Summary

PSA Version	Summary of Changes from Prior Model	CDF (per year)
1992	IPE submittal (excluding internal flooding) (RISKMAN)	3.13×10^{-5}
Update	5/2003 PSA Update (RISKMAN) - credited recovery of feedwater and condensate - added treatment of cross-header common-cause failure (CCF) for essential and nonessential service water headers - updated equipment performance and unavailability data - revised human error probabilities based on thermal-hydraulic calculations - updated reactor coolant pump (RCP) seal LOCA model - added treatment of internal flooding events	2.19×10^{-5}
Rev. 0	3/2005 PSA update (Computer-Aided Fault-Tree Analysis code [CAFTA]) - updated initiating event, component failure, and unavailability databases - updated offsite power recovery data per EPRI 1009889 - revised internal flooding analysis, including pipe-break frequencies and human error probabilities - changed CCF model from multiple Greek letter to Alpha method - updated human reliability analysis (HRA) method to the EPRI HRA method - updated RCP seal LOCA model to WCAP-16141 (WOG2000) - updated ISLOCA model to address ISLOCAs inside containment, to credit mitigation only for small LOCAs outside containment, and to remove credit for makeup to the refueling water storage tank (RWST)	1.71×10^{-5}

PSA Version	Summary of Changes from Prior Model	CDF (per year)
Rev. 1	2/2007 PSA update - updated selected initiating event frequencies - updated offsite power recovery model per NUREG/CR-6890 - included CCF for plugging service water pump strainers - revised model to reflect that normal offsite power feeds to the 480-V ac safeguards buses do not trip on a safety injection (SI) signal without a concurrent loss of offsite power - added credit for Indian Point Unit 1 (IP1) station air compressors for scenarios that do not involve loss of offsite power - revised auxiliary feedwater (AFW) success criterion to require flow to two (rather than one) steam generators for normal (non-ATWS) response	$1.79x10^{-5}$

Table G-3b. IP3 PSA Historical Summary

PSA Version	Summary of Changes from Prior Model	CDF (per year)
1994	IPE submittal (including internal flooding CDF of $6.5x10^{-6}$)	$4.40x10^{-5}$
Rev. 1	6/2001 PSA Update - updated initiating event, component failure, and unavailability databases - updated offsite power recovery model per NUREG/CR-5496 - revised and added CCF component groups consistent with the most recent probabilistic risk assessment (PRA) practices, and updated CCF data - revised HRA to reflect EOP changes - updated RCP seal LOCA model per Brookhaven model, including credit for qualified high-temperature RCP seals	$1.35x10^{-5}$

	- incorporated major plant design changes, including: • replacement of power-operated relief valves (PORVs) to eliminate leakage and allow operation with the block valve open • reassignment of power supplies to emergency diesel generator (EDG) room exhaust fans to eliminate dependencies • modification of backup battery charger 35 to be able to be powered from 480-V MCC 36C, 36D, or 36E • installation of a diesel-driven station air compressor • installation of temperature detectors to provide control room alarm if high temperature on the 15 and 33 feet (ft) elevation of the control building • installation of a waterproof door to the deluge valve station	
Rev. 2	2/2007 PSA Update - added a total loss of service water initiating event - updated offsite power recovery model per NUREG/CR-6890 - changed CCF model from modified Beta method to Alpha method - updated RCP seal LOCA model to WCAP-16141 (WOG2000) - revised AFW success criterion to require flow to two (rather than one) steam generators for normal (non-ATWS) response - modified success criteria for cooling of internal recirculation pumps to remove credit for cooling by redundant systems - removed the credit for an offsite gas turbine (which is no longer maintained)	1.15×10^{-5}

The CDF values from the IP2 and IP3 IPE submittals (3.13×10^{-5} per year and 4.40×10^{-5} per year, respectively) are near the average of the CDF values reported in the IPEs for pressurized-water reactors (PWRs) with dry containments. Figure 11.2 of NUREG-1560 shows that the IPE-based total internal events for these plants range from 9×10^{-8} to 8×10^{-5} per year, with an average CDF for the group of 2×10^{-5} per year (NRC 1997b). The NRC staff recognizes that other plants have updated the values for CDF subsequent to the IPE submittals to reflect modeling and hardware changes. The current internal event CDF results for IP2 and IP3 (1.79×10^{-5} per year and 1.15×10^{-5} per year, respectively) are comparable to those for other plants of similar vintage and characteristics.

The NRC staff considered the peer reviews performed for the IP2 and IP3 PSAs and the potential impact of the review findings on the SAMA evaluation in order to reach a conclusion regarding adequacy of the PRA to support SAMA evaluation. In the ER, Entergy described the peer review by the (former) Westinghouse Owner's Group (WOG) of the IP2 PSA model, conducted in May 2002, and of the IP3 PSA model, conducted in January 2001. The IP2 model reviewed was an updated version of the IPE that predated the May 2003 version described in Table G-3a. Similarly, the IP3 model reviewed was an updated version of the IPE that predated the June 2001 version described in Table G-3b.

For both IP2 and IP3, the ER states that all of the technical elements were graded as sufficient to support applications requiring the capabilities defined for grade 2 (e.g., risk-ranking applications). In addition, most of the elements were further graded as sufficient to support applications requiring the capabilities defined for grade 3 (e.g., risk-informed applications supported by deterministic insights).

For IP2, the ER states that there were no Level A findings (for which immediate model changes would have been appropriate) from the peer review. Although a number of minor model corrections were made following the peer review, no significant changes were made to the model structure or underlying assumptions in the May 2003 PSA update. The IP2 model was subsequently converted from the support-state RISKMAN model to a linked-fault-tree CAFTA model. Entergy indicates that the conversion effort included a number of modeling changes for consistency with other Entergy models and addressed the remaining findings and observations (F&Os) from the IP2 Peer Review (i.e., Level B, C, and D F&Os), where appropriate. In addition, the issues raised during the peer review of the IP3 model were also examined for applicability to IP2; all applicable issues were addressed consistent with the treatment used for IP3. For IP3, the ER states that all Level A and B F&Os from the IP3 peer review were addressed in the final version of the Revision 1 PSA model for IP3, which was issued in June 2001, and that less significant (Level C & D) F&Os were addressed, where appropriate.

Entergy indicates that the model changes incorporated in the IP2 Revision 1 and the IP3 Revision 2 PSA models also underwent an internal independent review by Entergy PSA staff and plant personnel and were subjected to a focused self-assessment to demonstrate technical quality in preparation for the NRC Mitigating Systems Performance Indicator (MSPI) program in 2006. In addition, the IP2 model was also subjected to a weeklong review by a team of industry peers from outside the Entergy staff in July 2005. Finally, the ER indicates that the model changes in the IP2 Revision 1 and the IP3 Revision 2 PSA models were peer reviewed for accuracy and consistency by members of the Entergy Nuclear Systems Analysis Group not directly involved in their implementation (Entergy 2007).

Given that the IP2 and IP3 internal events PSA models have been peer reviewed and the peer review findings were either addressed or judged to have no adverse impact on the SAMA evaluation, and that Entergy has satisfactorily addressed the NRC questions regarding the PSA (NRC 2007, NRC 2008, Entergy 2008a, Entergy 2008b). The NRC staff concludes that the internal events Level 1 PSA model for the plants is of sufficient quality to support the SAMA evaluation.

Section E.1.4 of the ER states that, for IP2, internal flooding was examined as part of the IPEEE, while Section E.3.4 indicates that internal flooding was included in the IP3 IPE. Internal flooding was later incorporated into the IP2 May 2003 PSA update, resulting in the consistent treatment of internal flooding for the two units.

The IP2 IPEEE analysis of internal flooding yielded a CDF of 6.6×10^{-6} per year while the IP3 IPE internal flooding analysis yielded a CDF of 6.5×10^{-6} per year. For each plant, three scenarios accounted for more than 80 percent of the flood CDF. All these scenarios result in a reactor trip and the nonrecoverable loss of safety-related switchgear from flooding sources located in or adjacent to each unit's 480-V switchgear room.

The internal flooding analysis was included in the WOG peer review. In response to an RAI, Entergy provided a detailed discussion on the incorporation of peer review comments for IP2 and IP3. For IP2, the licensee indicated that there were only two WOG peer review findings associated with the internal flooding analysis.

The first finding related to use of a flooding event screening criterion of 1×10^{-6} per year in the analysis. That criterion, however, was only applied to a scenario involving the potential for intercompartmental flooding from the EDG building to the electrical tunnel and involved leakage that could be accommodated by existing plant drains rather than catastrophic failure. Therefore, it was determined that screening of this scenario was appropriate and a model change was not needed.

The second finding was a general concern that the flooding study had not been updated since 1993. The IP2 internal flooding analysis was subsequently updated in 2005 (Entergy 2008a). For IP3, the licensee indicated that the IP3 WOG peer review concluded that the internal flooding analysis demonstrated a superior combination of industry data and models to obtain plant-specific piping rupture frequencies. The peer review identified four F&Os related to the internal flooding analysis. One F&O was a strength that warranted no change to the model. The other findings related to incorporation of historical data, assembly of walkdown records, and consideration of applicable draft American Society of Mechanical Engineers (ASME) standards to enhance the flooding analysis. The findings related to the incorporation of historical data and to the assembly of walkdown records were resolved during preparation of the final version of Revision 1 of the IP3 PSA model. The draft ASME standards identified by the review team were reviewed, and no modeling changes were warranted. Therefore, all internal flooding review comments that affect the model were addressed in the model used for the SAMA analysis (Entergy 2008a).

As indicated above, the current IP2 and IP3 PSA models do not include external events. In the absence of such an analysis, Entergy used the IP2 and IP3 IPEEEs, in conjunction with minor adjustments in fire and seismic scenarios, to identify the highest risk accident sequences and the potential means of reducing the risk posed by those sequences, as discussed below.

The IP2 and IP3 IPEEEs were submitted in December 1995 (Con Ed 1995) and September 1997 (NYPA 1997), in response to Supplement 4 of GL 88-20 (NRC 1991). These submittals included a seismic PRA analysis, a fire PRA, a high-wind risk model, and a screening analysis for other external events. While no fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events were identified, several opportunities for risk reduction were identified and implemented, as discussed below. In letters dated August 13, 1999, and February 15, 2001, the NRC staff concluded that the submittals for IP2 and IP3 generally met the intent of Supplement 4 to GL 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC 1999, NRC 2001). For IP3, the NRC staff identified an issue related to misdirection of manual fire suppression, which can fail equipment, but decided to resolve that issue separately from the IPEEE.

The IPEEE seismic analyses employed a seismic PSA following the guidance of NUREG-1407. The IPEEE estimated a seismic CDF of 1.46×10^{-5} and 4.4×10^{-5} per year for IP2 and IP3, respectively. Components related to decay heat removal were modeled in the seismic PSA for both units. No unique decay-heat removal vulnerabilities were found for either unit based on the quantitative risk results. Seismic-induced flooding and fires were examined as part of the IPEEE process for both units. Specific seismic-fire interactions were identified by Entergy, as listed in Table 2.12 of NUREG-1742 (NRC 2002). However, upon further consideration, the NRC staff concluded that the contribution to the CDF is small because the conditional probability of a fire, given an earthquake, is small (NRC 2001). For IP2 and IP3, the IPEEEs also addressed the issue of relay chattering through a detailed examination of the relays used in IP2 and IP3 against the low-capacity relay list found in Appendix D of Electric Power Research Institute (EPRI) NP-7148-SL. A list of the dominant contributors to the seismic CDF for IP2 and IP3 is provided in Tables G-4a and G-4b, based on the information provided in response to an RAI (Entergy 2008a).

In Section 4.21.5.4 of the ER, Entergy noted that conservative assumptions were used in the seismic analyses, including the use of a single, conservative surrogate element to model the most seismically rugged components, the assumption that redundant components are completely correlated in determining the probability of seismic-induced failure, and the assumption that seismic-induced ATWS events are not recoverable. For purposes of the SAMA evaluation, Entergy performed a reevaluation of the seismic CDF, as discussed below. For IP2, as a result of an IPEEE recommendation, the CCW surge tank hold-down bolts were upgraded. This effectively eliminated the contribution from the failure of the CCW surge tank, reducing the seismic CDF for IP2 from 1.46×10^{-5} per year to approximately 1.06×10^{-5} per year. For IP3, no seismic improvements were recommended. However, Entergy reevaluated the seismic PSA to reflect updated random component failure probabilities and to model recovery of onsite power and local operation of the turbine-driven AFW pump. This reduced the seismic CDF for IP3 from 4.4×10^{-5} per year to 2.65×10^{-5} per year. These reduced CDF values were used in developing the external events multipliers in the SAMA benefit analysis, as discussed later.

Table G-4a. IP2 Seismic Scenarios and Their Contribution to Seismic CDF

Seismic Scenario Description	CDF (per year) Frequency	Percent Contribution
Failure of CCW, primarily caused by failure of surge tank hold-down bolts	4.2x10^{-6}	29
Failure of the turbine building frame and consequential failure of control building	3.5x10^{-6}	24
Collapse of IP1 super heater stack onto control building	3.0x10^{-6}	21
Loss of 480 V emergency power	1.3x10^{-6}	9
Loss of service water (seismic failure of service water pumps)	1.3x10^{-6}	9
Seismic-induced loss of offsite power	4.4x10^{-7}	3
Other	7.4x10^{-7}	5
Total Seismic CDF from Dominant Scenarios	**1.46x10^{-5}**	**100**

Table G-4b. IP3 Seismic Scenarios and Their Contribution to Seismic CDF

Seismic Scenario Description	CDF (per year) Frequency	Percent Contribution
Loss of 480-V ac electric power with consequential RCP seal LOCA	1.9x10^{-5}	43
Loss of CCW with consequential RCP seal LOCA	1.0x10^{-5}	23
Loss of offsite power with seismic failures of the RHR heat exchangers, the condensate stage tank, containment instrument racks, and AFW	9.2x10^{-6}	21
Surrogate element (represents screened out, rugged components and structures, where failure leads to core damage)	3.5x10^{-6}	8
Seismic-induced ATWS	2.2x10^{-6}	5
Total Seismic CDF from Dominant Scenarios	**4.4x10^{-5}**	**100**

The IPEEE fire analyses employed a combination of PRA with the EPRI's fire-induced vulnerability evaluation methodology. The evaluation was performed in four phases:

(1) Qualitative screening;

(2) Quantitative screening;

(3) Fire damage evaluation screening;

(4) Fire scenario evaluation and quantification.

Each phase focused on those fire areas that did not screen out in the prior phases. The final phase involved using the IPE model for internal events to quantify the CDF resulting from a fire-initiating event. Each fire area that remained after screening was then treated as a separate initiating event and was propagated through the model with the appropriate model modifications. The CDF for each area was obtained by accounting for the frequency of a fire in a given fire area; the conditional core damage probability associated with that fire scenario in the fire area, including, where appropriate, the impact of fire suppression; and fire propagation. The potential impact on containment performance and isolation was evaluated following the core damage evaluation. The total fire CDF from the IPEEE was estimated to be 1.8×10^{-5} per year for IP2 (Con Ed 1995) and 5.6×10^{-5} per year for IP3 (NYPA 1997).

In Section 4.21.5.4 of the ER, Entergy noted that conservative assumptions were used in the IPEEE fire analyses, including overestimation of the frequency and severity of fires; conservative treatment of open, hot short, and short-to-ground circuits; and assumption of a plant trip for all fires. For purposes of the SAMA evaluation, Entergy performed a reevaluation of the fire CDF, as discussed below.

For IP2, Section E.1.3.2 of the ER notes that the IP2 IPEEE fire model had the following known conservatisms:

- The main feedwater and condensate systems were assumed to be unavailable in all scenarios, even when their power source was not affected by the fire scenario.

- The pressurizer PORV block valves were assumed to be in the limiting position (open or closed) to maximize the impact of the fire.

- All sequences involving RCP seal LOCAs were assumed to lead to complete seal failure.

For the purpose of the SAMA evaluation, Entergy reevaluated the dominant IPEEE fire sequences (sequences with CDF contributions greater than 1×10^{-7} per year) to reduce the conservatisms associated with main feedwater and condensate unavailability and PORV block valve assumptions and to reflect updated modeling associated with RCP-seal LOCAs. In response to a RAI, Entergy explained that other portions of the fire analysis methodology and modeling were not revised as part of the SAMA update. Entergy also noted that preliminary fire analysis results were inadvertently included in the ER and provided a corrected, revised IP2 fire CDF value of 8.4×10^{-6} per reactor year (Entergy 2008a). These revised results are included in Table G-5a and were used in developing the external events multiplier in the SAMA benefit analysis.

Similarly, for IP3, Section E.3.3.2 of the ER notes that the IP3 IPEEE fire model had known conservatisms in estimating the fire ignition frequency (e.g., an air compressor ignition frequency did not take into account that the compressor would operate only for a total of about 5 days per year). Also, at the time of IPEEE, the automatic suppression systems in some plant areas were placed in "manual" mode because of concerns with seismic interactions. Subsequently, some fire suppression systems were extensively modified so that the suppression mode could have been returned to "automatic." As part of the update for the purpose of SAMA evaluations, Entergy performed a reanalysis of the fire CDF and provided a revised IP3 fire CDF value of 2.55×10^{-5} per year (Entergy 2007). These revised results are included in Table G-5b and were used to develop the external events multiplier in the SAMA benefit analysis.

Table G-5a. IP2 Fire Areas and Their Contribution to Fire CDF

Fire Area	Area Description	CDF (per year)	
		IPEEE	**Fire Reanalysis**
1A	Electrical tunnel/pipe penetration area	9.2×10^{-7}	6.6×10^{-7}
2A	Primary water makeup area	1.1×10^{-6}	5.1×10^{-7}
11	Cable spreading room	4.3×10^{-6}	2.0×10^{-6}
14	Switchgear room	3.8×10^{-6}	1.4×10^{-6}
15	Control room	7.1×10^{-6}	3.0×10^{-6}
74A	Electrical penetration area	1.1×10^{-6}	7.3×10^{-7}
6A	Drumming and storage station	1.5×10^{-9}	1.5×10^{-9}
32A	Cable tunnel	9.6×10^{-8}	9.6×10^{-8}
1	CCW pump room	2.2×10^{-9}	2.2×10^{-9}
22/63A	Service water intake	7.5×10^{-9}	7.5×10^{-9}
23	AFW pump room	6.2×10^{-9}	6.2×10^{-9}
Total Fire CDF from Major Fire Areas		$\mathbf{1.8 \times 10^{-5}}$	$\mathbf{8.4 \times 10^{-6}}$

Table G-5b. IP3 Fire Areas and Their Contribution to Fire CDF

Fire Area	Area Description	CDF (per year)	
		IPEEE	**Fire Reanalysis**
14	480-V switchgear room	3.5×10^{-5}	1.3×10^{-5}
11	Cable spreading room	6.8×10^{-6}	5.3×10^{-6}
15	Control room	3.7×10^{-6}	3.7×10^{-6}
14/37A	480-V switchgear room/south turbine building	4.5×10^{-6}	1.8×10^{-7}
10	Diesel generator 31	2.1×10^{-6}	2.0×10^{-6}
102A	Diesel generator 33	1.9×10^{-6}	4.7×10^{-9}

Fire Area	Area Description	CDF (per year) IPEEE	CDF (per year) Fire Reanalysis
60A	Upper electrical tunnel	$7.1x10^{-7}$	$7.1x10^{-7}$
101A	Diesel generator 32	$3.4x10^{-7}$	$5.2x10^{-9}$
7A	Lower electrical tunnel	$2.8x10^{-7}$	$2.8x10^{-7}$

Table G-5b (continued)

Fire Area	Area Description	CDF (per year) IPEEE	CDF (per year) Fire Reanalysis
23	AFW pump room	2.3×10^{-7}	2.3×10^{-7}
37A	south turbine building elevation 15 ft	3.8×10^{-8}	3.8×10^{-8}
17A	primary auxiliary building (PAB) corridor	3.2×10^{-8}	3.2×10^{-8}
Total Fire CDF from Major Fire Areas		$\mathbf{5.6 \times 10^{-5}}$	$\mathbf{2.6 \times 10^{-5}}$

For high-wind and tornado events, the ER noted that IP2 structures and systems predate the 1975 Standard Review Plan (SRP) criteria. Therefore, a detailed PRA was developed as part of the IPEEE analysis to address the impact of high-wind events at IP2. The equipment of concern includes that located within sheet metal clad structures (e.g., the gas turbine and EDG components) and equipment in the yard, including the condensate storage tank (CST) and service water pumps. The CDF for high-wind events was estimated in the IPEEE to be 3.03×10^{-5} per year. In Section E.1.3.3.1 and E.1.4.3 of the ER, Entergy noted that its planned removal of the gas turbines from service would reduce the probability of recovering power from the offsite gas turbine location (as modeled in the PRA), but as shown by a sensitivity analysis this impact would be offset by the increased reliability and ruggedness of the new IP2 SBO/Appendix R diesel generator relative to that of the gas turbines. Accordingly, Entergy used the IPEEE high-wind CDF of 3.03×10^{-5} per year in determining the external event multiplier for IP2, as discussed later.

The IP3 structures and systems also predate the SRP criteria, but the IPEEE found the estimated CDF for high-wind events to be below the 1×10^{-6} per year screening criterion (from NUREG-1407). This conclusion is based in part on the assumption that high water levels are maintained in the condensate storage and city water storage tank, thus preventing significant wind load and pressure differential damage to the tanks that provide water to the AFW system (NYPA 1997). Because of the low CDF value, the IP3 external-event multiplier does not explicitly account for risks associated with high-wind and tornado events.

The IP2 and IP3 IPEEE submittals examined a number of other external hazards, including external flooding, ice formation, and accidents involving hazardous chemicals, transportation (e.g., accidental aircraft impacts), or nearby industrial facilities. These evaluations followed the screening and evaluation approaches specified in Supplement 4 to GL 88-20 (NRC 1991). No risks to the plant from external floods, ice formation, or accidents involving hazardous chemicals, transportation, or nearby facilities, were identified that might lead to core damage with a predicted frequency in excess of 1×10^{-6} per year (Con Ed 1995, NYPA 1997). For IP3, scenarios involving hydrogen explosions within the turbine building, the pipe trench between the PAB and containment, the hydrogen shed area in the containment access facility, and the pipe chase on the 73-ft elevation of the northeast corner of the PAB were identified that, in total, could result in core damage with an estimated frequency slightly above 1×10^{-6} per year. As a result, Phase II SAMA 53 was identified to evaluate the change in plant risk from plant modifications to install an excess flow valve to reduce the risk associated with hydrogen explosions inside the turbine building or PAB. Entergy noted that the risks from deliberate aircraft impacts were explicitly excluded, since this was being considered in other forums, along with other sources of sabotage.

Based on the aforementioned results, Entergy estimated that the external event CDF is approximately 2.8 and 4.52 times that of the internal-event CDF for IP2 and IP3, respectively. For IP2, this factor was based on an internal event CDF of 1.79×10^{-5} per year, a seismic CDF of 1.06×10^{-5} per year, a fire CDF of 8.4×10^{-6} per year, and a high-wind CDF contribution of 3.03×10^{-5} per year. For IP3, this factor was based on an internal-event CDF of 1.15×10^{-5} per year, a seismic CDF of 2.65×10^{-5} per year, and a fire CDF of 2.55×10^{-5} per year. Accordingly, the total CDF from internal and external events would be approximately 3.8 times the internal-event CDF for IP2 and 5.5 times the internal event CDF for IP3.

In the SAMA analysis submitted in the ER, Entergy increased the benefit that was derived from the internal-event model by a factor 3.8 and 5.5 to account for the combined contribution from internal and external events for IP2 and IP3, respectively. For SAMA candidates that address only a specific external event and have no bearing on internal-event risk (e.g., IP2 SAMA 66—Harden EDG Building Against High Winds), Entergy derived the benefit directly from the external-event risk model and then increased the benefit by the multipliers identified earlier. This resulted in a bounding benefit for the SAMA candidates addressing a specific external event. The NRC staff agrees with the licensee's overall conclusion concerning the impact of external events and concludes that the licensee's use of a multiplier of 3.8 and 5.5 for IP2 and IP3, respectively, to account for external events is reasonable for the purposes of the SAMA evaluation. This is discussed further in Section G.6.2.

The NRC staff reviewed both the general process used by Entergy to translate the results of the Level 1 PSA into containment releases and the results of the Level 2 analysis, as described in the ER and in response to the NRC staff's RAIs (Entergy 2007, Entergy 2008a). The containment designs and the Level 2 analyses are similar for IP2 and IP3. The NRC staff notes that, after reviewing information provided by Entergy, the current Level 2 PSA models are based on the IPE models, with updates to reflect changes to the plant and modeling techniques, including a 3.3 percent and 4.8 percent power uprate for IP2 and IP3, respectively; inclusion of additional PDSs to improve the Level 1–Level 2 PSA interface; and updated accident progression and source term analyses using a later version of the MAAP computer code.

The Level 1 core damage sequences are placed into one of 57 PDS bins that provide the interface between the Level 1 and Level 2 analyses. The PDSs are defined by a set of functional characteristics for system operation that are important to accident progression, containment failure, and source-term definition. The Level 2 models use a single CET with functional nodes representing both systemic and phenomenological events. The CET is used to determine the appropriate release category for each Level 2 sequence. CET nodes are evaluated using supporting fault trees and logic rules.

Entergy characterized the releases for the spectrum of possible radionuclide release scenarios using a set of nine release categories, defined based on the timing and magnitude of the release and whether the containment remains intact, fails, or is bypassed. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints binned into the release category. The release characteristics for each category were obtained by frequency weighting the release characteristics for each CET endstate contributing to the release category. The source-term release fractions for the CET endstates were estimated based on the results of plant-specific analyses of the dominant CET scenarios using the MAAP (Version 4.04) computer program. The release categories and their frequencies and release characteristics are presented in Tables E.1-10 and E.3-10 of the ER.

During the review of the Level 2 analysis, the NRC staff could not determine the modeling approach used to assess the likelihood of a thermally induced SGTR (TI-SGTR) following core damage in the current IP2 and IP3 PSAs. Entergy explained that TI-SGTR events are considered in the Level 2 analyses for two conditions:

(1) High reactor cooling system (RCS) pressure and steam generators dry (no secondary-side cooling);

(2) High RCS pressure and steam generators initially dry, with recovery of secondary-side cooling before challenging the steam generator tubes.

The first condition applies to transient event sequences in which RCS pressure is at the pressurizer PORV setpoint at the time of core damage. No credit is taken for recovery of secondary-side cooling in these sequences. Entergy states that a TI-SGTR probability of 0.01 is used for this case, based on Table 2-1 of NUREG/CR-4551, Volume 2, Revision 1, Part 1, which shows a distribution that ranges from 1×10^{-5} to 0.1208 and a mean value of 0.018. The second condition applies to SBO sequences in which RCS pressure is at the pressurizer PORV setpoint at the time of core damage. Entergy states that a TI-SGTR probability of 5×10^{-4} is used for this SBO case, based on the expectation that the steam generators will not dry out until after battery depletion and that secondary-side cooling and other mitigating system functions could be recovered before that time. The value is stated as being derived from the transient case value of 0.01 combined with the human error probability of 5.2×10^{-2} for failure to align AFW following ac power recovery. Entergy explained that a stuck-open main steam safety valve or other secondary-side depressurization event is required to create the large differential pressure needed for the conditional TI-SGTR probabilities assumed above and that the Level 2 analyses conservatively did not account for the probability that these additional failures do not occur (Entergy 2008b). A sensitivity analysis that increases the probability of the TI-SGTR was developed at the staff's request and is described in Section G.6.2.

The NRC staff's reviews of the Level 2 IPEs for IP2 and IP3 concluded that the analyses addressed the most important severe accident phenomena normally associated with large dry containments and identified no significant problems or errors (NRC 1995, NRC 1996). It should be noted, however, that the current Level 2 models are revisions to those of the IPE. The Level 2 PSA models were included in the WOG peer reviews mentioned previously. The changes to the Level 2 models to update the methodology and to address the peer review recommendations are described in Sections E.1.4 and E.3.4 of the ER (Entergy 2007) and in response to an RAI concerning peer review findings related to the Level 2 PSA model (Entergy 2008a).

In the RAI response, Entergy provided a detailed discussion of all the changes that resulted from the incorporation of the WOG peer review of the Level 2 PRA. For IP2, the licensee indicated that there were two Level C F&Os related to the Level 2 analysis. One issue dealt with treatment of containment failure from energetic events (e.g., direct containment heating, hydrogen combustion, in-vessel steam explosions, and ex-vessel steam explosions). The other issue related to treatment of a stuck-open main steam safety valve following an SGTR core damage event. Entergy indicated that all peer review recommendations associated with the WOG review were incorporated in Revision 0 of the IP2 PSA (3/2005).

For IP3, Entergy indicated that there were six F&Os from the WOG peer review team related to the Level 2 analysis:

- One F&O was related to the containment strength that was considered for a plant-specific containment structural analysis.
- One Level A F&O recommended that the LERF definition include the release of iodine as well as cesium and tellurium.
- Two Level B F&Os were related to justification for the value used for ex-vessel explosions, and an overestimation of the “Alpha mode”-induced containment failure probability.
- One Level C F&O recommended crediting repair and recovery of systems that affect containment performance.
- One Level D F&O was related to documentation.

Entergy indicated that all Level A and B F&Os were resolved and that changes were incorporated as necessary in Revision 1 of the IP3 PSA (6/2001). Entergy also stated that the Level C and D F&Os were addressed, as appropriate, in the next revision of the model (Revision 2, 2/2007).

Based on the NRC staff’s review of the Level 2 methodology, the fact that the Level 2 model was reviewed in more detail as part of the WOG peer review and updated to address peer review findings, and Entergy’s responses to the RAIs, the NRC staff concludes that the Level 2 PSAs for IP2 and IP3 are technically sound and provide an acceptable basis for evaluating the benefits associated with various SAMAs.

As indicated in the ER, the estimated IP2 and IP3 reactor core radionuclide inventories used in the MACCS2 input are based on the current core configuration and a power level of 3216 megawatt thermal (MWt). The information was derived from Westinghouse Electric Company, Core Radiation Sources to Support IP2 Power Uprate Project, CN-REA-03-4 (3/7/2005), and Westinghouse Electric Company, Core Radiation Sources to Support IP3 Stretch Power Uprate (SPU) Project, CN-REA-03-40 (5/19/2005). In response to an RAI, Entergy confirmed that the current core design and operational practice are consistent with this analysis and that there are no planned future changes to reactor power level or fuel management strategies that would affect the reactor core radionuclide inventory used in the MACCS2 analysis (Entergy 2008a).

The NRC staff reviewed the process used by Entergy to extend the containment performance (Level 2) portion of the PSA to an assessment of offsite consequences (essentially a Level 3 PSA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release categories and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was used to estimate offsite consequences. Plant-specific input to the code includes the source terms for each release category and the reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within an 80-kilometer (50-mile) radius for the year 2035, emergency evacuation modeling, and economic data. This information is provided in Sections E.1.5 and E.3.5 of the ER for IP2 and IP3, respectively (Entergy 2007).

As described in Sections E.1.5.2.6 and E.3.5.2.6 of the ER, meteorological data for a 5-year period from January 2000 to December 2004 were obtained from the Indian Point onsite meteorological monitoring system. The 5-year data included 43,848 consecutive hourly values of wind speed, wind direction, precipitation, and temperature. Missing data were estimated using data substitution methods. These methods include substitution of missing data with valid data from the previous hour and with data collected from other elevations on the meteorological tower. The data for the 5-year period were averaged to provide a data file consisting of one year of hourly readings representative of site meteorology. This data file was used as input to the MACCS2 code for the SAMA analysis reported in the ER.

Subsequent to issuance of the DSEIS, a problem with the process used to numerically average the site-specific meteorological data was identified. Entergy determined that the method used to average the wind direction data was faulty and resulted in a lower frequency of winds blowing toward the south than actually observed. Since a majority of the population near Indian Point is in the southern semicircle of the 50-mile radius, this error resulted in a smaller population dose and a smaller offsite economic cost than would be expected using the corrected method. Accordingly, the dose and economic impacts of a severe accident and the estimated benefits of candidate SAMAs would be larger than was reported in the ER (Entergy 2009).

To address the meteorological data error's impact on the SAMA evaluation, Entergy performed a separate MACCS2 analysis for each of the five single years of meteorological data. Entergy compared the results and selected the year that resulted in the largest population dose (year 2000) as the representative year for use in the SAMA analysis. This approach circumvents the problem associated with averaging wind directions, and is consistent with the intent of the ER to provide results for representative site meteorology. Entergy updated the population dose and offsite economic cost values for each containment release mode, and the estimated benefits for each SAMA based on the meteorological data for year 2000. The correction in meteorological data resulted in approximately a factor of 4 increase in population dose and offsite economic cost values, and resulted in several additional SAMAs becoming potentially cost-beneficial (Entergy 2009). This is discussed further in Section G.6.1. The NRC staff concludes that the updated approach taken for collecting and applying the meteorological data in the SAMA analysis is reasonable and acceptable. This is discussed further in section G.2.3.

The population distribution which the licensee used as input to the MACCS2 analysis was estimated for the year 2035 based on information from the New York Statistical Information System from 2000 to 2030, the New Jersey Department of Labor and Workforce Development from 2000 to 2025, the Connecticut State Data Center from 2000 to 2020, and the Pennsylvania State Data Center from 2000 to 2020. These data were used to project county-level resident populations to the year 2035 using regression analysis. The 2035 transient population was assumed to be the 2004 transient-to-permanent population ratio multiplied by the extrapolated permanent population. The 2004 transient data were obtained from State tourism agencies. The NRC staff notes that Entergy's projected 2035 population within a 50-mile radius of IP2 and IP3 reported in Tables E.1-12 and E.3-12 of the Entergy ER (19.2 million people) is approximately 15 percent greater than the 50-mile population obtained from NRC SECPOP2000 code (16.8 million) for the year 2003 (NRC 2003). This represents an average annual growth rate of 0.4 percent, which comports with Entergy's estimated growth rates reported in Section 2.6.1 of the ER. The NRC staff considers the methods and assumptions for estimating population reasonable and acceptable for the purposes of the SAMA evaluation.

Entergy did not credit evacuation either as part of the base-case analysis or for estimating the benefit from SAMA cases. Entergy assumed a “no evacuation scenario” to conservatively estimate the population dose. In response to an NRC staff RAI, Entergy clarified that the “no evacuation scenario” assumes that individuals within the 10-mile evacuation zone continue normal activity following a postulated accident without taking emergency response actions such as evacuation or sheltering. Relocation actions within a 50-mile radius of the plant are still modeled in the “no evacuation scenario.” As such, individuals within hot spots or high-radiation areas anywhere within the 50-mile zone are assumed to be relocated outside the 50-mile zone until long-term protective actions reduce radiation levels (Entergy 2008a). As used in the MACCS2 code, “evacuation” refers to the prompt movement of the population out of an affected region (e.g., certain sectors of the EPZ) during the emergency-phase time period immediately following an accident, in accordance with the emergency evacuation plan. “Relocation” refers to the movement of the population out of an affected region (e.g., within hot spots or high radiation areas) during the intermediate phase or long term phase based on longer-term dose considerations. The NRC staff concludes that the evacuation and relocation assumptions and analysis are generally conservative and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data was obtained from the 2002 Census of Agriculture (USDA 2002). These include the value of farm and nonfarm wealth. Other data, such as population relocation cost, daily cost for a person who is relocated, and cost of farm and nonfarm decontamination were obtained from the Code Manual for MACCS2 (NRC 1997c). The data from the MACCS2 Code Manual were inflation-adjusted using the consumer price index corresponding to the year 2005. Information on regional crops was obtained from the 2002 Census of Agriculture. Crops for each county were mapped into the seven MACCS2 crop categories.

MACCS2 requires an average value of nonfarm wealth (identified as VALWNF in MACCS2). The county-level nonfarm property value was used as a basis for deriving VALWNF and resulted in a value of $163,631 per person. This does not explicitly account for the economic value associated with tourism and business. In the ER, Entergy assessed the impact of including tourism and business losses using a sensitivity case. This sensitivity case assumed a loss of $208,838 per person in the affected region, as opposed to $163,631 per person in the base case. The NRC staff questioned the basis for the modified VALWNF value ($208,838 per person) and the rationale for treating the loss of tourism and business in a sensitivity case rather than in the baseline analysis (NRC 2007). In response, Entergy described the basis for the modified VALWNF value and explained that the impact of lost tourism and business was not modeled in the baseline analysis because the level of tourism and business activity can be re-established in time. Nevertheless, Entergy provided the results of a revised uncertainty analysis using the modified VALWNF value (Entergy 2008a). As a result, three additional potentially cost-beneficial SAMAs were identified (SAMAs 9 and 53 for IP2 and SAMA 53 for IP3). In response to an RAI, Entergy indicated that these SAMAs have been submitted for engineering project cost-benefit analysis to obtain a more detailed examination of their viability and implementation costs (Entergy 2008b). As described in Section G.6.2, the NRC staff has adopted the case incorporating lost tourism and business as its base case, given that it may take years to re-establish the level of tourism and business activity following a severe accident.

In the draft SEIS, the NRC staff reached a preliminary conclusion that the methodology used by Entergy to estimate the offsite consequences for IP2 and IP3 provides an acceptable basis from which to proceed with an assessment of candidate SAMAs. A further assessment of the methodology was subsequently performed by the NRC staff of issues raised in a petition by New York State (NYS) to intervene in the license renewal proceeding. As described below in Section G.2.3, the NRC staff reaffirms its original conclusion that the methodology used by Entergy to estimate the offsite consequences for Indian Point, as amended in Entergy's SAMA re-analysis (Entergy 2009), provides an acceptable basis from which to proceed with an assessment of candidate SAMAs.

G.2.3 Review of Issues Related to NYS Contentions 12 and 16

On November 30, 2007, New York State (NYS) filed a petition to intervene in the Indian Point license renewal proceeding, in which it filed various contentions, including two contentions challenging Entergy's SAMA analysis, asserting that the analysis was flawed based, in part, on its use of certain input data for the MACCS2 code and the ATMOS air dispersion module. The Atomic Safety Licensing Board (Board) admitted NYS Contentions 12 and 16 related to the SAMA analysis on July 31, 2008.

On February 27, 2009, NYS filed Amended Contentions 12A and 16A, challenging the NRC staff's evaluation and preliminary conclusions regarding Entergy's SAMA analysis as set forth in the DSEIS. On June 16, 2009, the Board admitted amended contentions NYS 12A and 16A, and consolidated them with original contentions NYS 12 and 16. As admitted by the Board, NYS Contention 12/12A challenges whether specific inputs and assumptions related to clean-up and decontamination costs are correct for the area surrounding Indian Point, and NYS Contention 16/16A challenges: (1) whether the population projections used by Entergy are underestimated, (2) whether the ATMOS module in MACCS2 is being used beyond its range of validity (beyond thirty-one miles), and (3) whether use of MACCS2 with the ATMOS module leads to non-conservative geographical distribution of radioactive dose within a fifty-mile radius of Indian Point.

On March 11, 2010, NYS filed Amended Contentions 12B and 16B, challenging various aspects of Entergy's December 2009 SAMA Reanalysis – which, using revised meteorological data, had produced revised estimates of offsite population doses and economic costs, and revised SAMA analysis results (including six additional potentially cost-beneficial SAMAs). On June 30, 2010, the Board admitted NYS Contentions 12B and 16B (in part), and consolidated them with NYS Contentions 12/12A and 16/16A. *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-10-13, 71 NRC ___ (2010), slip op. at 10, 14-15.

In reviewing the issues raised in these contentions, the NRC staff obtained the technical assistance of Sandia National Laboratory (Sandia). The NRC staff and Sandia performed a comprehensive review of relevant documents and references, including the ER, the draft SEIS, the MACCS2 input decks for Indian Point and associated documentation, the NYS contentions and supporting documents and references, the Board's rulings on the contentions, and other relevant filings in the adjudicatory proceeding. A summary of the staff's assessment of the issues raised in the admitted contentions is provided below.

Clean-up and Decontamination Costs (NYS Contention 12/12A/12B)

NYS Contention 12/12A/12B argues that the size of the particles dispersed from a severe reactor accident would be comparable to those released in nuclear weapons tests, smaller than the particle size considered in MACCS2, and that it will be more expensive to decontaminate and clean-up a suburban/urban area in which small-sized radionuclide particles have been dispersed. NYS defines large-sized particles as ranging in size from "tens to hundreds of microns" and defines small particles as ranging in size from "a fraction of a micron to a few microns".

The staff and Sandia reviewed the inputs and assumptions regarding particle size distribution and decontamination costs used in the SAMA analysis, and determined that the particle size utilized in the analysis was reasonable and acceptable. In this regard, in the MACCS2 input files (atmbi2NS.inp and atmbi3NS.inp), Entergy used a dry deposition velocity value of 0.01 meters per second (m/s) for all aerosol particles. A deposition velocity of 0.01 m/s corresponds to approximately a 5 to 10 micron radius particle, based on gravitational settling of small spheres in dilute laminar flow fields. Thus, the MACCS2 dispersion does not assume that the dispersion will consist of large-sized radionuclide particles as NYS contends. While smaller (or larger) particle sizes could have been used in the analysis, the particle size utilized in the analysis was relatively small, is consistent with the accepted SAMA analyses performed for other nuclear power plants, and is acceptable. With respect to the estimated decontamination costs used in Entergy's MACCS2 SAMA analysis, the staff found that Entergy's estimated decontamination costs were reasonable and acceptable, as described below.

In the MACCS2 input files, Entergy used decontamination cost parameters that were typically higher than the MACCS2 Sample Problem A values by a factor of 1.7. (Sample Problem A values were primarily developed for the Surry plant analysis in NUREG-1150 and represent best estimate information for that site and time.) As described in the ER, the values were obtained by adjusting the generic Sample Problem A economic data with the consumer price index of 195.3, which accounts for inflation between 1986 and 2005. Farm and nonfarm values for Indian Point were based on site-specific data and were not extrapolated from Sample Problem A. NYS suggests that in place of the "outdated" decontamination cost figures used by Entergy, the methodology described in a Sandia document, SAND96-0957, "Site Restoration: Estimation of Attributable Costs from Plutonium-Dispersal Accident" should be used in establishing decontamination values for input to MACCS2. The NRC staff does not consider the methodology for clean-up of a nuclear weapons accident relevant to clean-up following a nuclear power plant (NPP) accident. Nonetheless, at the staff's request, Sandia performed a comparison of the decontamination cost factors derived from the Site Restoration study to those used in the SAMA analysis. The approach to the cost comparison included identifying basic considerations of each type of accident (e.g., contaminants, half life of contaminants, and health and safety considerations), identifying the decontamination methods required, and comparing the Site Restoration study cost values (as applied to the urban area of New York City) to those used in Entergy's analysis.

Sandia noted that the primary constituent in weapons grade plutonium, Pu239, is an alpha emitter, whereas the primary contaminant from an NPP accident, Cs137, is a gamma emitter. As such, Pu239 is more difficult and expensive to characterize and verify in the field than gamma emitters like Cs137. Furthermore, Pu239 is primarily an inhalation hazard with half-life of 24,000 years, whereas Cs137 is primarily an external health hazard with half-life of about 30 years. The need for evacuating the public is much greater with plutonium because if inhaled, the health consequences can be severe.

Both the Site Restoration study and the MACCS2 model consider the extent of decontamination required in determining decontamination costs. This is typically expressed as a decontamination factor (DF) which represents the ratio of the contamination level before and after clean-up. The Site Restoration study provides cost estimates for remediation of light contamination (DF=2 to 5), moderate contamination (DF=5 to 10), and heavy contamination (DF>10). Appendix F of the Site Restoration study describes the decontamination methods for light, moderate, and heavy contamination by plutonium. For the Indian Point MACCS2 model, Entergy provided decontamination cost input values for two levels of remediation, specifically, a DF of 3 and a DF of 15. Sandia considered the decontamination activities described in the Site Restoration study together with the differences in health hazards posed by Pu239 versus Cs137, and concluded that the activities required to support clean-up of moderate plutonium contamination align more closely with clean-up activities for heavy cesium contamination. Sandia performed the comparison of decontamination cost values on this basis.

Sandia conservatively limited its cost comparison to urban areas (non-farmland) because urban areas are more costly to decontaminate than farmland, and because farmland makes up a very small percentage of land area within the Indian Point area, with most counties having less than 1 percent farmland. To further simplify the cost analysis and provide a comparison of the highest cost areas, the cost comparison was performed only for New York City, which includes five counties (the Bronx, Kings, New York, Queens, and Richmond). The population density of New York City is about 12,000 persons/km^2.

As described above, the decontamination activities for moderate plutonium contamination are most directly comparable to the decontamination activities for heavy cesium contamination. The Site Restoration study (Table 6-2) provides an estimated cost of \$178.4 million/km^2 for clean-up of moderate plutonium contamination in urban areas, or \$14,900 per person when expressed on a per capita basis for New York City. In contrast, a cost of \$13,824 per person was used in Entergy's MACCS2 analysis for decontamination of heavy cesium contamination. Thus, the decontamination cost from the Site Restoration study (\$14,900 per person) is not significantly different than the value used by Entergy in the SAMA analysis (\$13,824 per person). If the Site Restoration study values were escalated to 2005 dollars, as were the values used in the SAMA analysis, the difference would be greater, but would still be within a factor of about 2, The differential dollar cost attributable to this difference would vary depending upon the size of the area (i.e., the number of people) that would need to be evacuated. Thus, using the Site Restoration study values, decontamination could cost more than was estimated in Entergy's analysis; however, it could also cost less than Entergy estimated, inasmuch as the SAMA analysis assumed the dispersal of "heavy contamination." Considering the uncertainties inherent in such predictions, Entergy's decontamination cost estimates appear reasonable and acceptable. Further, Entergy's decontamination cost estimates are consistent with those used in accepted SAMA analyses performed for other nuclear power plants.

Population Projections (NYS Contention 16/16A/16B)

NYS Contention 16/16A/16B argues that Entergy's projections of the 2035 population living within the 50-mile radius of Indian Point underestimate the potential exposed population. The staff and Sandia reviewed Entergy's baseline and projected population values and its population projection methodology, and developed independent estimates of the baseline and projected population. Entergy obtained population estimates directly from State agency reports for periods ranging from 2000 to 2020 and 2000 to 2030, depending on the State data available. Entergy projected total permanent populations to the year 2035 for 25 of the 28 counties that are within or encroach upon the limit of 50 miles from Indian Point using linear extrapolation.

Entergy used areal weighting, which assumes a constant population distribution over the area assessed (i.e., in each of the 160 cells within the 16 sectors and radial rings representing the 50-mile radius surrounding the IP site), to establish fractional population within 50 miles of Indian Point. Entergy then adjusted this permanent population projection upward to account for the presence of the transient (tourist) population as estimated from available tourist information. For the remaining three counties, including New York (Manhattan), Rockland, and Westchester counties, Entergy used polynomial regression for projecting the population. A polynomial regression appears to have been used for these counties because State data shows a decrease in the population of these counties. The population for these counties was projected by the State to increase from 2000 to 2020 and then decrease from 2020 to 2030 resulting in a peak population in 2020. Because there is a peak within the projection period, Sandia agreed that use of a polynomial projection to the year 2035 is a more appropriate approach than a linear projection for these counties. Entergy estimated the year 2000 permanent population within the 50-mile radius of Indian Point to be 16,914,178. Entergy projected the permanent population out to 2035 to be 18,879,657, an increase of 12.43 percent. The population Entergy used in its SAMA analysis was 19,228,714, which accounts for the transient population, as described above.

Sandia performed an independent assessment of the population data within a 50-mile radius of Indian Point using the SECPOP2000 computer program. The population data in SECPOP2000 is based on 2000 U.S. Census Bureau data. The population for the year 2000 estimated by SECPOP2000 is 16,800,272; this compares very closely with Entergy's year 2000 estimate of the permanent population within the 50-mile radius (16,914,178).

Sandia also performed two analyses of projected population growth to the year 2035, and determined that Entergy's projected population growth was reasonable. The first evaluation was based on the US Census Bureau's projected growth from 2000 to 2008 for the Northeast region of the US. During these 8 years, the projected growth is 2.344 percent; based on this number, the annualized growth rate for the Northeast region of the country is 0.2900 percent. Assuming a constant growth rate between the years 2000 and 2035 results in an estimated growth of 10.67 percent. This estimate is lower than the Entergy value of 12.43 percent. The second evaluation used the same year 2000 population for the 28 counties surrounding Indian Point as used by Entergy, but used a simpler method than Entergy for extrapolating out to 2035. The annualized growth rate was calculated starting from the 2000 census values to the final (latest) year projected by each of the states. Assuming this growth rate to continue through 2035, the estimated growth for the 28 counties is 15.98 percent. This value is larger than Entergy's projected growth of 12.43 percent, but the difference is small. Thus, the two evaluations performed by Sandia bound the Entergy projection for population growth.

Finally, Sandia performed a separate population projection for the five counties comprising New York City. For New York, Queens, and Richmond Counties, Sandia projected slightly higher populations than Entergy. For Bronx and Kings Counties, Entergy projected higher populations. The difference between the Sandia and Entergy population projections for all 5 counties is only 0.39 percent. The NRC staff concludes that Entergy's population data and projected population growth analysis provide reasonable (and slightly conservative) population values for its SAMA analysis.

Validity of ATMOS Model (NYS Contention 16/16A/16B)

NYS Contention 16/16A/16B argues that the ATMOS air dispersion module utilized in the MACCS2 code is being used beyond its range of validity (beyond thirty-one miles), which could affect the validity of decontamination cost estimates for areas beyond that range. The NRC staff and Sandia National Laboratory addressed this issue in detail, in the NRC staff's October 13, 2009 response to a NYS motion for partial summary disposition. In brief, the NRC staff and Sandia considered the State's concern, and concluded that ATMOS air dispersion module provides an acceptable means for estimating potential plume travel and dispersion in a probabilistic statistical analysis, and is acceptable for use with the MACCS2 code, in which a probabilistic analysis is performed for a large number of meteorological trials, which are subject to hourly variation. Further, this conclusion is supported by a comparison of the results produced by MACCS2 analyses using the ATMOS module with the results of analyses performed with other codes.

ATMOS is a Gaussian plume model within MACCS2 that treats plume segments under different weather conditions based on hourly changes from the site meteorological data. The meteorological data considered for each segment include wind speed, direction, stability class, and precipitation. Once a plume is formed, the direction does not change; however, the wind speed, stability class, and precipitation rate can change hour-by-hour based on the meteorological data.

The MACCS2 code considers, among other things, phenomena related to atmospheric transport and deposition under time-variant meteorology, short- and long-term mitigative actions, potential exposure pathways, deterministic and stochastic health effects, and economic costs. The MACCS2 code samples the meteorological data from an entire year and uses wind rose data to account for the plume traveling through all 16 compass sectors to ensure that all the potential plume paths are accounted for in the calculations. This ensures that likely impacts for the entire area within a 50-mile radius have an accurate statistical model for likelihood of a plume reaching that area and its expected concentration. The MACCS2 model generates average or expected values of metrics of interest considering all of the relevant dose pathways, including the food and water pathway, and covering essentially a lifetime of exposure to a contaminated environment.

Questions regarding the adequacy of averaging metrics of interest over numerous weather sequences have been studied in detail. This included a detailed code comparison completed in 2004 with the objective of determining if the average atmospheric transport and dispersion results from codes such as MACCS2 are sufficiently accurate that more complex models are not required. In that study, results from the MACCS2 code were directly compared to those from the LODI (Lagrangian Operational Dispersion Integrator) code and the RASCAL 3.0 (Radiological Assessment System for Consequence Analysis, Version 3.0) code.

LODI is a state-of-the-art, three-dimensional (3D) advection dispersion code that uses a Lagrangian stochastic Monte Carlo method. LODI is coupled to ADAPT (Atmospheric Data Assimilation and Parameterization Technique), which provides time-varying, 3D fields of mean winds, turbulence, pressure, temperature, and precipitation based on observed meteorology. LODI is an element of the National Atmospheric Release Advisory Center (NARAC) emergency response modeling system at Lawrence Livermore National Laboratory (LLNL) which is a national support and resource center for planning, real-time assessment, emergency response, and detailed studies of incidents involving the spread of hazardous material accidentally or intentionally released into the atmosphere.

RASCAL 3.0 is used by the NRC for emergency response applications where a rapid response is required. The NRC evaluates accident conditions using RASCAL and compares results to those produced by NARAC during an accident. RASCAL 3.0 contains atmospheric transport and dispersion components that are intermediate in complexity between MACCS2 and ADAPT/LODI. RASCAL employs time-varying, two-dimensional meteorological fields of wind, stability, and precipitation based on surface-level meteorological observations as input to a Lagrangian trajectory transport model and a Gaussian puff dispersion model. While the dispersion portions of RASCAL 3.0 are similar to those of MACCS2, the transport portions are significantly different. The capabilities of RASCAL 3.0 are similar to those of the dispersion models CALPUFF and AERMOD, which were recommended by NYS.

As documented in NUREG/CR-6853, "Comparison of Average Transport and Dispersion Among a Gaussian, a Two-Dimensional, and a Three-Dimensional Model," this comparison shows that MACCS2 provides results consistent with those from the more complex plume models at distances up to 100 miles. This is well beyond the 50-mile radius considered in the SAMA analysis. The MACCS2 predictions for average, time-integrated, ground-level air concentrations (which directly relates to inhalation and cloudshine doses), and for average deposition (which directly relates to groundshine and ingestion pathway doses) were very comparable to predictions made by the state-of-the-art NARAC codes, ADAPT/LODI, at all distances. The direct comparison to state-of-the-art codes demonstrates that MACCS2 is well within its range of validity when used to perform SAMA analyses.

Geographical Distribution of Radioactive Contamination and Dose (NYS Contention 16/16A/16B)

NYS Contention 16/16A/16B also argues that use of MACCS2 with the ATMOS module leads to a non-conservative geographical distribution of radioactive dose and radionuclide contamination within a 50-mile radius of Indian Point, which could affect the validity of dose and contamination cost estimates within that area. The staff and Sandia considered the State's concerns regarding ATMOS, and concluded that ATMOS provides an acceptable plume model for the calculation of doses and radioactive contamination in a SAMA analysis. In response to this concern, Sandia assessed the impact of using a Gaussian plume model on accident consequences, and evaluated the population distribution and meteorological data used in Entergy's SAMA analysis.

The Gaussian plume model used in ATMOS assumes that the plume travels in a straight line. For Indian Point, this would minimize the distance the plume would travel in reaching the highest population areas, which are near the periphery of the 50-mile radius. The Gaussian plume model provides further conservatism under variable terrain conditions. Specifically, when variable terrain features such as river embankments or mountains intervene between a source and an observation point, these features would tend to disperse and dilute the plume as it is forced to move around obstacles. The plume model conservatively estimates that the plume travels in a straight line over or through the obstacle, thereby resulting in larger accumulated radiological doses and higher estimates of economic consequences in areas farther from the plant.

Although there are large geographic variations of population density within 50 miles of Indian Point, the evaluation of population distribution shows that the largest populations are located at the furthest distances within the 50-mile radius surrounding the site (i.e., in the New York City metropolitan area located about 30 to 50 miles south [SSE to SSW] of the Indian Point site). The shorter path of travel associated with the Gaussian plume model, together with the dominant wind direction being toward New York City (discussed below), ensures that a conservatively large amount of contaminant reaches the areas with higher population density in the MACCS2 analysis. Accordingly, use of the ATMOS module would result in a conservative geographical distribution of radioactive dose within a 50-mile radius of Indian Point relative to other atmospheric transport models.

Sandia reviewed the MACCS2 input files used in the Entergy baseline analysis to determine whether input parameter selection might contribute to non-conservative geographical distribution of radioactive dose within the 50-mile radius of Indian Point. Most of the input parameters used by Entergy in the MACCS2 analyses were standard choices consistent with Sample Problem A that is distributed with the MACCS2 code. The following input choices were specifically reviewed by Sandia:

- Meteorology – In the SAMA analysis described in the ER, Entergy averaged meteorological data for a 5-year period to provide a data file consisting of one year of hourly readings representative of site meteorology. After the staff raised questions concerning the weather data used in the analysis, Entergy submitted an updated MACCS2 input file which uses a single weather year with conservative data and corrects the wind rose data. The use of a single year's data is consistent with regulatory guidance; further, the wind direction in the updated file is predominantly to the south (toward New York City), consistent with information reported elsewhere for Indian Point (e.g., in annual effluent reports between 1999 through 2002). Thus, the staff's concern regarding wind direction has been resolved in the updated analysis.

- Population – The population values in the MACCS2 input files are consistent with the values reported in the ER. The population values were also found to be consistent with the US Census data as discussed above. The 2035 projected population value of 19,228,712 used by Entergy was reviewed and found to be reasonable. Sandia confirmed that Entergy's population projections for New York City, which is in the dominant downwind plume direction, are reasonable. Further, Entergy's use of populations accounting for tourists was found to be reasonable and to provide a slightly higher estimated cost.

- Dry Deposition Velocity – The dry deposition velocity of 0.01 m/s corresponds to a relatively small particle size. Within the plume model, small particle sizes will travel greater distances than large particle sizes. Therefore, smaller particle sizes would favor deposition at the higher population locations farther from the site, and would likely result in greater population dose and greater decontamination costs because the areas farther away from the plant are more densely populated urban areas which have higher decontamination costs. While smaller or larger particle sizes could have been used in the analysis, the particle size that Entergy used is reasonable and acceptable.

- Plume representation – Releases to the environment were modeled as a single Gaussian plume in the SAMA analysis. While Entergy's analysis utilized a single plume, MACCS2 has the ability to divide the plume into a number of plume segments. Use of additional plume segments would likely result in some variation in wind direction, dispersing the radiation and resulting in lower peak doses to the public. For purposes of a SAMA analysis, however, the results of a single isolated meteorological data trial is not at issue; rather, the analysis should model the results of numerous meteorological trials that provide a mean dispersion over the entire 50-mile radius. Such modeling necessarily includes variations in wind direction. The end result of conducting multiple meteorological trials is the calculation of a mean atmospheric transport, which describes the expected amount and timing of the contaminant release reaching any area within a 50-mile radius. This calculation allows for the determination of the mean effect on dose and economic costs for each modeled event that could occur at some time in the future under unknown weather conditions. The NRC staff notes that a SAMA analysis is not meant to provide a prediction of the contamination for any specific weather event; rather, it provides a mean result for a type of event under the mean potential circumstances. The use of a single Gaussian plume in each trial in the SAMA analysis provides a reasonable and acceptable approach for this purpose.

- Spatial grid – The MACCS2 analysis considered consequences with a 50-mile radius of the Indian Point site. This is consistent with NRC guidance for regulatory analysis as provided in NUREG/BR-0184.
- Decontamination costs – Decontamination costs were based on Sample Problem A and adjusted for inflation using the consumer price index factor. A comparison of Entergy's input values with those derived from the Site Restoration study shows the values are in reasonable agreement.
- Emergency evacuation – The emergency phase evacuation was not modeled in the Entergy analysis. Entergy claims that this is more conservative than using the radial evacuation approach applied in Sample Problem A. The emergency evacuation treatment is not expected to significantly affect the SAMA results (e.g., total population dose and offsite economic cost risk) because these metrics are typically driven by doses/deposition well beyond the 10-mile emergency planning zone.

Based on the NRC staff's and Sandia's review, the ATMOS module and MACCS2 input parameters used by Entergy are reasonable and acceptable, and do not result in a non-conservative geographical distribution of radioactive dose and contamination within a 50-mile radius of Indian Point.

Summary

The NRC staff, with the assistance of Sandia National Laboratory, evaluated the concerns raised in NYS Contentions 12/12A/12B and 16/16A/16B. Based on this review, the staff concludes that the issues raised in these contentions do not alter the staff's conclusions, set forth in the DSEIS, regarding the acceptability of Entergy's SAMA analysis. Accordingly, the NRC concludes that Entergy's use of the MACCS2 code, including the inputs and ATMOS module used to estimate offsite consequences for Indian Point, as amended in Entergy's SAMA re-analysis, provides an acceptable methodology for use in the assessment of candidate SAMAs.

G.3 Potential Plant Improvements

This section discusses the process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Entergy.

G.3.1. Process for Identifying Potential Plant Improvements

Entergy's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- The review of the most significant basic events from the current, plant-specific PSA;
- The review of potential plant improvements identified in the IP2 and IP3 IPE and IPEEE;
- The review of Phase II SAMAs from license renewal applications for nine other pressurized water reactors;
- The review of dominant contributors to seismic and fire events in the current seismic and fire analyses;
- The review of other NRC and industry documentation discussing potential plant improvements.

Based on this process, an initial set of 231 candidate SAMAs for IP2 and 237 candidate SAMAs for IP3, referred to as Phase I SAMAs, was identified. In Phase I of the evaluation, Entergy performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using one of the following criteria:

- The SAMA is not applicable at IP2 and IP3 because of design differences.
- The SAMA has already been implemented at IP2 and IP3.
- The SAMA is similar in nature and could be combined with another SAMA candidate.

Based on this screening, 163 IP2 SAMAs and 175 IP3 SAMAs were eliminated, leaving 68 unique SAMAs for IP2 and 62 unique SAMAs for IP3. The remaining SAMAs, referred to as Phase II SAMAs, are listed in Tables E.2-2 and E.4-2 of the ER (Entergy 2007). In Phase II, a detailed evaluation was performed for each of the remaining SAMA candidates, as discussed in Sections G.4 and G.6 below. To account for the potential impact of external events, the estimated benefits based on internal events were multiplied by a factor of 3.8 for IP2 and 5.5 for IP3, as previously discussed.

G.3.2. Review of Entergy's Process

Entergy's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events but also included explicit consideration of potential SAMAs for seismic and fire. The initial list of SAMAs generally addressed the accident sequences considered to be important to CDF from functional, initiating event, and risk-reduction worth (RRW) perspectives at IP2 and IP3 and included selected SAMAs from prior SAMA analyses for other plants.

Entergy provided a tabular listing of the PSA basic events, sorted according to their RRW for CDF (Entergy 2007). SAMAs affecting these basic events would have the greatest potential for reducing risk. Entergy used an RRW cutoff of 1.005, which corresponds to about a 0.5-percent change in CDF, given the 100 -percent reliability of the SAMA. This equates to a benefit of approximately $7,000 for IP2 and IP3 (based on a total benefit of about $1.3 million for each unit for eliminating all severe accidents caused by internal events). Entergy also provided and reviewed the LERF-based RRW events down to an RRW of 1.005. Entergy correlated the top CDF and LERF events with the SAMAs evaluated in Phase I or Phase II and showed that, with a few exceptions, all of the significant basic events are addressed by one or more SAMAs (Entergy 2007). Of the basic events of high-risk importance that are not addressed by SAMAs, each is closely tied to other basic events that had been addressed by one or more SAMAs.

Entergy considered the potential plant improvements described in the IPE and IPEEE in the identification of plant-specific candidate SAMAs for internal and external events. As a result of the IPE, four major procedural/hardware improvements were identified for each unit. The IP2 enhancements are to (1) upgrade IP2 gas turbine black-start capability, (2) install an additional EDG building fan, (3) monitor changes in the operating position of PORV block valves, and (4) implement periodic testing of all the EDG building fans. The IP3 enhancements are to (1) revise emergency operating procedures (EOPs) to instruct operators to align the backup city water supply to the AFW pumps, should the CST outlet valve fail as indicated by a low-suction-flow alarm, (2) revise the alarm response procedure for a high AFW pump room temperature, to direct operators to open the rollup door to the AFW pump room for ventilation, (3) install a switchgear room high-temperature alarm and implement an associated procedure to direct operators to block open doors to the 480-V ac switchgear room, and (4) revise EOPs to emphasize the need to align the safe-shutdown equipment to MCC 312A during events involving the loss of all 480-V ac safeguard buses while offsite power is available, as well as during fire-related events. These improvements have all been implemented and therefore were not considered further in the SAMA analysis.

As a result of the IPEEEs, several improvements were identified for external events. The IP2 enhancements are to (1) replace the hold-down bolts for the CCW surge tank with higher tensile strength bolts, (2) add surveillance of the control building drain flapper valve flow, (3) add weather stripping to doors between the transformer area and the switchgear room, and (4) add screens on the 480-V switchgear room equipment. The IP3 enhancements are to (1) restore the carbon dioxide (CO_2) suppression system to automatic mode within the switchgear room, (2) reroute the EDG exhaust fans and the auxiliary cables so that a fire in a single EDG cell would not affect multiple EDGs, and (3) install an excess flow valve to reduce the risk associated with hydrogen explosions inside the turbine building or PAB. With the exception of the last item, all of these improvements have been implemented and therefore were not considered further in the SAMA analysis. As noted in Section E.3.3.3 of the ER, IP3 SAMA 53 (install an excess flow valve to reduce the risk associated with hydrogen explosions) was proposed as a result of the IPEEE analysis and retained for the Phase II evaluation.

Several concerns were raised in the IPEEE regarding the seismic-induced failures of fire protection equipment (primarily for IP3). As mentioned above, these seismic-fire interactions were judged to be of little risk significance (NRC 2001). One plant improvement identified in Table 2.4 of NUREG-1742 (NRC 2002) addressed the potential spurious operation of the EDG room's CO_2 system and subsequent shutdown of the EDG ventilation system during a seismic event. Entergy subsequently installed a quality assurance Category I, seismic class I actuation permission auxiliary control panel for CO_2 discharge into the EDG building. Since shutdown of EDG ventilation caused by spurious operation of the CO_2 system during a seismic event is not considered in the seismic PSA model, the seismic CDF was not affected by this modification.

As noted in Section E.1.3.3.1 of the ER, the IP2 CDF for SBO events with gas turbines unavailable could be reduced by (1) aligning the IP3 Appendix R diesel to IP2, (2) installing an IP2 Appendix R diesel, (3) upgrading the EDG building for high winds, and (4) protecting the alternate power source from tornadoes and high winds. However, with the exception of the third item, these modifications were not evaluated as candidate SAMAs because a modification to replace the existing gas turbines with an IP2 SBO/Appendix R diesel generator capable of being used to recover power to the vital buses following an SBO was planned for the near future. The planned modification included provisions for aligning the IP3 Appendix R generator to IP2 and for protecting the new alternate power source from tornadoes and high winds.[1]

For a number of the Phase II SAMAs listed in the ER, the NRC staff found that information provided did not sufficiently describe the proposed modifications or other considerations that might have been taken into account in estimating the benefit and implementation cost**.** Therefore, the NRC staff requested, and the licensee provided, more information on certain proposed modifications listed for the Phase II SAMA candidates (NRC 2007, Entergy 2008a).

For several SAMA candidates, the NRC staff questioned if lower cost alternatives could have been considered, including:

- The implementation of improved instrumentation and procedures to help cool down and depressurize the RCS before RWST depletion.
- The implementation of a procedure for recovery of the steam dump to condenser from the unaffected steam generator.
- The implementation of a procedure for recovery of the main feedwater valve/condensate post-SI actuation.
- The purchase or manufacture of a “gagging device” that could be used to close a stuck-open steam generator safety valve on an SGTR before core damage occurred.
- The reactivation of the IP3 postaccident containment venting system (a system that is still active on IP2 but was deactivated on IP3).

In response, Entergy indicated that most of the low-cost alternatives to aid in the mitigation of an SGTR (four out of the five alternatives dismissed above) have been already implemented and provided specific reasons why the cost of these alternative SAMA candidates would be high enough that the decision on the final SAMA selection would not have been affected. However, the alternative associated with the gagging device was found to be potentially cost beneficial (Entergy 2008a, Entergy 2008b). The evaluation of these SAMAs is discussed further in Section G.6.2.

The NRC staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the NRC staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

---

[1] Installation of this diesel was made a condition of acceptance of the License Renewal Application (LRA) for review. The diesel was installed and operated prior to 4/30/2008. See Entergy letter NL-08-074, Indian Point, Units 2 and 3, Amendment 4 to LRA April 30, 2008 (ML 081280491).

The NRC staff concludes that Entergy used a systematic and comprehensive process for identifying potential plant improvements for IP2 and IP3 and that the set of SAMAs evaluated in the ER, together with those identified in response to the NRC staff inquiries, is reasonably comprehensive and therefore acceptable. The search included reviewing insights from the plant-specific risk studies and reviewing plant improvements considered in previous SAMA analyses. While explicit treatment of external events in the SAMA identification process was limited, the NRC staff recognizes that the prior implementation of plant modifications for seismic and fire events, and the absence of external-event vulnerabilities, reasonably justifies examining primarily the internal-event risk results for this purpose.

G.4 Risk-Reduction Potential of Plant Improvements

Entergy evaluated the risk-reduction potential of the remaining 68 IP2 and 62 IP3 SAMAs. The SAMA evaluations were performed using realistic assumptions with some conservatism. On balance, such calculations overestimate the benefits and are conservative.

For all of the SAMAs, Entergy used model requantification to determine the potential benefits. The CDF and population-dose reductions were estimated using the latest version of the IP2 and IP3 PSA models. The changes made to the models to quantify the impact of the SAMAs are detailed in Tables E.2-2 and E.4-2 of the ER (Entergy 2007). Table G-6 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of the percentage of reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table G-6 reflect the combined benefit for both internal and external events and the correction of the meteorological data error discussed previously. The determination of the benefits for the various SAMAs is further discussed in Section G.6.

The NRC staff questioned the assumptions used in evaluating the benefits or risk-reduction estimates of a number of SAMAs provided in the ER (NRC 2007). For example, the NRC staff requested information regarding the plant features or modeling assumptions that result in the CCW pumps having limited risk importance. In response, Entergy stated that both units are unique in that the capability exists to initiate backup cooling to key components in the event the primary CCW cooling function is lost. The use of backup city water cooling to the charging pumps enables continued seal injection and therefore reduces the likelihood of an RCP seal LOCA. In IP2, city water backup or primary water can be used to cool the safety injection and residual heat removal (RHR) pumps. In IP3, city water backup is available to cool RHR Pump 31. Also, CCW is not required in either plant during the injection phase of the response to a LOCA. The NRC staff considers the explanation of the plant features, as clarified, to be reasonable and therefore acceptable for the purposes of the SAMA evaluation.

For a number of the Phase II SAMAs listed in the ER, the description of the improvement and the associated analyses appeared either inconsistent between the two units or were unclear. Therefore, the NRC staff asked the applicant to provide more detailed descriptions of the modifications for several of the Phase II SAMA candidates (NRC 2007). In response, Entergy provided additional information on those SAMA candidates that further explained the SAMA modifications and the differences between units that account for the different analysis assumptions for each unit (Entergy 2008a). Entergy also provided further clarifications and discussion regarding the analysis assumptions and their bases. As an example, the licensee clarified a major difference in operation of a turbine-driven AFW pump between the two units that affects the disposition of several SAMA candidates. In its response, Entergy indicated that the units respond differently upon depletion of the station batteries. IP2 has pneumatic level and pressure instruments that allow operators to monitor key parameters and effectively control AFW flow after the batteries are depleted, whereas IP3 does not have this instrumentation. Although it is still possible for the operators to manipulate AFW flow, the current IP3 model does not credit this manual operation.

In the SAMA analysis submitted in the ER, Entergy increased the benefit that was derived from the internal-event model by factors of 3.8 and 5.5 to account for the combined contribution from internal and external events for IP2 and IP3, respectively. The NRC staff agrees with the licensee's overall conclusion concerning the impact of external events and concludes that the licensee's use of a multiplier of 3.8 and 5.5 for IP2 and IP3, respectively, to account for external events is reasonable for the purposes of the SAMA evaluation. This is discussed further in Section G.6.2.

For SAMA candidates that only address a specific external event and have no bearing on internal-event risk (e.g., IP2 SAMA 66—Harden EDG Building Against High Winds), Entergy derived the benefit directly from the external-event risk model and then increased the benefit by the multipliers identified earlier. The NRC staff notes that the use of multipliers for these SAMAs (conceptually, to account for additional benefits in internal events) is unnecessary, since these SAMAs have no bearing on internal events. However, use of the multipliers adds conservatism to the benefit estimate for these SAMA candidates.

IP3 SAMA 53 (install an excess-flow valve to reduce the risk associated with hydrogen explosions) was identified to reduce the risk associated with hydrogen explosions inside the turbine building or PAB. The proposed plant modification involves the installation of a nonelectric excess-flow valve. The benefit of this SAMA is also calculated in a bounding manner. As discussed in Section G.6.2, this SAMA was found to be potentially cost beneficial, based on revised analyses submitted in response to an NRC request.

The NRC staff has reviewed Entergy's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the NRC staff based its estimates of averted risk for the various SAMAs on Entergy's risk reduction estimates.

G.5 Cost Impacts of Candidate Plant Improvements

Entergy estimated the costs of implementing the candidate SAMAs through the application of engineering judgment and use of other licensees' estimates for similar improvements. The ER stated that the cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include contingency costs associated with unforeseen implementation obstacles. The cost estimates provided in the ER also did not account for inflation, which is considered another conservatism.

The NRC staff reviewed the bases for the licensee's cost estimates. For certain improvements, the NRC staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The NRC staff reviewed the costs and found them to be reasonable and generally consistent with estimates provided in support of other licensees' analyses.

Table G-6. Final Potentially Cost-Beneficial SAMAs for IP2 and IP3 [1]

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)		Cost ($)
		CDF	Population Dose	Baseline [2] (Int + Ext Events)	Baseline With Uncertainty	
IP2 SAMAs						
9 - Create a reactor cavity flooding system.	Eliminate containment failure caused by concrete-core interaction.	0	47	6.3M	13M	4.1M[3]
21 - Install additional pressure or leak monitoring instrumentation for ISLOCA.	Eliminate ISLOCA events.	0.8	11	2.1M	4.4M	3.2M[3]
22 - Add redundant and diverse limit switches to each containment isolation valve.	Reduce ISLOCA frequency by 50 percent.	0.4	6	1.1M	2.3M	2.2M[3]
28 - Provide a portable diesel-driven battery charger.	Eliminate failure of local operation of the turbine-driven AFW pump during SBO scenarios.	5	9	1.4M	2.9M	938K[3]
44 - Use fire water system as backup for steam generator inventory.	Eliminate failure of the turbine-driven AFW pump and local operation of AFW during SBO.	33	14	2.4M	4.9M	1.7M
53 - Keep both pressurizer PORV block valves open.	Eliminate failure of PORV block valves to open.	18	3	660K	1.4M	800K
54 - Install flood alarm in the 480-V ac switchgear room.	Reduce control building flooding initiator frequencies by a factor of 3.	20	39	5.6M	12M	200K
56 - Keep RHR heat exchanger discharge MOVs normally open.	Eliminate failure of RHR heat exchanger discharge MOVs to open.	2	0.2	49K	100K	82K
60 - Provide added protection against flood propagation from stairwell 4 into the 480-V ac switchgear room.	Eliminate flood initiated by a break in fire protection piping in stairwell 4.	5	9	1.3M	2.7M	216K
61 - Provide added protection against flood propagation from the deluge room into the 480-V ac switchgear room.	Eliminate flood initiated by a break in the 10-inch fire protection piping in the deluge room at elevation 15 feet.	10	19	2.8M	5.8M	192K

Table G-6 (continued)

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)		Cost ($)
		CDF	Population Dose	Baseline [2] (Int + Ext Events)	Baseline With Uncertainty	
62 - Provide a hard-wired connection to an SI pump from ASSS power supply.	Eliminate failure to align ASSS power to SI and charging pumps following loss of power from 480V buses.	3	6	850K	1.8M	1.5M[3]
65 - Upgrade the ASSS to allow timely restoration of seal injection and cooling.	Eliminate control building flooding initiators.	20	39	5.6M	12M	560K
IP3 SAMAs[4]						
7 - Create a reactor cavity flooding system.	Eliminate containment failures due to core-concrete interactions	0	24	5.0M	7.3M	4.1M[3]
18 – Route the discharge from the MSSVs through a structure where spray water would condense the stream and remove fission products.	Reduce SGTR accident source terms by a factor of 2.	0	11	4.8M[5]	15M[5]	12M[3]
19 – Install additional pressure or leak monitoring instrumentation for ISLOCAs.	Eliminate ISLOCA events	1	7	2.1M	3.1M	2.8M[3]
52 - Open city water supply valve for alternative AFW pump suction.	Eliminate loss of the normal suction path to the AFW system.	1	1	250K	360K	50K
53 - Install an excess flow valve to reduce the risk associated with hydrogen explosions.	Eliminate hydrogen ruptures inside the turbine building.	2	2	500K	720K	228K
55 – Provide the capability of powering one SI pump or RHR pump using the Appendix R bus (MCC 312A).	Eliminate operator failure to align MCC 312A.	16	18	4.1M	5.9M	1.3M
61 - Upgrade the ASSS to allow timely restoration of seal injection and cooling.	Eliminate control building flooding initiators.	17	20	4.4M	6.3M	560K

SAMA	Assumptions	% Risk Reduction		Total Benefit ($)		Cost ($)
		CDF	Population Dose	Baseline [2] (Int + Ext Events)	Baseline With Uncertainty	
62 - Install flood alarm in the 480-V ac switchgear room.	Eliminate control building flooding initiators.	17	20	4.4M	6.3M	197K

[1] The information was reproduced by combining the information from ER Tables E.2-2 and E.4-2 and Entergy's SAMA re-analysis (Entergy 2009).

[2] Reported benefit values account for risk reduction in both internal and external events and include the economic impact of lost tourism and business following a severe accident. The values do not account for analysis uncertainties.

[3] The cost estimate is based on a revised value provided in Entergy's SAMA re-analysis (Entergy 2009)

[4] SAMA 30 was identified as cost beneficial in the ER. However, an error in the original benefit calculation was discovered subsequent to submittal of the ER, as described in Entergy's response to RAI 5g (Entergy 2008a). Reported values in Table G-6 reflect correction of the calculational error. SAMA 30 is no longer cost beneficial after corrections.

[5] The benefit estimate is based on revised TI-SGTR sensitivity study results provided in Entergy's SAMA re-analysis (Entergy 2009).

The NRC staff questioned the high cost estimate ($800,000) for changing the pressurizer PORV block valves from normally closed to normally open in conjunction with IP2 SAMA 53 (NRC 2008a). In response, Entergy clarified that a modification had been previously implemented allowing closure of the block valves when operating pressure is less than 2235 pounds per square inch gauge (psig). If the reactor coolant pressure increases to 2300 psig, the current circuitry alarms and sends a signal to open the block valves. The SAMA would reverse this operating approach and may require adding or changing the auto-open feature to a lower value. Entergy provided a breakdown of the estimated cost, which included a $236,000 contingency cost. As Section 4.21 of the ER states that contingency costs are excluded, the staff requested clarification of this apparent inconsistency. In response, Entergy stated that the site-specific implementation cost estimates include some contingency costs to account for the high degree of uncertainty associated with the preliminary cost estimates and that, given the bounding nature of the benefit analysis, it is reasonable to include contingency costs in these estimates. To eliminate the confusion between Section 4.21 of the ER and the stated practice above, Entergy revised Section 4.21, eliminating the contingency exclusion clause (Entergy 2008b). Considering that this SAMA has been added to the list of potentially cost-beneficial SAMAs (see Section G.6), the staff finds the cost estimate for SAMA 53 to be acceptable. In addition, no other improvement cost estimates were identified as outliers. Therefore, the impact of including contingency costs does not appear to be consequential.

As part of Entergy's SAMA re-analysis (using corrected meteorological data), Entergy subjected a subset of the SAMAs to more comprehensive and precise cost estimating techniques – specifically, those SAMAs that appeared to be cost-beneficial based on the new benefit estimate and the original implementation cost estimate. For two IP2 SAMAs (IP SAMAs 17 and 40) and four IP3 SAMAs (IP3 SAMAs 17, 20, 40, and 50), the updated (increased) cost estimate resulted in the SAMA becoming non-cost-beneficial (i.e., the SAMA would be cost-beneficial based on the cost estimate reported in the ER, but not cost-beneficial based on the revised cost estimate). For each of these SAMAs, the NRC Staff requested that Entergy provide the basis for the revised cost estimate and a breakdown of the cost estimate in terms of the major cost factors. Entergy provided this additional information by letter dated January 14, 2010 (Entergy 2010). As stated in the response, the revised cost estimates were developed using Entergy's standard process for developing conceptual-level project cost estimates utilizing spreadsheets containing 2009 rates for material, labor, insurance, fees, etc. Also, Entergy determined that one SAMA that was previously identified as potentially cost beneficial was no longer cost beneficial based on correction of an error in the ER (IP3 SAMA 30) (Entergy 2008b, Entergy 2009).

The NRC staff reviewed this additional cost information to determine the degree to which the revised cost estimates and their constituent costs comport with the nature, magnitude and complexity of each change. The NRC staff notes that the associated modifications all involve either major plant modifications (e.g., erecting a barrier to protect the containment liner, installing secondary side guard pipes) or changes to safety-related systems, structures, or components (e.g., increasing secondary side pressure capacity, enhancing the RCS depressurization capabilities). In addition to hardware costs, the modifications would require extensive design work and safety analysis calculations, including seismic analyses, thermal analyses, and analyses for piping or penetration interferences. The cost estimates reported in previous SAMA analyses for similar modifications are typically on the order of $1M or more. Entergy's cost estimates are consistent with these values. The NRC staff also notes that for each of these SAMAs the revised cost estimates are at least 50 percent greater than the revised benefit estimates even when the benefit estimates are increased to account for uncertainties. Accordingly, Entergy's revised cost estimates appear reasonable, and result in an appropriate determination that these candidate SAMAs are not cost-beneficial.

The NRC staff concludes that the cost estimates provided by Entergy are sufficient and appropriate for use in the SAMA evaluation.

G.6 Cost-Benefit Comparison

Entergy's cost-benefit analysis and the NRC staff's review are described in the following sections.

G.6.1. Entergy's Evaluation

The methodology used by Entergy was based primarily on the NRC's guidance for performing a cost-benefit analysis (i.e., NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook" (NRC 1997a). The guidance involves determining the net present value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) - COE, where

APE = present value of averted public exposure ($)

AOC = present value of averted offsite property damage costs ($)

AOE = present value of averted occupational exposure costs ($)

AOSC = present value of averted onsite costs ($)

COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA, and it is not considered cost beneficial. Entergy's derivation of each of the associated costs is summarized below.

NUREG/BR-0058 has recently been revised to reflect the agency's policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed—one at 3 percent and one at 7 percent (NRC 2004). Entergy performed the SAMA analysis using 7 percent and provided a sensitivity analysis using the 3 percent discount rate in order to capture SAMAs that may be cost-effective using the lower discount rate, as well as the higher, baseline rate (Entergy 2007). This analysis is sufficient to satisfy NRC policy in Revision 4 of NUREG/BR-0058.

<u>Averted Public Exposure (APE) Costs</u>

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/year)

x monetary equivalent of unit dose ($2000 per person-rem)

x present value conversion factor (10.76 based on a 20-year period with a 7 percent discount rate)

As stated in NUREG/BR-0184 (NRC 1997a), the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk caused by a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss caused by a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, which assumes elimination of all severe accidents caused by internal events, Entergy calculated an APE of approximately $474,000 for IP2 and $527,000 for IP3 for the 20-year license renewal period. Based on Entergy's SAMA re-analysis (using corrected meteorological data), these values increase to $1.88M for IP2 and $2.04M for IP3.

<u>Averted Offsite Property Damage Costs (AOC)</u>

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction

x offsite economic costs associated with a severe accident (on a per-event basis)

x present value conversion factor

For the purposes of initial screening, which assumes all severe accidents caused by internal events are eliminated, Entergy calculated an annual offsite economic cost of about $45,000 for IP2 and $53,000 for IP3 based on the Level 3 risk analysis. This results in a discounted value of approximately $483,000 for IP2 and $568,000 for IP3 for the 20-year license renewal period. Based on Entergy's SAMA re-analysis (using corrected meteorological data), these values increase to $2.28 million for IP2 and $2.81 million for IP3.

<u>Averted Occupational Exposure (AOE) Costs</u>

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction

x occupational exposure per core damage event

x monetary equivalent of unit dose

x present value conversion factor

Entergy derived the values for AOE from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997a). Best estimate values that provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook, in conjunction with a monetary equivalent of unit dose of $2000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents caused by internal events are eliminated, Entergy calculated an AOE of approximately $7,000 for IP2 and $4,000 for IP3 for the 20-year license renewal period.

Averted Onsite Costs

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Entergy derived the values for AOSC based on information provided in Section 5.7.6 of NUREG/BR-0184, the regulatory analysis handbook (NRC 1997a).

Entergy divided this cost element into two parts—the onsite cleanup and decontamination cost, also commonly referred to as averted cleanup and decontamination costs (ACC), and the replacement power cost (RPC).

ACCs were calculated using the following formula:

ACC = Annual CDF reduction

x present value of cleanup costs per core damage event

x present value conversion factor

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in NUREG/BR-0184 to be $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents caused by internal events are eliminated, Entergy calculated an ACC of approximately $208,000 for IP2 and $133,000 for IP3 for the 20-year license renewal period.

Long-term RPCs were calculated using the following formula:

RPC = Annual CDF reduction

x present value of replacement power for a single event

x factor to account for remaining service years for which replacement power is required

x reactor power scaling factor

Entergy based its calculations on the value of 1071 megawatt electric (MWe) and scaled up from the 910 MWe reference plant in NUREG/BR-0184 (NRC 1997b). Therefore, Entergy applied a power-scaling factor of 1071/910 to determine the RPCs. For the purposes of initial screening, which assumes all severe accidents caused by internal events are eliminated, Entergy calculated an RPC of approximately $166,000 for IP2 and $107,000 for IP3, and an AOSC of approximately $374,000 for IP2 and $240,000 for IP3 for the 20-year license renewal period.

Using the above equations and corrected meteorological data, Entergy determined that the total present dollar-value equivalent associated with completely eliminating severe accidents caused by internal events is approximately $4.5 million at IP2 and $5.1 million at IP3. Use of a multiplier of 3.8 for IP2 and 5.5 for IP3 to account for external events increases the present dollar value to $17 million for IP2 and $28 million for IP3 and represents the present dollar value associated with completely eliminating the risk of severe accidents caused by all internal and external events at IP2 and IP3, respectively.

Entergy's Results

If the implementation costs for a candidate SAMA exceeded the calculated benefit, the SAMA was considered by Entergy not to be cost beneficial. In the baseline analysis (using a 7 percent discount rate) and the sensitivity analysis (using a 3 percent discount rate) contained in the ER, Entergy identified 10 potentially cost-beneficial SAMAs (five for IP2 and five for IP3). Based on consideration of analysis uncertainties, Entergy identified two additional potentially cost-beneficial SAMAs for IP2 in the ER (IP2 SAMAs 44 and 56).

In response to an NRC staff request, Entergy provided the results of a revised uncertainty analysis in which the impact of lost tourism and business was accounted for in the baseline analysis (rather than as a separate sensitivity case). The revised uncertainty analysis resulted in the identification of two additional potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 9 and 53) and one additional potentially cost-beneficial SAMA for IP3 (IP3 SAMA 53), as reported in the DSEIS.

Based on the SAMA re-analysis (using corrected meteorological data), Entergy identified three additional potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 21,22, and 62) and three additional potentially cost-beneficial SAMAs for IP3 (IP3 SAMAs 7, 18, and 19).

In sum, the potentially cost-beneficial SAMAs for IP2 are the following:

- SAMA 9 – Create a reactor cavity flooding system to reduce the impact of core-concrete interaction from molten core debris following core damage and vessel failure.
- SAMA 21 – Install additional pressure or leak monitoring instrumentation to reduce the frequency of interfacing system loss of coolant accidents.
- SAMA 22 – Add redundant and diverse limit switches to each containment isolation valve. This modification would reduce the frequency of an interfacing system loss of coolant accident.
- SAMA 28 – Provide a portable diesel-driven battery charger to improve dc power reliability. A safety-related disconnect would be used to charge a selected battery. This modification would enhance the long-term operation of the turbine-driven AFW pump on battery depletion.
- SAMA 44 – Use fire water as a backup for steam generator inventory to increase the availability of the steam generator water supply to ensure adequate inventory for the operation of the turbine-driven AFW pump during SBO events.
- SAMA 53 – Keep both pressurizer PORV block valves open. This modification would reduce the CDF contribution from loss of secondary heat sink by improving the availability of feed and bleed.
- SAMA 54 – Install a flood alarm in the 480-V ac switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.
- SAMA 56 – Keep RHR heat exchanger discharge valves, motor-operated valves 746 and 747, normally open. This procedure change would reduce the CDF contribution from transients and LOCAs.
- SAMA 60 – Provide added protection against flood propagation from stairwell 4 into the 480-V ac switchgear room to reduce the CDF contribution from flood sources within stairwell 4 adjacent to the 480-V ac switchgear room.

- SAMA 61 – Provide added protection against flood propagation from the deluge room into the 480-V ac switchgear room to reduce the CDF contribution from flood sources within the deluge room adjacent to the 480-V ac switchgear room.
- SAMA 62 – Provide a hard-wired connection to a safety injection (SI) pump from the alternate safe shutdown system (ASSS) power supply. This modification would reduce the CDF from events that involve loss of power from the 480V vital buses.
- SAMA 65 – Upgrade the alternate safe shutdown system (ASSS) to allow timely restoration of RCP-seal injection and cooling from events that cause a loss of power from the 480-V ac vital buses.

The potentially cost-beneficial SAMAs for IP3 are the following:

- SAMA 7 – Create a reactor cavity flooding system. This modification would enhance core debris cooling and reduce the frequency of containment failure due to core-concrete interaction.
- SAMA 18 – Route the discharge from the main steam safety valves through a structure where a water spray would condense the steam and remove fission products.
- SAMA 19 – Install additional pressure or leak monitoring instrumentation to reduce the frequency of interfacing system loss of coolant accidents.
- SAMA 52 – Institute a procedure for opening the city water supply valve for alternative AFW system pump suction to enhance the availability of the AFW system.
- SAMA 53 – Install an excess flow valve to reduce the risk associated with hydrogen explosions inside the turbine building or PAB.
- SAMA 55 – Provide the capability of powering one safety injection pump or RHR pump using the Appendix R diesel (MCC 312A) to enhance RCS injection capability during events that cause a loss of power from the 480-V ac vital buses.
- SAMA 61 – Upgrade the ASSS to allow timely restoration of RCP-seal injection and cooling from events that cause a loss of power from the 480-V ac vital buses.
- SAMA 62 – Install a flood alarm in the 480-V ac switchgear room to mitigate the occurrence of internal floods inside the 480-V ac switchgear room.

In response to an NRC staff inquiry regarding estimated benefits for certain SAMAs and lower cost alternatives, one additional potentially cost-beneficial SAMA was identified (regarding a dedicated main stream safety valve gagging device for SGTR events in both units) (Entergy 2008b), and one SAMA that was previously identified as potentially cost beneficial was found no longer cost beneficial based on correction of an error in the ER (IP3 SAMA 30) (Entergy 2008a, Entergy 2009). The potentially cost-beneficial SAMAs and Entergy's plans for further evaluation of these SAMAs are discussed in more detail in Section G.6.2.

G.1.2 Review of Entergy's Cost-Benefit Evaluation

The cost-benefit analysis performed by Entergy was based primarily on NUREG/BR-0184 (NRC 1997a) and was implemented consistent with that guidance.

SAMAs identified primarily on the basis of the internal events analysis could provide benefits in certain external events, in addition to their benefits in internal events. To account for the additional benefits in external events, Entergy multiplied the internal event benefits for each internal event SAMA by an amount equal to the ratio of the sum of the internal and external event CDF to the internal event CDF. This ratio is approximately 3.8 for IP2 and 5.5 for IP3. Potential benefits in external events were estimated in this manner, since the external-event models are generally less detailed than the internal-event models and do not lend themselves to quantifying the benefits of the specific plant changes associated with internal-event SAMAs. For example, the benefits of a procedural change associated with an important internal event sequence cannot be readily assessed using the seismic-risk model if that operator action or system is not represented in the seismic-risk model. The use of a multiplier on the benefits obtained from the internal events PSA to incorporate the impact of external events implicitly assumes that each SAMA would offer the same percentage reduction in external-event CDF and population dose as it offers in internal events. While this provides only a rough approximation of the potential benefits, such an adjustment was considered appropriate, given the large risk contribution from external events relative to internal events and the lack of information on which to base a more precise risk reduction estimate for external events. In view of the remaining conservatism in the external events CDF, and the licensee’s further evaluation of the impacts of the use of a multiplier on the SAMA screening (as part of the uncertainty assessment discussed below), the NRC staff agrees that the use of these multipliers for external events is reasonable.

For SAMA candidates that only address a specific external event and have no bearing on internal-event risk, Entergy derived the benefit directly from the external-event risk model and then increased the benefit by the multipliers identified earlier. The NRC staff notes that the use of multipliers for these SAMAs (conceptually, to account for additional benefits in internal events) is unnecessary, since these SAMAs have no bearing on internal events. However, use of the multipliers adds conservatism to the benefit estimate for these SAMA candidates.

Entergy considered the impact that possible increases in benefits from analysis uncertainties would have on the results of the SAMA assessment. In the ER, Entergy presents the results of an uncertainty analysis of the internal-event CDF for IP2 and IP3, which indicates that the 95th percentile value is a factor of 2.1 times the mean CDF for IP2 and 1.4 times the mean CDF for IP3. Entergy assessed the impact on the SAMA screening if the estimated benefits for each SAMA were further increased by these uncertainty factors. For purposes of this assessment, Entergy applied a multiplier of 8 to the internal-event benefits for each unit to account for both internal and external events, with analysis uncertainty. The multiplier of 8 slightly exceeds the product of the external-event multiplier and the uncertainty factor for each unit (i.e., 3.80x2.10=7.98 for IP2, and 5.53x1.40=7.73 for IP3) and adds a small amount of additional conservatism. Although not cost beneficial in the baseline analysis, Entergy included any additional SAMAs identified as potentially cost beneficial in the uncertainty analysis within the set of potentially cost-beneficial SAMAs that it intends to examine further for implementation.

Entergy also provided the results of additional sensitivity analyses in the ER, including use of a 3 percent discount rate, use of a longer plant life, and the consideration of economic losses by tourism and business (which were not included in the baseline analysis). These analyses did not identify any additional potentially cost-beneficial SAMAs beyond those already identified through the uncertainty analysis.

The NRC staff questioned the rationale for treating the loss of tourism and business in a sensitivity case rather than in the baseline analysis (NRC 2007). Incorporation of tourism and business losses within the baseline analysis could result in identification of additional cost-beneficial SAMAs, particularly when the baseline benefits are multiplied to account for uncertainties. In response, Entergy explained that the impact of lost tourism and business was not modeled in the baseline analysis because the level of tourism and business activity can be reestablished in time. Nevertheless, Entergy provided the results of an additional uncertainty case showing the impact of lost tourism and business combined with analysis uncertainty. This uncertainty case resulted in the identification of two additional potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 9 and 53) and one additional potentially cost-beneficial SAMA for IP3 (IP3 SAMA 53). Given that it may take years to reestablish the level of tourism and business activity following a severe accident, the NRC staff has conservatively adopted the case incorporating lost tourism and business as its base case and has reflected the results of that case in Table G-6.

In responding to an NRC RAI, Entergy identified and corrected an error in the benefit analysis for IP3 SAMA 30 (provide a portable battery charger for monitoring instrumentation necessary to allow manual operation of the turbine-driven AFW pump), which results in this SAMA no longer being potentially cost beneficial. As indicated in ER Section E.4.3, the benefit of this SAMA was estimated based on the assumption that the SAMA would increase the time available to recover offsite power before local operation of AFW is required from 2 hours to 24 hours, and would also reduce internal switchgear room floods by 5 percent (which bounds the benefit of using a portable diesel-driven battery charger in switchgear flood events). According to Entergy, the original analysis inadvertently reduced the contribution from internal switchgear room floods by more than 5 percent (Entergy 2008a). Entergy's reevaluation of the benefits for this SAMA, consistent with the intended bounding case, resulted in a reduction in the baseline benefit to about $146,000, including the impacts of lost tourism and business and analysis uncertainties (Entergy 2008a), and $309,000 using the same assumptions and corrected site meteorological data (Entergy 2009). The revised benefit estimate using corrected site meteorology is reflected in Table G-6. The NRC staff notes that the benefit associated with several other SAMA candidates that could increase the time available to recover offsite power before local operation of AFW is required from 2 hours to 24 hours (e.g., IP3 SAMA 24 (provide additional dc battery capacity) was estimated at about $51,000, including the impacts of lost tourism and business and analysis uncertainties. Therefore, a revised benefit estimate of $146,000 (before correcting site meteorological data) for IP3 SAMA 30, which also includes the additional benefit from reducing the contribution of internal switchgear room floods by 5 percent, appears reasonable. In the ER, Entergy indicated that the implementation cost associated with IP3 SAMA 30 (i.e., $494,000) was specifically estimated for IP3. The proposed plant modification involves purchasing, installing, and maintaining a diesel-driven generator to charge the 125-V dc batteries. Safety-related quick-disconnects would be used to charge the selected battery. The diesel generator would be installed in a weather enclosure outside the turbine or control building, requiring fire barrier penetration sealing. Calculation of cable size, as well as procedure development and training, would be required (Entergy 2007). In view of the scope of these modifications and the fact that the modifications involve a safety-related dc system, the estimated costs appear reasonable. As part of Entergy's SAMA re-analysis (using corrected meteorological data) Entergy provided an updated site-specific cost estimate of $938,000 for SAMA 30 based on more comprehensive and precise cost estimating techniques (Entergy

2009). However, the NRC staff notes that SAMA 30 would not be cost-beneficial regardless of which cost estimate is used. Accordingly, the NRC staff agrees that this SAMA would not be cost beneficial for IP3.

The NRC-sponsored severe accident analyses performed subsequent to the time of the IPE suggest that the probability of a TI-SGTR, given a core-damage event with high primary-side pressure and a depressurized, dry secondary side, may be higher than the value used in the IP2 and IP3 PSAs. In response to an NRC request, Entergy provided the results of a sensitivity study in which it increased the conditional TI-SGTR probability from 0.01 (used in the baseline analysis) to 0.25, which is comparable to the values reported in NUREG-1570 (NRC 1998). Entergy identified the candidate SAMAs potentially affected by the TI-SGTR assumption and reassessed the benefits for these SAMAs, subject to the increased conditional failure probability and the impact of analysis uncertainties. Entergy identified no additional cost-beneficial SAMAs as a result of this reassessment. Entergy also noted that the IP2 and IP3 steam generators have only 0.19 percent and 0.12 percent of the tubes plugged for IP2 and IP3, respectively, and would be classified as “pristine,” in accordance with the Westinghouse criteria for categorizing steam generator tube integrity. With no observed corrosion, Entergy concludes—and the NRC staff concurs—that this sensitivity study is conservative relative to the application of the NUREG-1570 results for pristine generators (Entergy 2008b).

As part of Entergy’s SAMA re-analysis, Entergy revisited this sensitivity study using corrected site meteorological data. Due to the higher offsite consequences in the re-analysis, additional SAMAs were identified as potentially impacted by the TI-SGTR assumption (relative to the original study) and were re-evaluated. Based on the re-evaluation, one additional SAMA was found to be potentially cost-beneficial for IP3 (IP3 SAMA 18) (Entergy 2009).

The NRC staff noted that for certain SAMAs considered in the ER, there may be alternatives that could achieve much of the risk reduction at a lower cost. The NRC staff asked the licensee to evaluate several lower cost alternatives to the SAMAs considered in the ER, including SAMAs that had been found to be potentially cost beneficial at other PWR plants. These alternatives were (1) implementation of improved instrumentation and/or procedures to aid in the mitigation of a SGTR, (2) implementation of a procedure for recovery of steam dump to condenser from the unaffected steam generator to aid the mitigation of a SGTR, (3) implementation of a procedure for recovery of the main feedwater/condensate after safety injection actuation to aid in the mitigation of a SGTR, (4) reactivation of the IP3 postaccident containment venting system, and (5) purchase or manufacture of a “gagging device” that could be used to close a stuck-open steam generator safety valve on a faulted steam generator before core damage occurs (NRC 2007a, NRC 2007b). Entergy provided a further evaluation of these alternatives, as summarized below.

- Improve SGTR instrumentation and/or valve procedures. Operator actions to cool and depressurize the RCS to cold shutdown conditions following a SGTR before depleting RWST inventory are already contained in EOPs. EOPs also direct plant personnel to initiate RWST makeup, given a low RWST level without a corresponding increase in the containment recirculation sump water level, or if the ruptured steam generator narrow-range level indication is high.

- Institute a procedure for recovery of steam dump to condenser. Procedures for recovery of steam dump to condenser from the unaffected steam generator are currently available at both units.

- Recover main feedwater/condensate. For IP2, the operators are currently directed to attempt to establish a secondary heat sink with AFW, main feedwater, or condensate, should the AFW system initially not function or subsequently fail during implementation of the EOPs. For IP3, procedural guidance currently exists for re-establishing condensate flow, but there is no guidance to use main feedwater following a loss of the secondary heat sink. Thus, the development of guidance on aligning main feedwater for secondary heat removal was evaluated as a potential SAMA for IP3.

- Reactivate the IP3 containment venting system. IP3 has three alternate methods of containment depressurization and combustible gas control. These methods are backflow to the steam ejector line, containment pressure relief line, and the containment purge system. All of the venting functions require similar operator actions. Given these various alternatives, failure to vent would be dominated by human error and would not be substantially reduced by providing an additional means of venting.

With regard to the steam generator safety gagging device, which was found to be potentially cost beneficial at another pressurized-water reactor seeking license renewal, Entergy provided a separate assessment of the benefits and implementation costs. Entergy estimated the benefit associated with successfully gagging a stuck-open main steam safety valve following an SGTR by assuming all early steam generator isolation failures and all TI-SGTRs would be eliminated. The total benefits were estimated to be about $2.9 million for IP2 and $4.4 million for IP3 (Entergy 2008b). Based on Entergy's SAMA re-analysis (using corrected meteorological data), these values would increase to about $13 million for IP2 and $19 million for IP3 (Entergy 2009). The implementation cost, including purchasing and storing a dedicated gagging devise, revising procedures, and providing training, was estimated to be about $50,000 for each unit. As such, the results indicate that this SAMA is potentially cost beneficial for both units. Entergy indicates that this additional SAMA has been submitted for an engineering project cost-benefit analysis for a more detailed examination of its viability and implementation cost (Entergy 2008b). The NRC staff concurs with Entergy's findings regarding these alternative SAMAs because the NRC staff finds the additional information provided by Entergy for the aforementioned alternative SAMAs to be technically sound.

The NRC staff notes that all of the 12 potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 9, 21, 22, 28, 44, 53, 54, 56, 60, 61, 62 and 65) and eight potentially cost-beneficial SAMAs for IP3 (IP3 SAMAs 7, 18, 19, 52, 53, 55, 61, and 62), identified in either Entergy's baseline analysis or supplemental analyses provided in response to the NRC requests, as well as the additional SAMA regarding a dedicated gagging device for SGTR events (applicable to both units), are included within the set of SAMAs that Entergy will consider further for implementation. The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the other SAMAs would be higher than the associated benefits (i.e., no additional SAMAs appear to be cost-beneficial).

G.7 Conclusions

Entergy compiled a list of 231 candidate SAMAs for IP2 and 237 SAMAs for IP3, based on a review of the most significant basic events from the current plant-specific PSA, insights from the plant-specific IPE and IPEEE, and a review of other industry documentation. An initial screening removed SAMA candidates that (1) were not applicable at IP2 and IP3, (2) were already implemented or their intent had been met, or (3) were similar in nature and could be combined with another SAMA candidate. Based on this screening, 163 IP2 and 175 IP3 SAMAs were eliminated, leaving 68 IP2 and 62 IP3 candidate SAMAs for evaluation.

For the remaining SAMA candidates, more detailed evaluation was performed as shown in Table G-6. The cost-benefit analyses in the ER showed that five IP2 and five IP3 SAMA candidates were potentially cost beneficial in either the baseline analysis or sensitivity analysis using a 3 percent discount rate. Entergy performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. As a result, four additional IP2 SAMAs and one additional IP3 SAMA were identified as potentially cost beneficial. In addition, a SAMA regarding a dedicated gagging device for SGTR events was identified as potentially cost beneficial for both units. Correction of an error in the benefit analysis for IP2 SAMA 30 resulted in it no longer being considered cost beneficial. Subsequent to issuance of the DSEIS, in response to NRC Staff questions, Entergy identified an error in the Indian Point site meteorology file used to calculate offsite consequences of severe accidents, and submitted a SAMA re-analysis based on corrected meteorological data (Entergy 2009). The SAMA re-analysis resulted in identification of three additional potentially cost beneficial SAMAs for IP2 (IP2 SAMAs 21, 22, and 62) and three potentially cost beneficial SAMAs for IP3 (IP3 SAMAs 7, 18, and 19). Entergy has indicated that all 12 potentially cost-beneficial SAMAs for IP2 (IP2 SAMAs 9, 21, 22, 28, 44, 53, 54, 56, 60, 61, 62, and 65) and eight potentially cost-beneficial SAMAs for IP3 (IP3 SAMAs 7, 18, 19, 52, 53, 55, 61, and 62), as well as the additional SAMA regarding a dedicated gagging device for SGTR events, will be considered further for implementation at IP2 and IP3.

The NRC staff reviewed the Entergy analysis and concludes that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by Entergy are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process and inclusion of a multiplier to account for external events.

The NRC staff concurs with Entergy's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff agrees that further evaluation of these SAMAs by Entergy is warranted. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to Title 10 of the *Code of Federal Regulations*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (10 CFR Part 54).

G.8 References

Consolidated Edison (Con Ed). 1992. Letter from Stephen B. Bram to U.S. NRC, Subject: Generic Letter 88-20, Supplement 1: Individual Plant Examination (IPE) for Severe Accident Vulnerabilities—10 CFR 50.54, IP2 and IP3 Unit No. 2, August 12, 1992.

Consolidated Edison (Con Ed). 1995. Letter from Stephen E. Quinn to U.S. NRC, Subject: Final Response to Generic Letter 88-20, Supplement 4: Submittal of Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities, IP2 and IP3 Unit No. 2, December 6, 1995.

Entergy Nuclear Operations, Inc. (Entergy). 2007. Letter from Fred Dacimo to U.S. NRC, Subject: IP2 and IP3 Energy Center Licensee Renewal Application, NL-07-039, April 23, 2007. ADAMS Accession No. ML071220512.

Entergy Nuclear Operations, Inc. (Entergy). 2008a. Letter from Fred R. Dacimo to U.S. NRC, Subject: Reply to Request for Additional Information Regarding License Renewal Application—Severe Accident Mitigation Alternatives Analysis, NL-08-028, February 5, 2008. ADAMS Accession No. ML080420264.

Entergy Nuclear Operations, Inc. (Entergy). 2008b. Letter from Fred R. Dacimo to U.S. NRC, Subject: Supplemental Reply to Request for Additional Information Regarding License Renewal Application—Severe Accident Mitigation Alternatives Analysis, NL-08-086, May 22, 2008. ADAMS Accession No. ML081490336.

Entergy Nuclear Operations, Inc. (Entergy). 2009. Letter from Fred Dacimo to U.S. NRC, Subject: License Renewal Application – SAMA Re-analysis Using Alternate Meteorological Tower Data, NL-09-165, December 11, 2009. ADAMS Accession No. ML093580089.

Entergy Nuclear Operations, Inc. (Entergy). 2010. Letter from Fred Dacimo to U.S. NRC, Subject: License Renewal Application – Supplement To SAMA Re-Analysis Using Alternate Meteorological Tower Data, NL-10-013, January 14, 2010. ADAMS Accession No. ML100260750.

New York Power Authority (NYPA). 1994. Letter from William A. Josiger to U.S. NRC, Subject: IP2 and IP3 3 Nuclear Power Plant Individual Plant Examination for Internal Events, June 30, 1994.

New York Power Authority (NYPA). 1997. Letter from James Knubel to U.S. NRC, Subject: IP2 and IP3 3 Nuclear Power Plant Individual Plant Examination of External Events (IPEEE), September 26, 1997.

Nuclear Regulatory Commission (NRC). 1990. “Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants.” NUREG-1150, Washington, DC, December 1990. ADAMS Accession No. ML040140729.

Nuclear Regulatory Commission (NRC). 1991. Generic Letter 88-20, Supplement 4, “Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities,” June 28, 1991.

Nuclear Regulatory Commission (NRC). 1995. Letter from Jefferey F. Harold to William J. Cahill, Jr., Subject: Staff Evaluation of IP2 and IP3 Nuclear Generating Unit No. 3—Individual Plant Examination (TAC No. M74423), December 11, 1995.

Nuclear Regulatory Commission (NRC). 1996. Letter from Barry Westreich to Stephen E. Quinn, Subject: Staff Evaluation of IP2 and IP3 Nuclear Generating Unit No. 2—Individual Plant Examination (TAC No. M74422), August 14, 1996.

Nuclear Regulatory Commission (NRC). 1997a. “Regulatory Analysis Technical Evaluation Handbook.” NUREG/BR-0184, Washington, DC, January 1997.

Nuclear Regulatory Commission (NRC). 1997b. “Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance.” NUREG-1560, Washington, DC, December 1997.

Nuclear Regulatory Commission (NRC). 1997c. “Code Manual for MACCS2: Volume 1, User's Guide.” NUREG/CR-6613, Washington, DC, May 1998.

Nuclear Regulatory Commission (NRC). 1998. “Risk Assessment of Severe Accident-Induced Steam Generator Tube Rupture.” NUREG-1570, Washington, DC, March 1998.

Nuclear Regulatory Commission (NRC). 1999. Letter from Jefferey F. Harold to A. Alan Blind, Subject: Review of IP2 and IP3 Nuclear Generating Unit No. 2—Individual Plant Examination of External Events (IPEEE) Submittal (TAC No. M83631), August 13, 1999.

Nuclear Regulatory Commission (NRC). 2001. Letter from George F. Wunder to Michael Kansler, Subject: Review of Individual Plant Examination of External Events—IP2 and IP3 Nuclear Generating Unit No. 3 (TAC No. M83632), February 15, 2001. ADAMS Accession No. ML 010080273.

Nuclear Regulatory Commission (NRC). 2002. “Perspectives Gained From the Individual Plant Examination of External Events (IPEEE) Program," Volume 1 & 2, Final Report. NUREG-1742, Washington, DC, April 2002.

Nuclear Regulatory Commission (NRC). 2004. “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission.” NUREG/BR-0058, Washington, DC, September 2004. ADAMS Accession No. ML042820192.

Nuclear Regulatory Commission (NRC). 2007. Letter from Jill Caverly to Entergy, Subject: Request for Additional Information Regarding Severe Accident Mitigation Alternatives for IP2 and IP3 Nuclear Generating Unit Nos. 2 and 3 Licensee Renewal (TAC Nos. MD5411 and MD5412), December 7, 2007. ADAMS Accession No. ML073110447.

Nuclear Regulatory Commission (NRC). 2008. Letter from Bo M. Pham to Entergy, Subject: Request for Additional Information Regarding the Review of the License Renewal Application for IP2 and IP3 Nuclear Generating Unit Nos. 2 and 3 (TAC Nos. MD5411 and MD5412), April 9, 2008. ADAMS Accession No. ML080880104.

Nuclear Regulatory Commission (NRC). 2010. Atomic Safety and Licensing Board. LBP-10-13. 71 NRC ___ (2010). slip op. at 10, 14-15.

U.S. Department of Agriculture (USDA). 2002. “Census of Agriculture.” Accessed at: http://www.nass.usda.gov/census/ on April 26, 2005.us/ on April 26, 2009.

Appendix H

U.S. Nuclear Regulatory Commission
Staff Evaluation of
Environmental Impacts of Cooling System

Appendix H

U.S. Nuclear Regulatory Commission Staff Evaluation of Environmental Impacts of Cooling System

H.1 Environmental Impacts of Cooling System

Environmental issues associated with the operation of a nuclear power plant during the renewal term are discussed in the U.S. Nuclear Regulatory Commission (NRC) document, NUREG-1437, Volumes 1 and 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (hereafter referred to as the GEIS) (NRC 1996, 1999).[a] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a generic (Category 1) or site-specific (Category 2) designation. As set forth in the GEIS, generic issues are those that have the following characteristics:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, OR LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

No additional plant-specific analysis is required for generic issues unless new and significant information is identified. Site-specific issues do not have all the above characteristics, and a plant-specific review is required.

This appendix addresses the issues that are listed in Table B-1, Appendix B, Subpart A, of Title 10 of the *Code of Federal Regulations* (CFR), Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," and that are related to the operation of the cooling systems of Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) during their renewal term. Section H.1 addresses the impingement of fish and shellfish applicable to the IP2 and IP3 cooling systems. Section H.2 addresses the entrainment of fish and shellfish applicable to the IP2 and IP3 cooling systems. Section H.3 addresses the combined effects of impingement and entrainment, and Section H.4 discusses cumulative impacts. Finally, Section H.5 lists the references for Appendix H. Category 1 and Category 2 issues that are not applicable to IP2 and IP3, because they are related to plant design features or site characteristics not found at IP2 and IP3, are listed in Appendix F. As stated in Section 4.1 of this SEIS, the applicant submitted corrected impingement and entrainment data following publication of the draft SEIS. The NRC staff considered those data as well as comments NRC received regarding the draft SEIS in preparing this appendix.

H.1.1. Impingement of Fish and Shellfish

Impingement occurs when organisms are trapped against cooling water intake screens or racks by the force of moving water. Impingement can kill organisms immediately or gradually, by exhaustion, suffocation, injury, or exposure to air when screens are rotated for cleaning. The potential for injury or death is generally related to the amount of time an organism is impinged, its susceptibility to injury, and the physical characteristics of the screenwash and fish return system that is employed. Studies of impingement losses associated with the operation of IP2 and IP3 cooling systems were conducted annually from 1975 to 1990. Before the installation of modified Ristroph screen systems in 1991, impingement mortality was assumed to be 100 percent. Beginning in 1985, studies were conducted to evaluate whether the addition of Ristroph screens would decrease impingement mortality for representative species. The final design (Version 2), as reported in Fletcher (1990), appeared to reduce impingement mortality, based on a pilot study, in comparison to the existing (original) system in place at IP2 and IP3 (Table H-1). The impingement survival estimates reported in Fletcher (1990) were not validated, however, after the new Ristroph screens were installed at IP2 and IP3 in 1991.

Table H-1 Assumed Cumulative Mortality and Injury of Selected Fish Species after Impingement on Ristroph Screens

Species	Percent Dead and Injured
Alewife	62
American Shad	35
Atlantic Tomcod	17
Bay Anchovy	23
Blueback Herring	26
Hogchoker	13
Striped Bass	9
Weakfish	12
White Catfish	40
White Perch	14

Source: Fletcher 1990.

H.1.1.1. Summary of Impingement Monitoring Studies

The former owners of IP2 and IP3 conducted impingement monitoring between 1975 and 1990 using a variety of techniques. Between January 1975 and June 1981, fish were collected and sorted during a daily intake screen washing between 0800 and 1200 hours (hr). In July 1981 and continuing through October 1990, fish were collected during intake screen washings between 0800 and 1200 hr on selected days determined from a stratified random design intended to reduce the overall sampling effort without affecting data use and utility. Between October and December 1990, IP2 was sampled every Tuesday, and IP3 was not sampled because of a plant outage. During all collections, the wash water was circulated to draw a portion of the fish and debris into the forebay, where it was drained through a sluice containing a 1-millimeter (mm) (0.375-inch [in.]) square mesh screen. Collection efficiency was estimated in 1974, 1975, and 1977 at IP2. The results of these studies suggested that the collection efficiency was highly variable (ranging from 2 percent to 45 percent based on the recovery of dyed fish) and averaged 29 percent (Con Edison 1976, Con Edison 1979). Collection efficiency at IP3 in 1976 and 1977 ranged from 58 percent to 86 percent recovery of dyed fish with an average of 71 percent (Con Edison 1977, Con Edison 1979). The difference in the collection efficiency at the two units was associated with the differences in the type of screens (fixed versus traveling screens) and the method used for screen washing. To estimate the total number of fish impinged, the total number of fish collected was multiplied by an adjustment factor representing the inverse of the collection efficiency. From 1975 to 1978, adjustment factors of 3.5 and 1.4 were used for IP2 and IP3, respectively (Con Edison 1980).

Analysis of variance and the correlation of environmental and IP2 and IP3 operation variables were employed to explain the variation in collection efficiency. Early studies suggested that collection efficiency increased during periods of low water temperature. In 1979, the adjustment factor became a function of the time of year, based on the increase in collection efficiency when water temperatures were less than 15°C (59˚F). Thus, cool water adjustment factors of 2.1 and 1.2 were adopted to estimate the number of fish impinged at IP2 and IP3, respectively, during January through April, November, and December. For May to October, the adjustment factor was 3.8 for IP2 and 1.5 for IP3. In 1981, the collection efficiency was estimated with a regression relationship with temperature:

IP2 efficiency= E_2 = -0.00945 (Temperature ˚C) + 0.54708

IP3 efficiency= E_3 = -0.00792 (Temperature ˚C) + 0.71640 (Con Edison 1984).

These regression relationships were updated in 1982, and screen-specific adjustments were devised from studies conducted in 1985 and 1986 (Table H-2).

Impingement monitoring designs changed through time (Con Edison 1980, Con Edison 1984, Con Edison and NYPA 1986, Con Edison and NYPA 1987, Con Edison and NYPA 1988, Con Edison and NYPA 1991) as follows. In 1979, the daily variation in impingement counts was analyzed to determine its effect on the precision and accuracy of reduced sampling plans. Starting in July 1981, a sampling plan employing a seasonally stratified random sample developed from these results was used for all further impingement studies except the last quarter of 1990. Instead of sampling daily, IP2 and IP3 were sampled a total of 110 days per year (a 30-percent sampling fraction with approximately 92-percent accuracy) (Con Edison 1984). Days were selected at random within four calendar strata defined by similar water temperatures and variance in the number of fish impinged (January–March, April–June, July–September, and October–December). The number of days sampled per stratum was proportional to the number of days available and the variance in impingement for all taxa combined (Table H-3) (Con Edison 1984). The number of days allocated to strata was updated in 1985 to take advantage of current data trends and again in 1990 because of known plant outages. Even though IP2 and IP3 had different numbers of samples allocated to each stratum, sampling was conducted on the same day at both units to the extent possible.

During 1981, the New York State Department of Environmental Conservation (NYSDEC) required daily sampling when total impingement counts were greater than 10,000 fish. Daily sampling was required to continue until the total was below 10,000 fish. Because these sampling dates were not part of the stratified design, they were used in place of random dates that were associated with unplanned unit outages. Outages were defined as circulating pump outages and were not necessarily associated with cessation of power generation. In 1981, randomly selected days that fell on planned outages were not replaced. From 1982 to October 1990, to minimize the effect of planned and unplanned outages on the selected days for collection, a randomly selected replacement day within the given stratum was sampled. In October 1990, a systematic sampling design was employed that required sampling at IP2 each Tuesday. No sampling was conducted at IP3 from October 1990 to December 1990 because of an extended outage.

Sampling for blue crabs began in April 1983 and continued though December 1990. Sampling was conducted on all days of plant operation. The total number of impinged crab and their total weight were obtained for each sampling. In addition, the carapace width, total weight, and observed condition were recorded for each collected individual.

Table H-2 Estimates of Collection Efficiency Based on Temporal Averages, Regressions as a Function of Temperature, and Specific Screens

Year	IP2 Conventional Screen	IP3 Conventional Screen	Ristroph Screen Version[1]
1975–1978	29 percent	71 to 73 percent	None installed
1979–1980	Jan.–April = 48 percent May–Oct. = 26 percent Nov.–Dec. = 48 percent	Jan.–April = 83 percent May–Oct. = 66 percent Nov.–Dec. = 83 percent	None installed
1981	$E_2 = -0.00945\ T + 0.54708$	$E_3 = -0.00792\ T + 0.71640$	None installed
1982–1985	$E_2 = -0.00871\ T + 0.51858$	$E_3 = -0.00792\ T + 0.71640$	None installed

Table H-2 (continued)

Year	IP2 Conventional Screen	IP3 Conventional Screen	Ristroph Screen Version[1]
1986	$E_2 = -0.00871\ T + 0.51858$	$E_3 = -0.00792\ T + 0.71640$	Jan.–Mar. = 70.8 percent Apr.–June = E_2 or E_3 July–Aug. = 18.7 percent Sept. = 29.6 percent Oct.–Dec. = E_2 or E_3
1987–1990	$E_2 = -0.00871\ T + 0.51858$	$E_3 = -0.00792\ T + 0.71640$	Jan.–Mar. = 74.4 percent Apr.–June = E_2 or E_3 July–Aug. = 18.7 percent Sept. = 29.6 percent Oct.–Dec. = E_2 or E_3

[1] Number of Ristroph Screens at IP2. In 1986, a Ristroph Screen was installed on Intake Bay 26.
E_2 – Collection Efficiency at IP2.
E_3 = Collection Efficiency at IP3.
T = Temperature in degrees C.

Sources: Con Edison 1980, Con Edison 1984, Con Edison and NYPA 1986, Con Edison and NYPA 1987, Con Edison and NYPA 1988, Con Edison and NYPA 1991.

Table H-3 Number of Days Allocated to Each Quarter Based on the Stratified Random Sampling Design

Stratum	Dates	Total Days	Allocation to IP2 in 1981; 1982–84; 1985–89; and 1990	Allocation to IP3 in 1981; 1982–84; 1985–89; and 1990
Winter	Jan. 1–Mar. 31	90	N/A[a]; 30; 23; 23	N/A; 27; 35; 35
Spring	Apr. 1–June 30	91	N/A; 10; 8; 8	N/A; 18; 20; 20
Summer	July 1–Sept. 30	92	11; 11; 11; 11	31; 31; 31; 31
Fall	Oct. 1–Dec. 31	92	59; 59; 68; 13	34; 34; 24; 0

[a] N/A = Not Applicable, the reduced sampling began July 1, 1981 (Con Edison 1984).
Sources: Con Edison 1984, Con Edison and NYPA 1986, Con Edison and NYPA 1987, Con Edison and NYPA 1988, Con Edison and NYPA 1991.

For all impingement studies, fish were sorted and counted completely if either the identified species was white perch, striped bass, or tomcod, or the total number collected for a given species was less than 100 individuals (with heads). All other sorted samples were enumerated by subsampling and weighing to four general length classes. This information was used to determine the total sample size. To estimate the number of fish impinged, the estimated daily counts (taken before July 1981) were multiplied by the collection efficiency adjustment factor (Con Edison 1984). During the period of stratified random sampling (July 1981–1990), the mean of the estimated number of fish counted within a stratum was multiplied by the collection efficiency adjustment factor and the number of days of plant operation (Con Edison 1984).

H.1.1.2. Historic Assessment of Impingement Impacts

As discussed in the previous section, numerous studies have been conducted to evaluate the effects of impingement associated with the Indian Point cooling systems. Studies have also been conducted to evaluate the trends of fish populations in the Hudson River. Entergy Nuclear Operations, Inc. (Entergy, or the applicant) and NYSDEC have used the results of these studies to evaluate the potential for adverse effects associated with the operation of the Indian Point cooling systems. The results of these assessments are described below. Nongovernmental groups and members of the public have also evaluated publicly available information and data associated with the Hudson River and have expressed the opinion that many species of fish in the river are in decline and that the entrainment of juvenile and adult fish at Indian Point is contributing to the decline, destabilization, and ultimate loss of these important aquatic resources.

<u>Applicant Assessment</u>

In the draft environmental impact statement (DEIS) (CHGEC 1999) and environmental report (ER) for license renewal (Entergy 2007), the applicant acknowledged that some impinged fish survive and others die. Mortality can be immediate or occur at a later time (latent or long-term mortality), and mortality rates depend on the species, the size of the fish, the water's temperature and salinity, the design of the screens, the water velocity through the screen, the length of time the fish was impinged, and the design and operation of the fish return system. Impingement effects were examined by evaluating conditional mortality rates (CMRs) and trends associated with population abundance for eight selected taxa representing 90 percent of those fish species collected from screens at IP2 and IP3, including striped bass, white perch, Atlantic tomcod, American shad, bay anchovy, alewife, blueback herring, and spottail shiner. Estimates of the CMR, defined as the fractional reduction in the river population abundance of the vulnerable age group caused by one source of mortality only, were assumed to be the same as or lower than that which occurred in past years, caused by the installation of Ristroph screens and fish return systems at IP2 and IP3. For species exhibiting low impingement mortality (e.g., striped bass, white perch, and Atlantic tomcod), future impingement effects were expected to be substantially lower than they were before the installation and use of the present protective measures.

Central Hudson Gas and Electric Corporation (CHGEC) (1999) concluded that the maximum expected total impingement CMR was 0.004 for white perch and less for all other taxa. The ER (Entergy 2007) stated that the results of in-river population studies performed from 1974 to 1997 had not shown any negative trend in overall aquatic river species populations attributable to plant operations:

> More than 30 years of extensive fisheries studies of the Hudson River in the vicinity of IP2 and IP3 support current operations. The results of the studies performed from 1974 to 1997, the period of time covered in the DEIS, are referenced and summarized in the DEIS, and have not shown any negative trend in overall aquatic river species populations attributable to plant operations...

The ER also stated that ongoing studies continue to support these conclusions. Thus, the applicant determined impingement impacts to be small, suggesting that the withdrawal of water from the Hudson River for the purposes of once-through cooling for IP2 and IP3 did not have any demonstrable negative effect on representative Hudson River fish populations, nor did it warrant further mitigation measures.

To support this assessment, the applicant provided two reviews, Barnthouse et al. (2002) and Barnthouse et al. (2008). These reviews addressed the status and trends of fish populations and communities of the Hudson River estuary in relation to the operation of Bowline Point, IP2 and IP3, and Roseton generating stations, which currently share a State Pollutant Discharge Elimination System (SPDES) permit. Barnthouse et al. (2002) was based on a review of the DEIS, comments on the DEIS abundance indices though 2000 (CHGEC 1999), and the annual Year Class Report (ASA 2000). Barnthouse et al. (2008) was based on abundance indices through 2005, the spawning stock biomass-per-recruit model (SSBR), and CMR estimates. Although both reviews recognized that the long-term population trends reflected the combined effects of entrainment and impingement, the 2008 report focused on entrainment and suggested that the existing retrofits (Ristroph screens and fish returns) have resolved the concerns regarding impingement. Additional discussions concerning the results of the Barnthouse et al. (2008) analyses are provided in Section H.2.

NYSDEC Assessment

With respect to the operation of the IP2 and IP3 cooling systems, the NYSDEC regulatory role includes protecting aquatic resources from impacts associated with impingement, entrainment, and thermal and chemical discharges. Based on activities conducted under the Hudson River Settlement Agreement (HRSA), subsequent Consent Orders, and existing agreements with the operators of IP2 and IP3, Roseton, and Bowline Point power generation stations, NYSDEC concluded that IP2 and IP3 have achieved some reductions in intake volumes through the use of dual-speed and variable-flow pumps and have improved impingement survival through the installation of modified Ristroph traveling screens (NYSDEC 2003a). However, NYSDEC stated that “while these represent some level of improvement compared to operations with no mitigation or protection, there are still significant unmitigated mortalities from entrainment and impingement at all three of the HRSA facilities.” In a petition submitted to the NRC to intervene in the IP2 and IP3 license renewal proceeding dated November 30, 2007, the NYSDEC stated the following:

> The plants' outdated design and operation have caused significant adverse environmental impacts to the Hudson River. These impacts include impingement, entrainment, and heat shock to numerous fish species in the Hudson, including the endangered sturgeon. In the alternative, even if the NRC were to grant the license renewal application, it could only do that by conditioning the renewal on the construction and use of closed-cycle cooling water intake systems at IP2 and IP3. As was stated in the above contention on impingement and entrainment, the perpetuation of once-through cooling here, with its long history of massive injury and destruction of tens of millions of Hudson River fish, is simply no longer tenable, either in fact or in law.

NYSDEC stated further that the applicant would need a Clean Water Act Section 316(b) determination, a demonstration that the current cooling water intake structure reflects the best technology available for minimizing adverse environmental impacts (NYSDEC 2007). However, the NYSDEC states the following:

> Entergy has not and could not demonstrate that its once-through cooling water intake structures at IP2 and IP3 reflects the best technology available for minimizing adverse environmental impacts. Indeed, the New York State Department of Environmental Conservation has determined in the pending SPDES permit renewal proceeding that closed-cycle cooling, and not once-through cooling, represents the best technology available for minimizing adverse environmental impacts.

H.1.1.3. NRC Staff Assessment of Impingement Impacts

To assess impingement impacts, the NRC staff evaluated weekly estimated impingement numbers at IP2 and IP3 from January 1975 to November 1980, and seasonally estimated impingement numbers from January 1981 and December 1990. The combined numbers of young of year (YOY), yearling, and older fish were used for analysis since these data were available for all years of sampling.

The applicant's monitoring data showed that a total of 141 fish taxa and blue crab were collected and identified at IP2 and IP3 during this 16-year period. At IP2, the estimated number of representative important species (RIS; as defined in Table 2-4 in the main text) fish impinged made up greater than 85 percent of the total impinged (fish and blue crab; Figure H-1, solid lines). Until 1984, the RIS fish made up at least 95 percent of the total impinged. When blue crab are included with the RIS fish, the estimated number impinged made up greater than 90 percent of the total impinged for all but one year. The total number of fish and blue crab impinged at IP2 has significantly decreased at a rate of 0.15 million per year (linear regression; $n = 16$; $p = 0.025$) from 1975 to 1990. Total impingement approached or exceeded 4 million in 1977 and 1981 (Figure H-1, dashed line). Impingement of all fish and blue crab was lowest in 1984 (about 0.5 million).

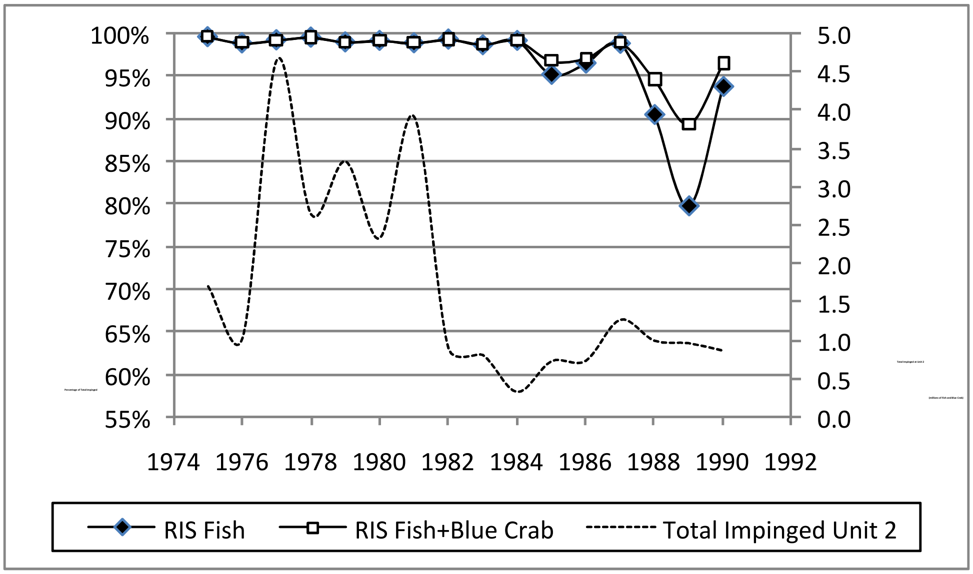


Figure H-1 Percentage of impingement composed of RIS fish and RIS fish plus blue crab relative to the estimated total impingement at IP2 (data from Entergy 2007b and 2009 [NL-09-131]).

At IP3, the estimated number of RIS fish impinged made up greater than or equal to 95 percent of the total impinged except for the last three years (Figure H-2, solid lines). When blue crab were included with the RIS fish, the estimated number impinged was greater than 85 percent for all but one year. The total number of fish and blue crab impinged at IP3 significantly decreased from 1976 to 1990 at a rate of 0.08 million per year (linear regression; n = 15; p = 0.002). Except for 1983, for which IP3 had extensive outages, the numbers of fish and crab impinged annually at IP2 are 2.6 times greater than those at IP3. The highest total impingement at IP3 occurred in 1977 at just over 1.8 million fish and blue crab; the lowest occurred in 1983 at about 0.03 million (Figure H-2, dashed line).

Total impingement trends at IP2 and IP3 suggest that the total number of fish and blue crab impinged tended to decrease between 1977 and 1982, then leveled off between 1982 and 1990. From 1975 to 1990, the number of days of operation at IP2 and IP3 has shown a general increase of eight days per year for IP2 and five days per year for IP3 (linear regression, p = 0.004 and p = 0.286 for IP2 and IP3, respectively). The total volume circulated at IP2 and IP3 combined has also shown a general increase of 26.2 x 10^6 cubic meters (m^3) (linear regression, p = 0.164). If the IP2 and IP3 cooling systems are considered a relatively constant sampler of Hudson River aquatic biota (recognizing the slight increase in frequency and volume of water circulated), then the decrease in the percent of RIS impinged and total impingement would suggest that RIS and all other taxa within the vicinity of IP2 and IP3 have decreased from a high in 1977 to a relatively constant lower level of impingement between 1984 and 1990. This will be explored further in Section H.3.

To determine trends in RIS impingement, the NRC staff examined quarterly data from IP2 and IP3 from 1975 to 1990 (Table H-4). The two major time periods (1975–1980) and (1981–1990)

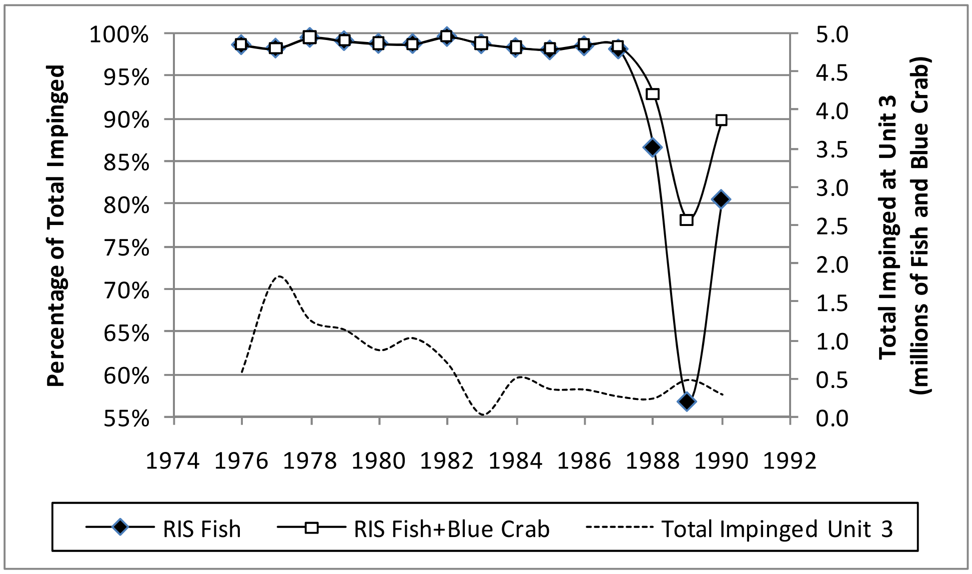


Figure H-2 Percentage of impingement composed of RIS fish and RIS fish plus blue crab relative to the estimated total impingement at IP3 (data from Entergy 2007b and 2009 [NL-09-131]).

were analyzed separately to account for the differences in impingement sampling strategies discussed above. Eight RIS taxa, including blue crab, accounted for 96 percent (IP2) and 93 percent (IP3) of the total number of RIS impinged over all years. During January to March sampling events for both units and all years, white perch was the most commonly impinged species, accounting for 78 to 98 percent of the RIS impinged. Impingement of RIS was more variable during other sampling periods but was dominated by white perch, Atlantic tomcod, bay anchovy, and blueback herring. The notable exception to this pattern occurred between 1981 and 1990, when the percentage of hogchoker and weakfish impinged increased at both units during the spring and summer sampling periods compared to estimates obtained from 1975 to 1980 (Table H-4). Greenwood (2008) stated that power station cooling-water intake screens are effective estuarine fish sampling devices. Therefore, if we regard the cooling systems associated with IP2 and IP3 as an efficient environmental sampler, then the patterns observed in the impingement data could indicate a change in species composition in the vicinity of IP2 and IP3 occurred in the 1980s.

As a result of the HRSA, operational measures were implemented to reduce the loss of aquatic resources to impingement. These measures included the installation of dual-speed intake pumps at IP2 in 1984, installation of variable-speed pumps at IP3 in 1985, and the installation of modified Ristroph screens and fish-return systems at both units in 1991. The plant operators also developed programs to employ flow-reduction measures and scheduled outages to reduce impingement and entrainment impacts. Flow rates are dependent on intake water temperature, with increased flow required when water temperatures rise above 15° C. For example, the average monthly water temperatures taken near Poughkeepsie, New York from 1992 to 2006 (Figure H-3) suggests to NRC staff that greater flow would be required during the months of

May through October. This roughly corresponds to the second and third quarters of impingement sampling (April–September timeframes in Table H-4). The seasonal percentage of RIS fish impinged as a function of the annual number of RIS fish impinged at IP2 was significantly different between seasons with January to March greater than April to June (Kruskal-Wallis, p = 0.04). Thus, a greater percentage of impingement occurred at IP2 when the average intake water flow was relatively low compared to the rest of the year. The median seasonal percentage impinged over years was 14 to 32 percent.

Percentage of RIS taxa impinged as a function of the annual number of RIS taxa impinged at IP3 was not significantly different among seasons (Kruskal-Wallis, p = 0.25; Figure H-4). Thus, even though the plants withdrew a greater volume of water between May and October (analysis of variance (ANOVA), p = 0.02 with a CV = 41 percent and p = 0.53 with a CV = 61 percent for IP2 and IP3, respectively), impingement did not increase during these periods. Instead, the seasonal pattern of impingement may reflect times when susceptible fish are present near the facility.

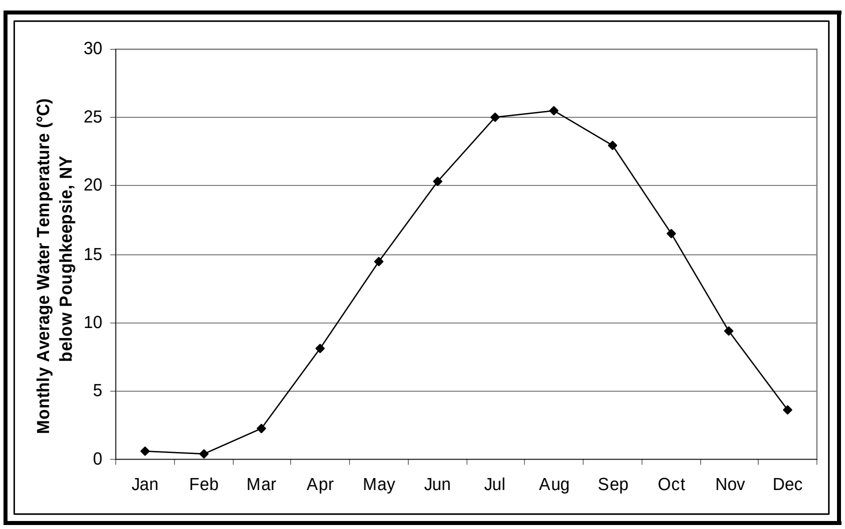
Table H-4 Average Percentage Impingement of RIS Compared to Total Impingement per Season for 1975–1980 and 1981–1990 for Selected Taxa (data from Entergy 2007b)

IP2 COOLING SYSTEM									
RIS Species	**1975–1980**				**1981–1990**				**Percent of RISTaxa[1]**
	Jan–Mar	**Apr–Jun**	**Jul–Sep**	**Oct–Dec**	**Jan–Mar**	**Apr–Jun**	**Jul–Sep**	**Oct–Dec**	
White Perch	96	35	17	38	93	44	13	62	50
Atlantic Tomcod	1	55	27	1	1	35	24	3	14
Bay Anchovy	0	2	32	7	0	5	23	8	11
Blueback Herring	0	0	10	45	0	0	2	11	14
Hogchoker	0	3	4	3	0	10	12	4	2
Weakfish	0	0	3	0	0	0	9	2	2
Striped Bass	2	0	2	1	4	1	2	4	2
Blue Crab	NA	NA	NA	NA	0	0	14	2	1
Percent of RIS Fish	100	99	99	96	99	98	99	98	98[2]

Table H-4 (continued)

RIS Species	1975–1980 Jan–Mar	1975–1980 Apr–Jun	1975–1980 Jul–Sep	1975–1980 Oct–Dec	1981–1990 Jan–Mar	1981–1990 Apr–Jun	1981–1990 Jul–Sep	1981–1990 Oct–Dec	Percent of RISTaxa[1]
IP3 COOLING SYSTEM									
White Perch	95	55	10	43	91	62	16	56	51
Atlantic Tomcod	0	23	40	2	0	14	16	2	17
Bay Anchovy	0	3	23	2	0	6	17	3	8
Blueback Herring	0	3	6	38	0	3	2	27	10
Hogchoker	0	5	8	1	0	8	15	2	3
Weakfish	0	0	3	0	0	0	5	1	1
Striped Bass	2	1	1	6	5	1	1	2	2
Weak Fish	NA	NA	NA	NA	0	1	20	6	2
Percent of RIS Fish	99	98	98	98	99	98	99	99	97[2]

[1] RIS Taxa include Blue Crab.
[2] Percent of RIS Taxa out of all impinged taxa.
NA = Not included in data collection.



Source: U.S. Geological Survey Surface Water Data, http://waterdata.usgs.gov/usa/nwis/uv?site_no=01372058.

Figure H-3 Average monthly water temperature taken from below Poughkeepsie, NY, from 1992 to 2006.

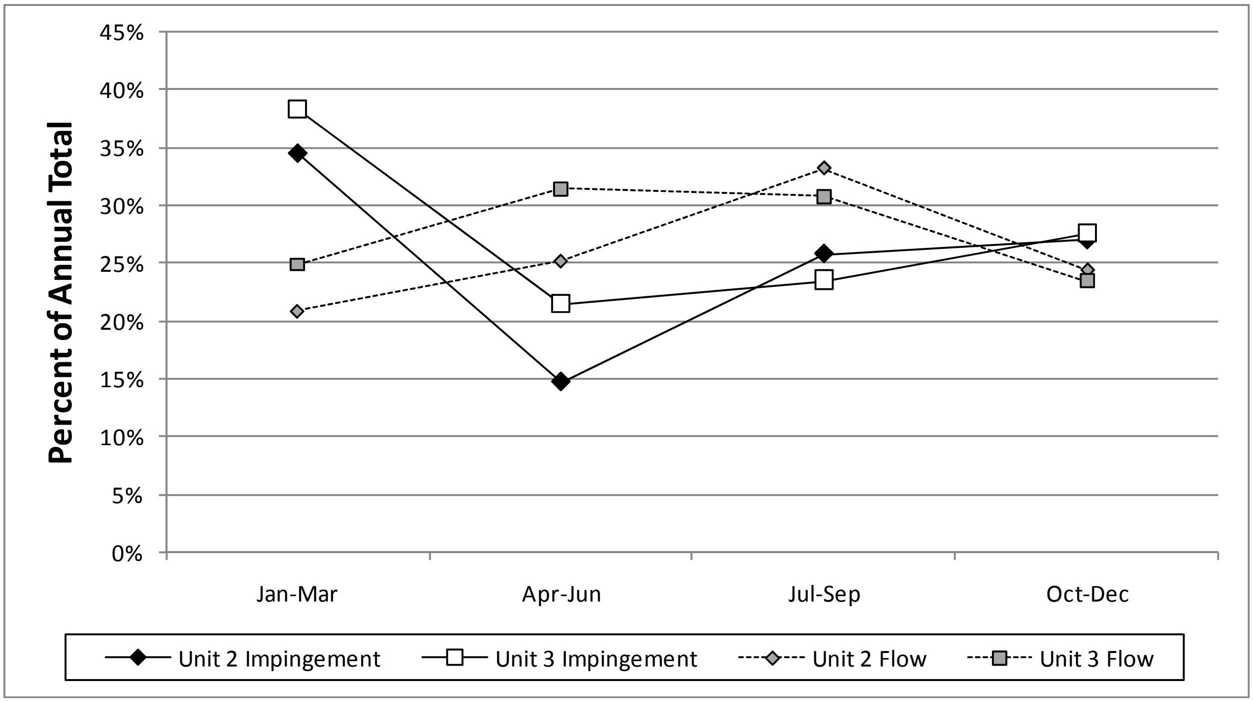


Figure H-4 Seasonal percentage of RIS fish impinged out of the annual total taxa impinged and the seasonal percentage of the volume circulated out of the annual total volume circulated from 1975–1990 (data from Entergy 2007b and 2009).

Based on the above NRC staff analyses, the species with the highest percentage of impingement at IP2 and IP3 from 1975 to 1990 were white perch, Atlantic tomcod, blueback herring, bay anchovy, and hogchoker. Impingement trends for both units show that each of these species was impinged during at least one sampling season in quantities representing at least 10 percent of the total impingement counts for that period. During some sampling seasons, a single species represented over 90 percent of the total impingement (e.g., white perch during January to March). Impingement magnitude does not appear to be directly related to flow; rather, the available information suggests that the frequency of impingement is associated with seasonal patterns of fish and their proximity to IP2 and IP3. The environmental significance of impingement is explored further in Section H-3.

H.1.2. Entrainment of Fish and Shellfish in Early Life Stages

Entrainment occurs when small aquatic life forms are carried into and through the cooling system as water is withdrawn for use in the plant's cooling system. Entrainment can affect organisms smaller than the screen mesh (0.25 to 0.5 in.) that are carried into the plant with the pumped water mass and have limited swimming ability to escape. This includes phytoplankton, microzooplankton, and macrozooplankton. Entrained organisms also include the young life stages of fish (eggs, larvae, post-yolk-sac larvae [YSL], and juveniles) and shellfish.

Entrained organisms pass through the circulating pumps and are carried with the flow through the intake conduits toward the condenser units. They are then drawn through one of the many condenser tubes used to cool the turbine exhaust steam and enter the discharge canal for return to the water. As entrained organisms pass through the intake, they may be injured from abrasion or compression. Within the cooling system, they encounter physical impacts in the pumps and condenser tubing, pressure changes, sheer stress, thermal shock, and chemical exposure to chlorine and residual industrial chemicals discharged at the diffuser ports (Mayhew et al. 2000). Death can occur immediately (direct effect) or after being discharged (indirect effect) from an inability to escape predators, a reduced ability to forage, or other factors.

The former owners of IP2 and IP3 conducted studies of entrainment loss associated with IP2 and IP3 in 1981 and then annually from 1983 to 1987. Entrainment survival is a disputed subject. The U.S. Environmental Protection Agency (EPA) assumes that the mortality associated with entrainment is 100 percent (NYSDEC 2003a). Consolidated Edison Company of New York (Con Edison) and New York Power Authority (NYPA 1984) assume that, for the more delicate species (bay anchovy, American shad, clupeids), mortality was 100 percent. However, for other species, mortality could be separated into thermal and mechanical components and overall was less than 100 percent. By 1987, Con Edison estimated the survival of entrained bay anchovy could be up to 52 percent (EA 1989). This assessment recognizes that 96-hr survival of fish following entrainment is not a measure of the potential reduction in ability to forage and avoid predation within hours or days of being discharged at the diffuser ports. Thus, indirect losses for a given species from entrainment for the purpose of this assessment are unknown.

H.1.2.1. Summary of Entrainment Survival Monitoring Studies

Entrainment studies to evaluate the survival of entrainable aquatic organisms (eggs, larvae, YSL, small juveniles) have been conducted at IP2 and IP3 since the early 1970s. A variety of sampling gear has been employed. Study endpoints included estimates of immediate and latent mortality by monitoring collected organisms for up to 96 hr. Initial monitoring efforts were based on the assumption that survival of organisms collected by nets was the same from intake canal samples as it was from discharge canal samples. It was discovered, however, that differences in water velocity at intake and discharge sampling stations may have affected ichthyoplankton survival, and subsequent studies demonstrated that the survival of striped bass eggs and larvae collected using fixed nets were velocity dependent. Based on these results, entrainment survival sampling at IP2 and IP3 in 1977 and 1978 was expanded to include new sampling gear designed to reduce or eliminate the effects of intake and discharge water velocity on apparent postcollection survival. The primary change involved the use of centrifugal pumps to transport water into a flume and larval collection table, where water quality conditions could be optimized and samples concentrated for survival and latent mortality analyses. In spite of these refinements, entrainment survival estimates derived from the pump/larval table collection system were again compromised by poor ichthyoplankton survival in control samples collected in front of intakes representing initial larval conditions before passage through the IP2 and IP3 cooling systems.

Subsequent revisions to sampling gear were employed in 1979, 1980, and 1989, and are discussed below. Because the survival estimates conducted before 1979 were significantly compromised by sampling gear design and choice, the NRC staff focused on the later studies to evaluate entrainment mortality at IP2 and IP3. Sampling was also conducted in 1985 to determine the effects of entrainment mortality resulting from an upgrade to the pumping system associated with IP2. The results of this study are not directly comparable to the 1979 and 1980 studies, because a different sampling design was employed.

Details of the 1979 entrainment survival and related studies are presented in EA (1981a). Entrainment survival studies were conducted during two separate sampling periods, the late winter season from March 12 to 22, 1979, to evaluate the larvae of Atlantic tomcod (*M. tomcod*), and in the spring–summer season from April 30 to August 14, 1979, to evaluate early life-stages of striped bass (*M. saxatilis*), white perch (*M. americana*), herring (*Clupeidae*), and anchovies (*Engraulidae*). During the winter season, sampling with a pump/larval table collection system was conducted at the intakes associated with IP2 and IP3, in the IP3 effluent before it enters the discharge canal, and in portions of the discharge canal containing effluent water from both units. The shutdown of IP3 from March 20 to 22, 1979 provided an opportunity to evaluate Atlantic tomcod larval survival under one- and two-unit operation. During the spring–summer season, a raft-mounted flume collection was used for the first time at IP2 and IP3. This system was designed to reduce sampling stress on target organisms by taking advantage of head pressure created by a difference between water levels on either side of the flume apparatus. The shutdown of IP2 after June 16, 1979, provided an opportunity to assess the survival of other species during both one- and two-unit operation.

For the Atlantic tomcod study during the winter of 1979, sampling was initiated upon notification of the first occurrence of tomcod larvae and conducted on four consecutive nights per week over the two-week sampling period from March 12 to 22, for a total of eight sampling days. Sampling occurred between 1700 and 0200 hr to coincide with the diel period of peak larval abundance. At the beginning of the study, both IP2 and IP3 units were operating, but an unscheduled shutdown of IP3 occurred on March 20 and continued through the remainder of the study. Although the unit did not generate power, two circulating water pumps continued to operate. Thus, for the tomcod study, a total of 11 circulating pumps were operating from March 12 to 19 (6 at IP2, 5 at IP3), and a total of eight pumps were operating from March 20 to 22 (6 at IP2, 2 at IP3). The pump/larval table collection system used for the tomcod study consisted of a modular two-screen collection flume that allowed collection of larval samples with minimal sampling stress associated with turbulent flow or temperature changes. Sample water was delivered to the table by two centrifugal pumps equipped with flowmeters. Collected entrainment samples were transferred to an onsite laboratory for sorting, where *icthyoplankton* were sorted and classified as live (fish, eggs), stunned (fish only), or dead (fish and eggs). Dead eggs and larvae were preserved; live or stunned fish or eggs were transferred to holding facilities to determine latent effects on survival at 3, 6, 12, 24, 48, 72, and 96 hr. Specific sampling procedures are discussed in the EA (1981a).

The spring–summer sampling to evaluate entrainment survival of striped bass, white perch, herrings, and anchovies was conducted from April 30 to August 14, 1979, coincident with the primary spawning and nursery seasons of these species. Samples were collected on two consecutive nights each week for a total of 32 sampling days from 1800 to 0200 hr that coincided with maximum abundance. As described above, a pumpless, rear-draw plankton sampling flume mounted on rafts was employed during this study to minimize stress associated with the use of centrifugal pumps. The volume of water samples collected from all samplers was measured with integrated flowmeters, and vertical 505-micron (μm) mesh screens were employed to divert entrained organisms into collection boxes, where they were concentrated and processed to determine latent survival as described for the tomcod study.

EA (1982) presents details of the 1980 entrainment survival and related studies. In 1980, entrainment survival sampling at IP2 and IP3 was conducted from April 30 to July 10. Sampling was focused on entrainable life stages of striped bass (*M. saxatilis*), white perch (*M. americana*), herrings (*Clupeidae*), and anchovies (*Engraulidae*). Juvenile Atlantic tomcod (*M. tomcod*) were also collected. To correct possible sources of gear-related effects on study results, the rear-draw and pumpless plankton flumes used in 1979 were modified with flow diffusion panels and slotted standpipes installed behind the angled diversion screens. These refinements were intended to more evenly distribute the water across the surface of the screens and eliminate localized areas of high-velocity flow that may have caused impingement. This, along with other improvements to the sampling system, was expected to decrease the gear-related mortality observed in control samples from the intakes at IP2 and IP3.

Entrainment survival sampling for striped bass, white perch, herring and anchovies was conducted from April 30 to July 10, 1980, coinciding with the primary spawning and nursery seasons of these taxa. Samples were collected on 4 consecutive nights each week for a total of 44 sampling days between the hours of 1600 and 0200. Sampling was conducted at discharge canal station DP and at the IP3 intake using the modified rear-draw plankton sampling flumes. Live and dead icthyoplankton collected during the study were sorted at the onsite laboratory immediately after sample collection and classified as live (fish and eggs), stunned (fish only), or dead (fish and eggs). Dead eggs and larvae were preserved; live or stunned fish or eggs were transferred to holding facilities to determine latent effects with checks at 3, 6, 12, 24, 48, 72, and 96 hr.

During the summer and early fall of 1984, dual-speed cooling water pumps were installed at IP2. In 1985, variable-speed pumps were installed at IP3. The specific objectives of the 1988 entrainment studies were to (1) estimate the initial and extended survival of ichthyoplankton entrained at IP2 and IP3 and compare the results to those from previous years, (2) determine whether live and dead ichthyoplankton are randomly dispersed in the IP2 and IP3 discharge canal at sampling station D2, and (3) assess whether the thermal and mechanical components of entrainment stress are independent. The study description that follows was obtained from the EA (1989).

The 1988 study EA (1989) was designed to sample 180 m^3 per day with each flume system. One flume was deployed at intake Station IP3; two flumes were deployed at discharge station D2. The original design required that flumes be operated 3 days per week from May 23 to June 30, 1989, resulting in 18 total sampling days. Specific daily volume requirements and numbers of sampling days were developed to ensure sufficient numbers of organics were collected. Because of a number of logistical challenges, the actual number of sampling days was 13, from June 8 to 30. The flume design and collection procedures employed in 1988 were consistent with previous studies described above. Average daily sample volumes collected at the intake were 143.3 m^3, and the daily combined volume sampled by both flumes in the discharge canal was 271.2 m^3. The sampling program was conducted during afternoon and evening hours (1300–2300). Live and dead icthyoplankton collected during the study were sorted at the onsite laboratory immediately after sample collection and classified as described above. Other studies conducted in 1988 included sampling stress evaluations to provide a better understanding of mortality caused by sampling stress at intake versus discharge sampling locations, direct release studies to augment entrainment studies based on wild fish captures, and net studies in the discharge canal to provide additional information on icthyoplankton distribution.

The results of entrainment survival from the 1977–80, 1985, and 1988 studies are presented in EA (1989) for initial intake survival (EA 1989, Figure 4-8), initial discharge survival (EA 1989, Figure 4-9), and overall entrainment survival (EA 1989, Figure 4-10). Summary information for the 1979, 1980, and 1988 study years are summarized in Table H-5 below:

Table H-5 Entrainment Survival Estimates for Study Years 1979, 1980, and 1988

Species	Initial Intake Proportion Survival	Initial Discharge Proportion Survival	Estimated Entrainment Proportion Survival
Bay Anchovy PYSL	~0.09–0.32	~0.01–0.05	~0.12–0.52
Striped Bass YSL	~0.52–0.95	~0.61	~0.62–0.72
Striped Bass PYSL	~0.50–0.95	~0.70–0.78	~0.68–0.80
White Perch PYSL	~0.15–0.95	~0.19–0.85	~0.30–0.92
Alosa spp. PYSL	~0.25–0.90	~0.30–0.60	~0.30–0.65

Adapted from Figures 4-8–4-10 in EA (1989).

H.1.2.2. Summary of Entrainment Abundance Monitoring Studies

During 1981, EA employed an Automated Abundance Sampler (AUTOSAM) to collect icthyoplankton samples from IP2 and IP3. Mid-depth water samples were collected twice a week during May–August from discharge station D2. Each sampling effort consisted of collecting 90-minute (min) composite samples within eight 3-hr sampling intervals extending over a 24-hr period. Ichthyoplankton samples were sorted, identified to species and life stage, and counted (EA 1981b). In 1983, entrainment abundance samples were again collected at discharge canal station D2 from May 3 to August 13, 1983, using the AUTOSAM collector. From May 3 to 18, each sample consisted of a 90- min composite sample within eight 3-hr sampling periods. From May 19 to August 13, the 90-min composites reflect a shorter collection time to reduce clogging caused by the presence of detritus. Ichthyoplankton samples were sorted, identified to species and life stage, and counted (EA 1984). In 1984, icthyoplankton samples were collected from discharge canal station D2 from May 3 to August 11, 1984. Sampling equipment, collection procedures, and sample processing were consistent with past sampling efforts described above (EA 1985).

In 1985, ichthyoplankton samples were taken continuously (24 hr per day) from May 1 to August 11. Each sample consisted of one 3-hr period, resulting in eight samples per day. Total sample volumes were 150 m^3. Replicate sampling to determine variance estimates was conducted on Wednesdays and Thursdays of each week. Samples were collected by pumping water through a 10-centimeter (cm) (4-in.) diameter pipe submerged to a depth of 3 m at discharge canal Station D2 and passing the collected water into a plankton net with a codend cup. The collected sample was transferred to a sample jar, preserved, and transferred to a laboratory for sorting, identification to species and life stage, and enumeration (Normandeu 1987a). Pump samples to quantify ichthyoplankton entrained at IP2 and IP3 were collected from May 1 to August 10, 1986, at discharge canal station D2. Sampling duration was 3 hr without replication from May 1 to May 14, and 2 hr from May 15 to August 10 to increase the number of collected samples. Replicate sampling to provide variance estimates were collected five days per week from May 16 through August 10. Sampling equipment and processing were consistent with the 1985 sampling study (Normandeu 1987b). In 1987, pump samples to determine ichthyoplankton entrainment abundance were collected 24 hr per day from May 6 to August 10 from discharge canal station D2. Sample duration was 2 hr, which allowed a large number of samples to be collected. Replicate sampling to provide variance estimates was collected five days per week from May 6 to August 7 (Normandeu 1988).

H.1.2.3. Historic Assessment of Entrainment Impacts

As discussed in Sections 4.1.2.1 and 4.1.2.2 of the SEIS, numerous studies have been conducted to estimate the quantity of RIS that are entrained by the Indian Point cooling systems and evaluate the survival of these species after entrainment occurs. Studies have also been conducted to evaluate the trends of fish populations in the Hudson River. The applicant and NYSDEC have used the results of these studies to evaluate the potential for adverse effects associated with the operation of the Indian Point cooling systems. The results of these assessments are described below. As described in Section 4.1.1.2 of the SEIS, nongovernmental groups and members of the public have also evaluated publicly available information and data associated with the Hudson River and have expressed the opinion that many species of fish in the river are in decline and that entrainment of eggs, larval, and juvenile fish at Indian Point is contributing to the decline, destabilization, and ultimate loss of these important aquatic resources.

<u>Applicant Assessment</u>

In the environmental report for IP2 and IP3 (Entergy 2007), the applicant presents estimates of CMR for American shad, Atlantic tomcod, bay anchovy, river herring, striped bass, and white perch and discusses the results of the assessment conducted by Barnthouse et al. (2002). The conclusions of the ER are as follows:

> More than 30 years of extensive fisheries studies of the Hudson River in the vicinity of IP2 and IP3 support current operations. The results of the studies performed from 1974 to 1997, the period of time covered in the DEIS, are referenced and summarized in the DEIS, and have not shown any negative trend in overall aquatic river species populations attributable to plant operations. Ongoing studies continue to support these conclusions [ASA]. In addition, current mitigation measures implemented through the HRSA and retained in the four Consent Orders, the current agreements with NYSDEC, and the outcome of the draft SPDES Permit proceeding, will ensure that entrainment impacts remain SMALL during the license renewal term. Therefore, withdrawal of water from the Hudson River for the purposes of once-through cooling at the site does not have any demonstrable negative effect on representative Hudson River fish populations, nor does it warrant further mitigation measures.

Additional impact assessment information was also provided to the NRC staff in Barnthouse et al. (2008) that used environmental risk-assessment techniques to evaluate the potential for adverse impacts to Hudson River RIS from a variety of natural and anthropogenic stressors, including the operation of the IP2 and IP3 cooling water intake system (CWIS), fish pressure, the presence of zebra mussels, predation by striped bass, and water temperature. Summary results available in Barnthouse et al. (2008) are presented in Table H-6. Using this information, the authors concluded the following:

> Considered together, the evidence evaluated in this report shows that the operation of IP2 and IP3 has not caused effects on early life stages of fish that reasonably would be considered “adverse” by fisheries scientists and/or managers. The operation of IP2 and IP3 has not destabilized or noticeably altered any important attribute of the resource.

Table H-6 Summary of Impact Assessment for IP2 and IP3

Species	Suspected Cause of Apparent Hudson River Decline
American Shad	CWIS and zebra mussel hypothesis rejected. Most likely cause: fishing, with striped bass predation a potential contributing factor (Barnthouse et al. 2008, Table 5).
Atlantic Tomcod	CWIS hypothesis rejected. Temperature is a significant influence, but cannot explain post-1990 decline. Most likely cause of decline: striped bass predation (Barnthouse et al. 2008, Table 6).
Bay Anchovy	CWIS hypothesis rejected. Striped bass predation most likely cause of change (Barnthouse et al. 2008, Table 8).
River Herring	CWIS and zebra mussel hypothesis rejected. Most likely cause: striped bass predation (Barnthouse et al. 2008, Table 7).
Striped Bass	CWIS and zebra mussel hypothesis rejected. Most likely cause: fishing (Barnthouse et al. 2008, Table 3).
White Perch	CWIS hypothesis rejected. Zebra mussel and striped bass predation may have contributed to declines occurring in later years, but other unknown causes were responsible for declines occurring between 1975 and 1985 (Barnthouse et al. 2008, Table 4).

Source: Entergy 2008, adapted from Barnthouse et al. 2008.

<u>NYSDEC Assessment</u>

In 2003, NYSDEC developed a Final Environmental Impact Statement (FEIS) for the draft SPDES permit (NYSDEC 2003a) in response to the DEIS submitted by the operators of IP2 and

IP3, Roseton, and Bowline Point (CHGEC 1999). In the FEIS, NYSDEC noted that "while the DEIS was acceptable as an initial evaluation and assessment, it was not sufficient to stand as the final document, and additional information as to alternatives and evaluation of impacts must be considered." The Public Comment Summary portion of the NYSDEC FEIS presents a summary of comments received on the 1999 DEIS (CHGEC 1999); a subsequent section, Responses to Comments, provides the NYSDEC reply. In response to comments associated with the "cropping of fish populations by power plants," NYSDEC provided a detailed response. The following excerpt from pages 53 and 54 of the document presented by NYSDEC at the time of the FEIS publication:

> Rather than "selective cropping," the impacts associated with power plants are more comparable to habitat degradation; the entire natural community is impacted. These "once-through cooling" power plants do not selectively harvest individual species. Rather, impingement and entrainment and warming of the water impact the entire community of organisms that inhabit the water column. For example, these impacts diminish a portion of the forage base for each species that consumes plankton (drifting organisms in the water column) or nekton (mobile organisms swimming through the water column) so there is less food available for the survivors. In an intact ecosystem, these organisms serve as compact packets of nutrients and energy, with each trophic (food chain) level serving to capture a diffuse resource and make it more concentrated. Ichthyoplankton (fish eggs, larvae and very small fish which drift in the water column) and small fish feed on a base of zooplankton (drifting animal life) and phytoplankton (drifting plant life). The loss of these small organisms in the natural community may be a factor that leads to harmful algal blooms. The small fish themselves serve as forage for the young of larger species, which serve as forage for larger individuals, and so on up the food chain, more correctly understood as a "trophic pyramid." Once-through cooling mortality "short-circuits" the trophic pyramid and compromises the health of the natural community. For example, while an individual bay anchovy might ordinarily serve as food for a juvenile striped bass or even for a common tern, entrainment and passage through a power plant's cooling system would render it useful only as food to lower trophic level organisms. It could no longer provide its other ecosystem functions of consuming phytoplankton, digesting and concentrating it into its tissues, and ranging over a wide area, distributing other nutrients as manure. This is just a single example from a very complex natural system, where the same basic impact is multiplied millions of times over more than one hundred fish species.

NYSDEC also expressed concern about entrainment in the 2003 "Fact Sheet" pertaining to SPDES license renewal at IP2 and IP3 (NYSDEC 2003b, Attachment B, 1. Biological Effects):

> 1. Biological Effects
>
> Each year Indian Point Units 2 and 3 (collectively "Indian Point") cause the mortality of more than a billion fish from entrainment of various life stages of fishes through the plant and impingement of fishes on intake screens. Entrainment occurs when small fish larvae and eggs (with other aquatic organisms) are carried into and through the plant with cooling water, causing

> mortality from physical contact with structures and thermal stresses. Impingement occurs when larger fish are caught against racks and screens at the cooling water intakes, where these organisms may be trapped by the force of the water, suffocate, or otherwise be injured. Losses at Indian Point are distributed primarily among seven species of fish, including bay anchovy, striped bass, white perch, blueback herring, Atlantic tomcod, alewife, and American shad. Of these, Atlantic tomcod, American shad, and white perch numbers are known to be declining in the Hudson River (ASA Analysis and Communications 2002). Thus, current losses of various life stages of fishes are substantial.

Finally, in the petition to intervene submitted to the NRC on November 30, 2007, regarding the relicensing of IP2 and IP3 (NYSDEC 2007), the NYSDEC commented on impingement and entrainment impacts:

> Impingement and Entrainment Contention
>
> The operation of Indian Point consumes and returns approximately 2.5 billion gallons of Hudson River water each day. The river is an important estuarine ecosystem, and this operation has significant adverse impacts to the fish that call the Hudson home. Large fish are “impinged” on screens at the water intake where they are severely stressed and then suffocated. Smaller fish are “entrained” in the water intake, pulled through the operating plant and killed. This relentless process has continued relatively unabated for almost 40 years, and the applicant now seeks 20 more years. This must not continue because the environmental costs are too high. The NRC must fully consider the alternative of closed cycle cooling to mitigate these significant adverse impacts in this license renewal proceeding.

H.1.2.4. NRC Staff Assessment of Entrainment Impacts

Entergy (2007b) provided data to the NRC staff. Entrainment data included weekly average densities of entrained taxa for a given life stage for IP2 and IP3 for analysis. Entrainment data were collected from May to August in 1981 and 1983 through 1985, from January to August in 1986, and from May to August in 1987. NRC staff estimated the number entrained per week by life stage and taxon as the product of the mean weekly density entrained and the sum of the weekly volume of circulated water (m^3) at IP2 and IP3. The NRC staff used the sum of the weekly numbers entrained of all life stages for a given taxon and season (January–March, April–June, July–September, and October–December) to estimate the seasonal number entrained per taxon.

The NRC staff found that the entrainment monitoring data provided by the applicant comprised 66 identified taxa. There were no blue crab, shortnose or Atlantic sturgeon, or gizzard shad identified in the 1981–1987 entrainment data. Because of the difficulty in identification of early life stages, RIS included those taxa identified only to family or genus (*Alosa* spp., anchovy family, and *Morone* spp.). NRC compared the percent RIS fish entrained and total identified fish entrained to the total number entrained (Figure H-5). Except for two weeks in 1984 and 1985 (one week in May and June) for which amphipods (*Gammarus* sp.) were recorded, the percentage RIS fish entrained was greater than 70 percent of entrained taxa. The number of amphipods collected in two weeks in 1984 was more than 2.5 times greater than the number of identified fish collected over 15 weeks within the same year. Linear regression ($n = 6$; $p < 0.01$) indicated that the number of identified fish entrained decreased at a rate of 187 billion fish per year, a result consistent with the decrease observed in the number of fish impinged.

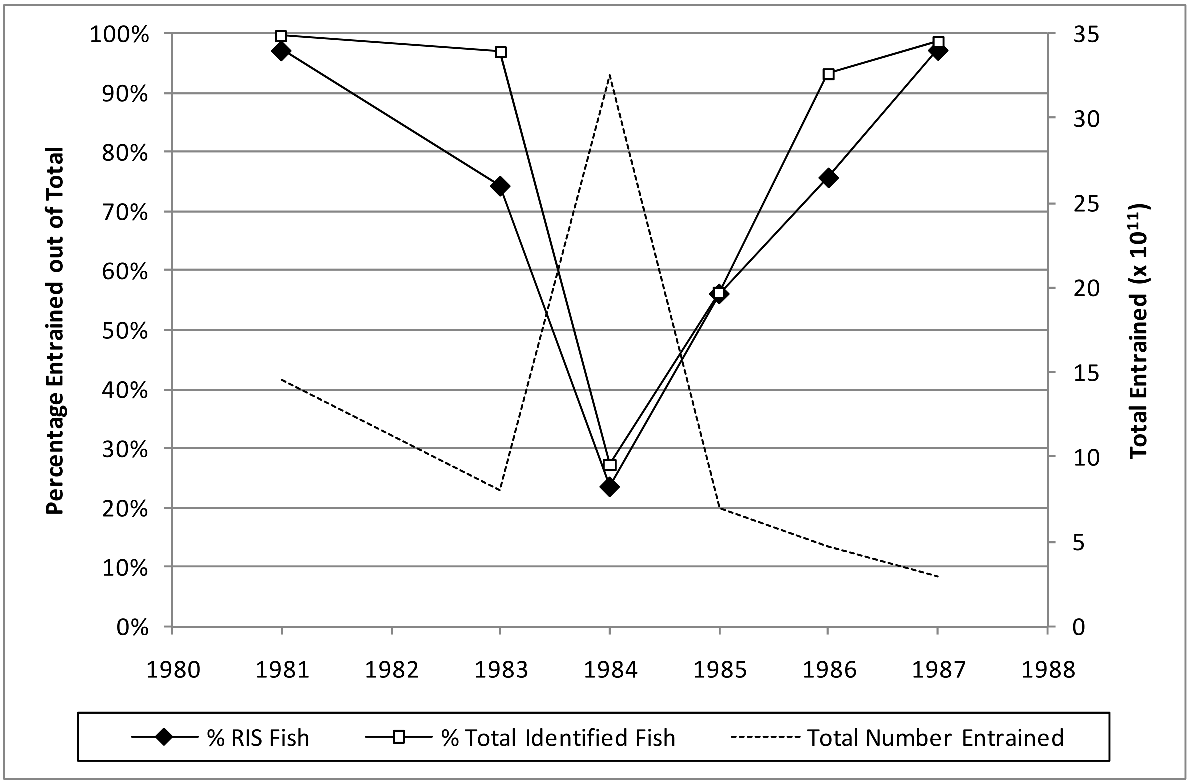


Figure H-5 Percentage of entrainment composed of RIS fish and total identified fish relative to the estimated total entrainment at IP2 and IP3 combined (data from Entergy 2007b)

NRC staff evaluated the seasonal pattern in the percentage entrainment of each RIS relative to the total RIS fish entrained (Table H-7). Entrainment of American shad, *Alosa* spp. (i.e., not identified to species), white perch, and striped bass occurred mainly in the second quarter (April–June). Entrainment of weakfish and hogchoker occurred mainly in the third quarter (July–September). The greatest percentage of rainbow smelt and Atlantic tomcod occurred in the first quarter (January–March) of 1986. The taxa (lowest level identified) representing 10 percent or greater of total RIS entrained for at least one sampling period were *Alosa* spp., anchovy family, Atlantic tomcod, bay anchovy, *Morone* spp., rainbow smelt, striped bass, and white perch (Table H-7). Entrainment losses may affect populations directly by reducing the number of individuals available for recruitment and indirectly through the removal of potential food for predators. The environmental significance of entrainment is explored further in Section H.1.3.

H.1.3. Combined Effects of Impingement and Entrainment

The combined effects of impingement and entrainment were evaluated by the applicant in the DEIS (CHGEC 1999) by estimating CMR, which is intended to represent the fractional reduction in abundance of the vulnerable age groups (primarily those fish hatched during the current year) from a single source.

Table H-7 Percentage Entrainment of RIS by Year and Season (data from Entergy 2007b)

Year/	1981		1983		1984		1985		1986			1987	
Season	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**3**	**2**	**3**
Alewife	-	-	-	<0.05	<0.05	-	-	-	-	0.1	-	<0.05	-
Alosa Species	5.7	<0.05	52.9	<0.05	55.1	<0.05	0.7	-	0.4	<0.05	-	<0.05	-
American Shad	0.1	<0.05	0.2	<0.05	5.5	<0.05	<0.05	-	-	0.1	-	<0.05	<0.05
Anchovy Family	3.5	7.7	<0.05	43.3	1.2	8.5	-	-	-	-	-	-	-
Atlantic Menhaden	-	-	-	-	-	-	0.1	-	-	0.2	-	-	-
Atlantic Tomcod	0.4	-	0.1	<0.05	1.7	0.1	7.9	<0.05	30.6	1.3	-	1.1	<0.05
Bay Anchovy	51.7	91.5	0.1	53.1	16.9	85.3	66.1	98.9	-	8.1	98.5	48.5	99.1
Blueback Herring	-	<0.05	<0.05	0.1	<0.05	<0.05	-	<0.05	-	<0.05	<0.05	-	-
Bluefish	-	-	-	-	-	<0.05	-	<0.05	-	-	-	-	-
Hogchoker	<0.05	0.3	<0.05	0.6	<0.05	0.2	<0.05	0.3	-	<0.05	0.3	<0.05	0.1
Morone Species	-	-	10.9	0.2	1.4	0.1	3.7	<0.05	-	4.2	<0.05	2.9	<0.05
Rainbow Smelt	-	-	<0.05	-	0.3	<0.05	<0.05	<0.05	66.7	2.7	0.2	0.8	0.1
Spottail Shiner	-	-	-	<0.05	-	<0.05	-	-	-	-	-	-	-
Striped Bass	24.8	<0.05	13.4	0.9	10.0	3.1	14.0	<0.05	-	43.8	0.2	38.0	0.3
Weakfish	-	0.3	-	1.1	-	2.2	0.1	0.7	-	-	0.4	<0.05	<0.05
White Catfish	-	-	-	-	-	<0.05	-	-	0.1	<0.05	-	-	-
White Perch	13.8	0.1	22.4	0.6	7.8	0.5	7.3	0.1	2.1	39.5	0.4	8.6	0.3

(a) Season 1 is January–March;
Season 2 is April–June;
Season 3 is July–September.
(b) – indicates no identified observation.
Units = percent.

Here the NRC staff analysis relied primarily on the extensive fishery data sets collected under the direction and oversight of the NYSDEC.

The purpose of this analysis is to determine the potential for adverse impacts to the aquatic resources of the Hudson River Estuary associated with the operation of IP2 and IP3 once-through cooling systems during the relicensing period. The National Environmental Policy Act, as amended (NEPA), requires an ecologically relevant analysis of potential impacts that is more holistic than a general fisheries biology approach. Fisheries biology tends to focus on single species issues, such as sustaining a harvest rate, no matter what the effect may be on other species within the system. In contrast, the NRC staff analysis considers potential impacts across trophic levels and life history strategies by assessing the population responses over time for important predator and prey species in the lower Hudson River.

The operation of the IP2 and IP3 cooling systems can directly affect the aquatic communities of the Hudson River through impingement, entrainment, or thermal releases. Loss of YOY, yearling and older fish, blue crabs (*Callinectes sapidus*), and other aquatic species can occur from impingement against intake screens. Eggs, YSL, post-yolk-sac larvae (PYSL), and juvenile fish and invertebrates small enough to pass through the intake screens (9.5-mm or 0.375-in. square mesh) may become entrained within the intake units of the once-through cooling system and experience adverse effects associated with mechanical, chemical, and thermal stressors. Releases of heated noncontact cooling water through subsurface diffuser ports into the Hudson River can result in heat- or cold-shock effects. Cooling system operation can also result in indirect effects to aquatic resources. Impingement may injure, stun, or debilitate an organism, reducing its ability to avoid predation, capture prey, or grow and reproduce in a normal manner. Entrainment of larval or small juvenile forms not resulting in death may reduce viability or survival success. Entrainment can also create an indirect adverse impact to estuarine food webs by removing potential prey items from predators, or altering and redistributing the aquatic organic carbon represented by entrained organisms. In addition, the release of heated water can result in sublethal effects, including changes in reproduction or development, increased susceptibility to other environmental stressors, or behavioral changes associated with avoiding thermal plumes.

Evaluating the potential for adverse impacts of the IP2 and IP3 cooling systems to the aquatic resources of the Hudson River Estuary presents a significant challenge for a variety of reasons. First, the potential stressor of interest (the IP2 and IP3 cooling systems) occupies a fixed position on the Hudson River, while RIS associated with the Hudson River generally have large spatial and temporal distributions that can change for each life stage. Thus, evaluation of causal relationships between potential stressors and receptors is difficult and requires a systems-level understanding that may not be possible with existing environmental information. Second, the Hudson River estuary represents a dynamic, open-ended system containing a complex food web that is hydrologically connected from freshwater locations near the Troy Dam to the Atlantic Ocean. Detectable trends at population levels that suggest adverse effects may be attributable to a variety of anthropogenic and natural stressors, including the activities at IP2 and IP3. Finally, because the Hudson River estuary represents a complex system with hundreds of aquatic species, it is necessary to focus primarily on a subset of RIS. While this simplifies the assessment of impact, it also introduces additional uncertainties that must be acknowledged and addressed.

The GEIS defines impingement, entrainment, and heat shock from cooling system operation as Category 2 issues requiring site-specific review. Levels of impact associated with these issues are defined as potentially SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in Footnote 3 to Table B-1, Appendix B, 10 CFR Part 51, as follows:

- SMALL—Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE—Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attributes of the resource.
- LARGE—Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

To evaluate whether the operation of the IP2 and IP3 cooling systems adversely affects RIS, the NRC staff employed a modified weight-of-evidence (WOE) approach as represented in Figure H-6. The approach used impingement and entrainment monitoring data obtained from the IP2 and IP3 facilities, data from the lower Hudson River collected during the Long River Survey (LRS), Fall Juvenile/Fall Shoals Survey (FJS/FSS), and Beach Seine Survey (BSS), as described in Table 2-3 in the main text of this SEIS, and coastal fishery trend data, when available, as ancillary information. Lines of evidence (LOE) associated with the population trends and strength of connection were developed. The WOE is a technique used to integrate multiple LOE, or types of variables, to make a single decision concerning the magnitude of impact and its association with a potential stressor (IP2 and IP3 cooling systems). The WOE approach employed was based on Menzie et al. (1996) and consisted of the following steps depicted in Figure H-7:

(1) Identify the environmental component or value to be protected.

(2) Develop LOE and quantifiable measurements to assess the potential for adverse environmental effects and evaluate whether the IP2 and IP3 cooling systems are contributing to the effect.

(3) Quantify the use and utility of each measurement for supporting the impact assessment.

(4) Develop quantifiable “decision rules” for interpreting the results of each measurement.

(5) Use the WOE to integrate the results, assign a level of potential impact, and determine if adverse effects in RIS populations, if present, are related to the operation of the IP2 and IP3 cooling systems.

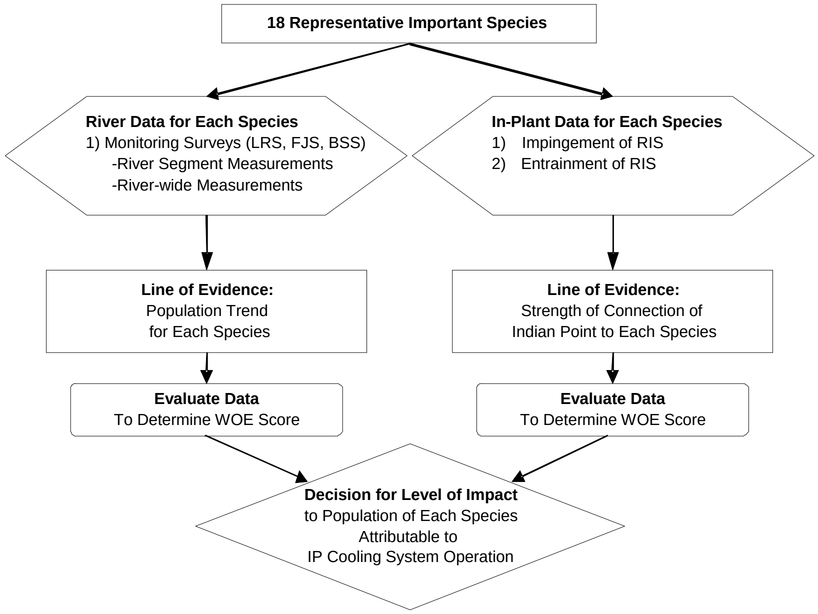


Figure H-6 General weight-of-evidence approach employed to assess the level of impact to population trends attributable to IP cooling system operation

These steps are discussed below in more detail. Supporting information for the statistical analyses used in this determination is presented in Appendix I. A WOE approach was not used to evaluate thermal effects, because recent monitoring or modeling data were not available.

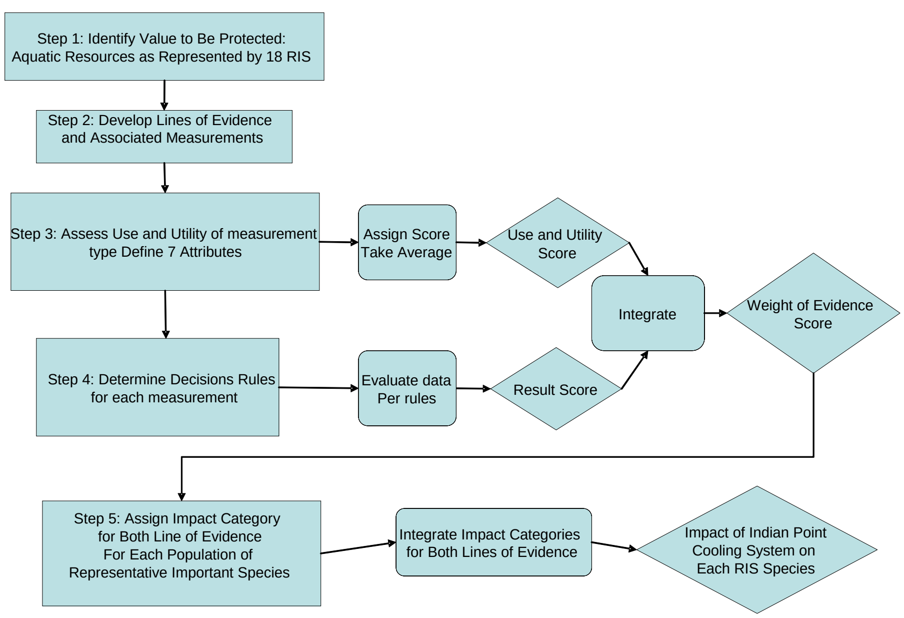


Figure H-7 Steps used to conduct the weight-of-evidence assessment

Step 1: Identify the Environmental Component or Value to be Protected

For this assessment, the environmental component to be protected is the Hudson River aquatic resources as represented by the 18 RIS identified in Table 2-4 in the main text of this SEIS. These species represent a variety of feeding strategies and food web classifications and are considered ecologically, commercially, or recreationally important. The WOE approach focuses primarily on the potential impacts to YOY and yearling fish and their food sources. Although eggs, larvae, and PYSL are important components to the food web, the natural mortality to these life stages is high, as noted by Barnthouse et al. (2008) and Secor and Houde (1995). In contrast, fish surviving to YOY and older are more likely to add to the adult breeding population and are at greater risk from the cooling system operation. Any factor that increases (or decreases) the survival of those fish during juvenile and yearling stages can affect the sustainability of the population.

The conceptual model considers that the dynamics of the system are subject to large changes based on a wide variety of controlling factors. Phytoplankton and zooplankton communities form the basis of the food web and are used by a variety of fish and invertebrates during their development from larvae to adults. Plankton abundances generally increase during the spring and summer, coinciding with the emergence of larval and juvenile forms of fish and invertebrates after spawning. For some species, such as striped bass, PYSL and juvenile forms initially eat small, planktonic prey, then switch to larger prey as they grow. For other species, such as herring and alosids, adults remain planktivores. Predator-prey relationships within the estuary are complex and are influenced by a variety of physical, chemical, spatial, and temporal factors. Within this system, predation may be inter- or intraspecific, and operate at a variety of levels simultaneously. There are also a variety of controlling factors that may exert influence on the estuarine food web and inhabitants of the estuary. Physical and chemical fluctuations can serve as cues for reproduction and promote or inhibit growth, the nature and extent of predation can result in shifts in food web dynamics, and the influence of invasive or exotic species and anthropogenic activities can affect year-classes or result in long-term changes to populations.

After reviewing available information, the NRC staff could not determine if the operation of the IP2 and IP3 cooling systems is adversely affecting the RIS through the phytoplankton and zooplankton populations present near the facilities. It is possible, however, that the entrainment of these food web constituents can alter or influence the food web by removing potential prey items from the water column and reintroducing and redistributing them in the river in an altered state. As a result, the form and distribution of organic carbon can be fundamentally changed, even though the overall mass-balance remains the same. A similar effect may exist for larval forms that experience entrainment and are thus unavailable in their natural state for predation. Impingement losses may also alter the food web by removing potential predator or prey items from the system or by changing the dynamics of the relationships at critical periods. At the higher levels of the food web, large predators such as bluefish, weakfish, and striped bass may be affected by alterations to the food web in ways that are not always obvious. For instance, work by Baird and Ulanowicz (1989) suggested that, even though striped bass and bluefish in the Chesapeake Bay ecosystem were both piscivorous predators, 63 percent of the bluefish intake depended indirectly on benthic organisms, whereas striped bass depended mainly on planktonic organisms.

Within this food web context, the IP2 and IP3 cooling systems can be viewed as hybrid predators. Although the operation of the cooling water systems exerts a predatory effect at multiple levels within the estuarine food web, the fixed position of the plants in the environment, their relatively continuous operation, and their lack of sensitivity to traditional environmental stressors that affect predators place them in a unique position within the estuarine system. The cooling system also functions as an environmental sampling device through impingement and entrainment. To fully explore the potential adverse impacts of cooling system operation to the aquatic resources of the Hudson River estuary, it is necessary to examine both the direct impacts associated with losses caused by impingement, entrainment, and heat, and the indirect impacts of these potential stressors that may work through the food web and contribute to detectable long-term changes to RIS populations.

Step 2: Develop Lines of Evidence and Quantifiable Measurements

The LOE and measurements used by the NRC Staff to assess the impacts of the IP2 and IP3 cooling systems on RIS in the Hudson River estuary are presented in Table H-8. The first LOE (LOE-1) was a population-trend analysis using data from the three surveys conducted for the Hudson River utilities. Population trends over time are often used to assess long-term changes in population abundance or species composition and to provide information on sustainability.

For Measure 1-1, the NRC staff based river-segment trends on the fish caught within River Segment 4 (IP2 and IP3) or, if this sampling area had a consistently low catch, an adjoining segment (River Segments 2 through 6), whichever had a greater catch (Figure 2-10 in the main text). The river-segment data were the weekly catch-per-unit-effort (CPUE) and catch density from the FSS, BSS, and LRS. The annual estimate of the population response was the 75th percentile of the weekly data for a given year, because it was not as sensitive as the mean to the few large observations collected each year. Using a percentile provided a better measure of central tendency given the highly skewed data. The NRC staff chose the 75th percentile rather than the median because on average 52 percent and 65 percent of the weekly FSS and BSS catches were 0 for the chosen RIS.

For Measure 1-2, riverwide population trends were based on the annual CPUE and the annual abundance index derived by the applicant. Population trends also formed the basis of the WOE analysis used by the NRC staff to assess the cumulative impacts of IP2 and IP3 activities, as well as other anthropogenic and natural environmental stressors, including the potential effects of zebra mussels in the freshwater portion of the Hudson River. The draft SEIS used commercial harvest data in addition to Hudson River sampling program data to assess population trends of RIS. The NRC staff removed this measure in this final SEIS based on comments on the SEIS and a reassessment by the NRC staff. Coast-wide fish populations are not the young-of-the-year populations measured by the Hudson River sampling programs and so respond different factors and can change on different time scales. These are differences that can introduce unwanted noise into the analysis.

Table H-8 Lines of Evidence and Measurements Used To Assess Cooling System Impacts

LOE-1: ASSESSMENT OF POPULATION TRENDS OF RIS	
Measurement 1-1	River-segment RIS population trends from FSS and BSS (and LRS for tomcod)

Measurement 1-2	Riverwide RIS population trends from FSS and BSS (and LRS for tomcod)

Table H-8 (continued)

LOE-2: ASSESSMENT OF STRENGTH OF CONNECTION	
Measurement 2-1	Impingement of RIS
Measurement 2-2	Entrainment of RIS

The second LOE (LOE-2) is a semi-quantitative measure of the strength of the connection between the operation of the IP2 and IP3 cooling systems and the aquatic resources in the Hudson River. NRC staff determined the strength of connection from monitoring data at IP2 and IP3 from 1975 to 1990 that provide information on impingement and entrainment rates for RIS. As discussed above, the operation of the cooling system can result in direct mortality of RIS or may debilitate or damage organisms in a manner that causes latent mortality.

Impingement and/or entrainment can also remove and reintroduce RIS prey into the aquatic system in a manner that alters food web dynamics and produces indirect effects that may result in decreased recruitment, changes in predator-prey relationships, changes in population feeding strategies, or movements of populations closer to or farther away from the cooling system intakes or discharges. NRC staff based the analysis of the strength of connection on an estimate of uncertainty derived from a Monte Carlo simulation that examined the differences in population trends with and without losses of YOY fish by entrainment and impingement. Uncertainty analysis is an important component of risk characterization required in the U.S. Environmental Protection Agency ecological risk assessment guidelines (USEPA 1998) before interpreting the ecological significance of a decision.

<u>Step 3: Quantify the Use and Utility of Each Measurement</u>

The following attributes of each measurement within each LOE were adapted from Menzie et al. (1996) and were assigned an ordinal score corresponding to a ranking of its use and utility as low (1), medium (2), or high (3):

(1) <u>Strength of Association Between the Measured Parameter and the Aquatic Community</u>—the extent to which the measurement parameter is representative of, correlated with, or applicable to the assessment of the target fish community;

(2) <u>Stressor-specificity</u>—the extent to which the measurement parameter is associated with the specific stressor (e.g., impingement mortality);

(3) <u>Site-specificity</u>—the extent to which data, media, species, environmental conditions, and other factors relate to the site of interest;

(4) <u>Sensitivity of the Measurement Parameter for Detecting Changes</u>—the ability to detect a response in the measurement parameter;

(5) Spatial Representativeness—the degree of compatibility between the study area, location of measurements or samples, locations of stressors, and locations of biological receptors and their points of exposure;

(6) Temporal Representativeness—the temporal compatibility between the measurement parameter and the period during which effects of concern would occur;

(7) Correlation of Stressor to Response—the degree to which a correlation is observed between levels of response, and the strength of that correlation.

The NRC staff then calculated overall use and utility scores for each measurement within each LOE as the average of the individual attribute scores. For a given LOE, the average score for all attributes was used to characterize the overall use and utility of the measurement as low, medium, or high, using the following definitions:

- Low use and utility—overall score of <1.5 (questionable for decision-making)
- Medium use and utility—overall score of ≥ 1.5 and ≤ 2 (adequate for decision-making)
- High use and utility—overall score of >2 (very useful for decision-making)

The results of these evaluations are presented for each LOE and supporting measurements in Tables 4-2 and 4-3. For LOE-1, RIS population trends, measurements with the highest use and utility are those that provide information on long-term trends in RIS populations at river-segment and riverwide scales (Table H-9). Comprehensive data sets extending over 30 years yield high use and utility for assessing impacts. As measurements of populations become more spatially distributed, the ability to use the measurement to assess impacts associated with IP2 and IP3 decreases.

The NRC staff used the strength of the connection between the IP2 and IP3 cooling systems and the aquatic environment (i.e., the ability of the IP2 and IP3 cooling system operation to affect RIS populations in the Hudson River estuary) as a semi-quantitative line of evidence. Thus, the staff did not apply the use and utility analysis to this LOE.

Table H-9 Use and Utility of Each Measurement Type to Evaluate RIS Population Trends Potentially Associated with IP2 and IP3 Cooling System Operation

Use and Utility Attribute	River-Segment RIS Community Trends	Riverwide RIS Community Trends
Strength of Association between Measurement and Community Response	3	2
Stressor-specificity	2	1
Site-Specificity of Measurement in Relation to the Stressor	2	1
Sensitivity (Variability) of Measurement	2	2
Spatial Representativeness	3	2
Temporal Representativeness	3	3
Correlation of Stressor to Response	2	1
Overall Utility Score	2.4	1.7

Overall Assessment[a]	High	Medium

(a) Overall Assessment: scores <1.5: low utility (questionable use for decision-making); 1.5≤ scores ≤2.0: medium utility (adequate for decision-making); scores >2.0: high utility (very useful for decision-making).

Step 4: Develop Quantifiable Decision Rules for Interpreting the Results of Each Measurement

For all population trend assessments in the first LOE, NRC Staff used a two-step process to assign the level of potential for an adverse impact suggested by a given measurement. The first step was to determine the shape of the best-fit model for the abundance data; the second step was to evaluate determine if a statistically significant decline in population occurred. The shape of the trend data was determined using simple linear regression and segmented regression as a function of time with a single join point (see the statistical approach below and Appendix I for specific details). The segmented regression analysis allowed a delayed response and two time periods to evaluate trends. The model with the smallest error mean square was chosen as the better fit and was used to assess the level of potential adverse impact. In the second step, staff used the significance of the estimated slope(s) to determine whether a detectable population decline was present.

For the population trend LOE, the number of data sets available for each RIS and measurement scale (river segment and riverwide) varied. Based on two possible outcomes, the NRC staff used the following decision rules to evaluate RIS population trend data:

- RIS populations were not declining if population trends had slopes that were not significantly less than zero (i.e., undetected population decline or a detectable population increase). This indicated the RIS populations had not changed appreciably over time, or were increasing. The NRC staff assigned trends satisfying this description a score of 1.
- RIS populations were declining if population trends had slopes that were significantly less than zero (i.e., detectable population decline). NRC staff assigned trends satisfying this description a score of 4.

The staff chose a value of 4 to represent large because it allowed for scaled intermediate scores to occur when combining the results of multiple datasets for a given measurement scale (river segment and riverwide). Staff considered each data set within a measurement scale to be equal and the population trend scores were then averaged (Table H-10). The staff evaluated multiple data sets from the same measurement scale to garner consistency for a determination of either a small or large potential adverse impact. The NRC staff determined that an intermediate potential of an adverse impact was warranted when equal numbers of 1s and 4s occurred for a given measurement scale.

Table H-10 Possible outcomes and the resulting average for single or multiple data sets for a measurement scale in the population trend line of evidence

Number of Data Sets	Possible Outcomes				Measurement Scale Average
1	1				1
	4				4
2	1	1			1
	1	4			2.5
	4	4			4
3	1	1	1		1
	1	1	4		2
	1	4	4		3
	4	4	4		4
4	1	1	1	1	1
	1	1	1	4	1.75
	1	1	4	4	2.5
	1	4	4	4	3.25
	4	4	4	4	4

To evaluate the strength of connection between the operation of the IP2 and IP3 cooling systems and the observed RIS population declines, the NRC staff developed decision rules for assessing the influence of impingement and entrainment directly on. All of the RIS appeared in either the impingement or the entrainment samples. Thus, the NRC staff considers that the connection relative to risk to the population abundance from the operation of the cooling systems has been established. However, staff can only determine the proportion of the population decline caused either directly or indirectly by the operation of IP2 and IP3 qualitatively. This qualification depends on the ability of a simple exponential model to approximate RIS population trends through time and estimate a biologically relevant measure of uncertainty associated with the cause of decline in RIS populations in the Hudson River. The NRC staff conducted simulation runs with different model parameter values to provide a greater sense of the separation between conclusions on the strength of connection and specific model assumptions. The staff discusses the details of the development of the uncertainty analysis of population abundance with and without losses of YOY fish by entrainment, impingement, and food web dependencies in the statistical approach below and in Appendix I.

- The RIS had a Low strength of connection if the interval between the first and third quartiles of the difference in modeled cumulative abundance for a given YOY RIS with and without mortality from entrainment, impingement, and loss of prey included zero for at least one of the simulation runs. That is, the variability in the species population trend was too large to enable the detection of losses from entrainment and impingement. Thus, there is high level of uncertainty associated with the link between the population trend and the direct and indirect effects of the operation of IP2 and IP3 cooling systems.

- The RIS had a High strength of connection if the interval between the first and third quartiles of the difference in modeled cumulative abundance for a given YOY RIS with and without mortality from entrainment, impingement, and loss of prey did not include zero for any of the simulation runs. That is, the effects of entrainment and impingement were greater than the variability in the population trend, and the direct and indirect effects of the operation of IP2 and IP3 cooling systems affected species population trends.

<u>Step 5: Integrate the Results and Assess Impact</u>

The NRC Staff derived WOE scores for only the population trend LOE. The staff used the strength of connection LOE to evaluate uncertainty in the evidence as to whether the IP2 and IP3 cooling systems were affecting the RIS population trends. The above decision rules enabled the NRC to assign levels of impact to individual measurement scales of RIS populations. Staff used a weighted mean equation to assign a level of impact across measurement scales as follows:

$$\text{WOE Score} = \frac{\sum_i (\text{overall utility score}_i)(\text{decision rule result score}_i)}{\sum_i \text{overall utility score}_i} ,$$

where i = 1 to the number of measurements; the overall utility score$_i$ is defined in Table H-9; and the result score$_i$ equals the average of 1's and 4's defined in Table H-11 and on the above decision rules for individual data sets on population trends.

The NRC Staff defined the WOE population trend impact categories as follows:

- Small impact: WOE score < 2.2
- Moderate impact: WOE score ≥ 2.2 but ≤ 2.8
- Large: WOE score > 2.8

The staff defined boundary values between impact categories based on the possible outcomes for a given measurement scale (Table H-10). WOE scores less than 2.2 occurred when population trend data produced more result scores that were 1s than were 4s. WOE scores greater than 2.8 occurred when population trend data produced more result scores that were 4s than were 1s.

The resulting impact categories for the population trend and strength of connection LOE were then integrated by applying the logic developed by EPA for evaluating the ecological effects of environmental stressors (EPA 1998). In accordance with EPA (1998) risk assessment guidelines, a connection between the stressor and the response must be established to assign any level of impact using. For the purpose of this assessment, the stressor is the IP2 and IP3 cooling systems, while the receptor is the aquatic community, as represented by the RIS populations, and the degree of exposure is qualified by the strength of connection.

Statistical Approach for Each Line of Evidence

The decision rules developed above to determine the level of adverse impact to the aquatic resources of the Hudson River estuary associated with the operation of the IP2 and IP3 once-through cooling systems use (1) population trend data to provide a measure of potential impacts to the aquatic resources, and (2) impingement and entrainment data to provide a measure of the strength of connection between IP2 and IP3 operations and the aquatic environment. The statistical approach used to evaluate each measurement is described below. Results were compared to the decision rules to assign a result score that was then integrated using the weighted mean presented above. WOE was then used to integrate the measures of potential impact with the measures of strength of connection to assign a level of impact attributable to the operation of the IP2 and 3 cooling systems.

Statistical Approach to Assessing Long-Term RIS Population Trends: Simple linear regression and segmented regression with a single join point were statistically fit to an annual measure of abundance (y) for each RIS using GraphPad Prism Version 4.0, 2003. The form of the segmented regression model is

$$\mathrm{y} = \begin{cases} a + S_1\mathrm{x} \text{ for } \mathrm{x} < \mathrm{J_p} \\ a + \mathrm{J_p}(S_1 - S_2) + S_2\mathrm{x} \text{ for } \mathrm{x} \geq \mathrm{J_p} \end{cases}$$

where x was the year, *a* was the intercept, S_1 and S_2 were early (associated with years < J_p) and recent slopes of the line, and J_p was the estimated point in time when the slope changed (i.e., the join point). The model with the smallest mean squared error (MSE) was chosen as the better fit to the data. If the best-fit model was the simple linear regression and the slope was statistically significant (negative or positive, $\alpha = 0.05$), a population trend was detected. If the slope was not significantly different from zero, then a population trend was not detected. If the best-fit model was the segmented regression and either slope, S_1 or S_2, was statistically significant ($\alpha = 0.05$), then a population trend was considered detected. If both slopes S_1 and S_2 were not significantly different from zero ($\alpha = 0.05$), then the trend was not considered detected. Note that an NRC impact level of small (value = 1) was defined as the lowest level of potential adverse impact.

To evaluate whether abundance data were indicative of potential aquatic impacts, NRC staff standardized all data by subtracting the mean of the first five years of data and then dividing by the standard deviation based on all years of data. The first five years (1979–1983) were chosen as the standard because the coefficient of variation (CV) of abundance either leveled out at n = 5, or it was preceded by a rapid change in direction (Figure H-8). For density and CPUE data, the staff compared population trends between the BSS and FJS to determine if the shift from the epibenthic sled to the beam trawl in 1985 was influencing the shape of the response. The NRC staff split FJS data into pre- and post-1985 for analysis if a visual and statistical assessment (see Appendix I for details) showed that the FJS data had standardized observations that were consistently less than the standardized BSS data after 1985.

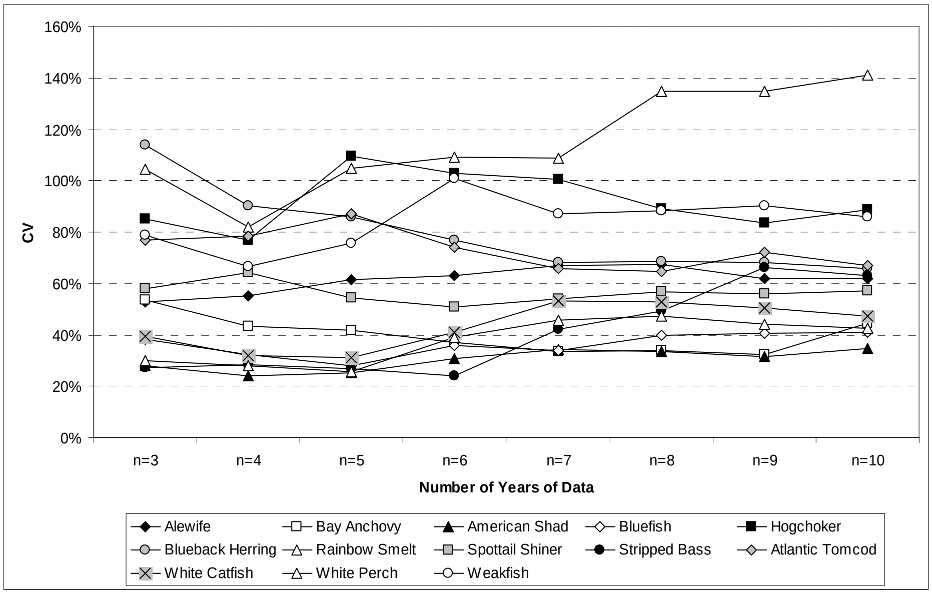


Figure H-8 Coefficient of variation of the abundance index for an increasing number of data points (data from Entergy 2007b).

The NRC staff considered an assessment of adverse impact supported if at least one of the slopes from the best fit model or models (if pre- and post-1985 data were modeled separately) was significantly less than zero. There were six possible outcomes for the assessment (Table H-11).

Table H-11 Comparison of Possible Outcomes When Assessing Population Trends of RIS in the Hudson River Studies

Best-fit Model	Statistical Outcome	Potential for Impact and Result Score
	Significant Slope(s)	
Simple Linear Regression (All data)	No Yes	1 4
Segmented Regression (All data)	Neither Either or Both	1 4
Simple Linear Regression (1979-1984) Segmented Regression (1985-2005)	None At least One	1 4

Statistical Approach to Assessing Strength of Connection: To determine the strength of connection between the operation of the IP2 and IP3 cooling systems and the RIS that exist in the Hudson River near the facility, the NRC staff used the information from two types of environmental samplers: (1) impingement and entrainment data obtained from the operators of IP2 and IP3 (a stationary environmental sampler along the shore of the Hudson) and (2) long-term aquatic resource studies conducted in the river by power plant operators under the supervision of State agencies (e.g. LRS, FJS, BSS). Rose (2000) suggested that the high interannual variation in YOY fish populations greatly reduces the statistical power of correlation-based analyses to isolate the effects of anthropogenic impacts to fish populations. Rose also contended that model-based approaches have been more successful in increasing the detectability of anthropogenic impacts. Newbold and Iovanna (2007) supported this approach by suggesting that models that assess density-independent mortality associated with cooling-water withdrawals can help put raw data on entrainment and impingement losses into a “broader ecological context.” Newbold and Iovanna recognized, however, that the model should reflect the differential losses based on life stage (eggs, larvae, and juveniles).

The NRC staff acknowledges that River Segment 4 at Indian Point is not a closed biological system for which loses and gains to a population can be easily studied. Many of the RIS reproduce 100 river miles upriver, and the eggs and larvae then float downstream where some are entrained at IP2 or IP3. The resulting YOY population densities near Indian Point are inherently noisy (highly variable) and even a detected decline can easily be related to several environmental, ecological, and anthropogenic effects that occur upstream and downstream of River Segment 4. Thus, if the loss of YOY RIS is to be linked to mortality from entrainment and impingement at IP2 and IP3, the effect of the cooling system operation on a given population must be greater than the noise or variability in the abundance of the population over time near the Indian Point plant.

For this analysis, the NRC staff determined the strength of connection from the uncertainty in estimating the difference in the RIS YOY population abundance with and without losses from impingement and entrainment by IP2 and IP3 cooling systems. The staff conducted a series of Monte Carlo simulations (n = 1000 for each series) to estimate the first and third quartiles of the modeled relative cumulative difference in the population abundance achieved over a specified number of years (t = 1 to 27, for example) with and without removal of eggs, larvae, and juveniles by entrainment and impingement. Staff used a simple exponential model to estimate the annual juvenile population abundance (N_t) assuming losses from entrainment and impingement (Figure H-9; see Appendix I for a complete model description);

$$N_t = N_0 e^{rt} + \sigma_t \varepsilon_t$$

where N_0 is the initial population abundance, r is the linear growth rate estimated from the River Segment 4 population trend, σ_t is the standard deviation of abundance at time t, and ε_t is a Normal (0,1) random variate. NRC staff estimated YOY annual abundance without losses from entrainment and impingement by increasing the initial population abundance (N_0) by the number of eggs, larvae, and juveniles entrained and amending the growth rate (r) by multiplying it by one minus the conditional impingement mortality rate (Figure H-10). The conditional impingement mortality rate assumes partial survival associated with the installation of Ristroph screens at IP2 and IP3.

The cumulative annual difference in the YOY abundance from the two models provided an estimate of the proportion of YOY lost from entrainment and impingement. The staff used the Monte Carlo simulation to estimate a distribution of the proportion lost based on the variability in population abundance. The null hypothesis was that the interval between the quartiles of the modeled differences in the YOY cumulative abundance over time in the fish community near IP2 and IP3 with and without the effects of entrainment and impingement would contain zero (i.e., there was a Low strength of connection between population trend and the effects of entrainment and impingement).

NRC staff conducted four simulations (n = 1000) with different input variables for N_0 and t. Each simulation produced a sample with the same variability as that observed in the abundance data for the given RIS. Multiple simulations allowed NRC staff to qualify the strength of connection with less dependency on specific model parameters. There were two possible outcomes, each with an associated conclusion of the strength of connection (Table H-12).

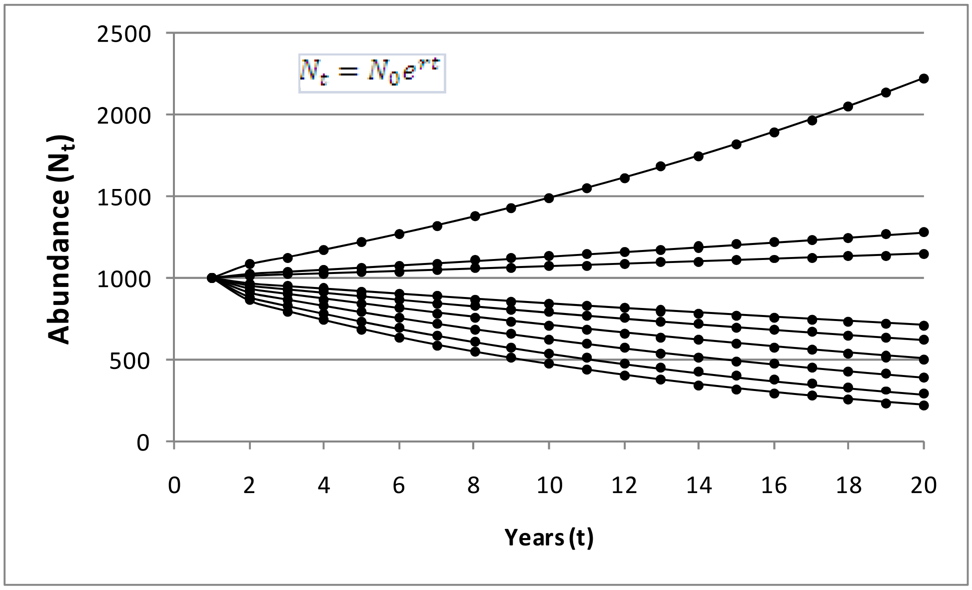


Figure H-9 Range in Expected YOY Population Abundance Over Time Based on an Exponential Model for Each of the RIS Assuming Losses From Entrainment and Impingement. The curves represent growth rates (ranging from -0.08 to 0.04) for modeled RIS as presented in Appendix I, Table I-31.

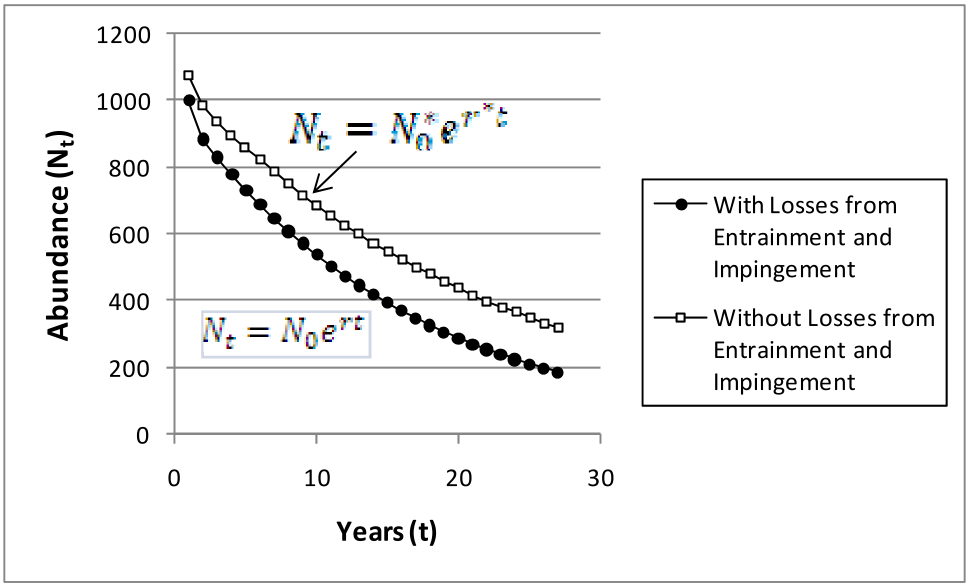


Figure H-10 Expected YOY Population Abundance Over Time Based on an Exponential Model With and Without Losses From Entrainment and Impingement.

Table H-12 Possible Outcomes When Assessing Simulation Results of RIS YOY Abundance With and Without the Effects of IP2 and IP3 Cooling System

Outcome	Strength of Connection Conclusion
At least one out of four simulation results contain zero within the interval between the first and third quartiles of the sample distribution.	Low strength of connection suggesting the RIS population trend is not associated with the effects of the cooling system.
None of the simulation results contains zero within the interval between the first and third quartiles of the sample distribution.	High strength of connection suggesting the RIS population trend is highly likely to be associated with the effects of the cooling system.

H.1.3.1. Assessment of Population Trends

Studies Used To Evaluate Population Trends

The Hudson River utilities conducted the LRS from 1974 to 2005 and targeted fish eggs, YSL, and PYSL from the George Washington Bridge (river mile (RM) 12) to the Federal Dam at Troy (RM 152), a total of 140 miles (CHGEC 1999). Sampling was conducted during the spring, summer, and early fall, using a stratified random design based on 13 regions and three strata within each region (channel, shoal, and bottom). A 1-m^2 Tucker trawl was used to sample the channel strata; an epibenthic sled-mounted 1-m^2 net similar in design to the Tucker trawl was used to sample the bottom strata, and both gear types were used to sample the shoal strata.

Because this survey targeted younger life stages, staff did not use the LRS in this analysis except for YOY Atlantic tomcod data.

The utilities' FJS, also known as the FSS, was conducted from 1974 to 2005 and targeted juveniles, yearlings, and older fish (CHGEC 1999). Samples were collected on alternate weeks from the BSS between Manhattan (RM 0) and the Troy Dam (RM 152) using a stratified random design. Data were used to estimate the abundance of YOY and older fish in offshore habitats. Approximately 200 samples were collected each week from July to December. Between 1974 and 1984, a 1- m^2 Tucker trawl with a 3-mm mesh was used to sample the channel and a 1-m^2 epibenthic sled with a 3-mm mesh was used to sample the bottom and shoal strata. From 1985 to 2005, a 3-m beam trawl with a 38-mm mesh on all but the cod-end replaced the epibenthic sled. Bay anchovy, American shad, and weakfish were sampled with less efficiency using the beam trawl (NYPA 1986). Further, the number and volume of samples in the bottom and shoal strata were generally greater than 2.5 times those in the channel. Thus, all data were evaluated to determine if a shift in the gear type was affecting the observed trend. When the standardized FJS data were consistently less than the standardized BSS data after 1985, staff analyzed the pre- and post-1985 data separately.

The utilities' BSS was conducted from 1974 to 2005 and targeted YOY and older fish in the shore-zone (extending from the shore to a depth of 10 ft) (CHGEC 1999). Samples were collected from April to December but generally every other week from mid-June through early October between the George Washington Bridge (RM 12) and the Troy Dam (RM 152). A 100-ft bag beach seine was used to collect 100 samples during each sampling period from beaches selected according to a stratified random design. A completed tow covers an area of approximately 450 m^2.

For ancillary information, the NRC Staff obtained coastal population trends for striped bass, American shad, Atlantic sturgeon, river herring, bluefish, Atlantic menhaden, and weakfish from commercial and recreational harvest statistics gathered by the Atlantic States Marine Fisheries Commission (ASMFC). Currently, the ASMFC Interstate Fisheries Management Program coordinates the conservation and management of 22 Atlantic coastal fish species or species groups. For species that have significant fisheries in both State and Federal waters, the ASMFC works cooperatively with the relevant East Coast Regional Fishery Management Councils to develop fishery management plans. The ASMFC also works with the National Marine Fisheries Service to develop compatible regulations for Federal waters. For each of the managed species, the ASMFC conducts periodic stock assessments. Information on each of the managed species can be found at http://www.asmfc.org/.

Data from all three field surveys from the Hudson River Estuary Monitoring Program (LRS, FJS, and BSS) were provided for this analysis. The three data sets included the annual abundance index per taxon and life stage from 1974 through 2005, the annual total catch and volume sampled per taxon from 1974 through 2005, and the weekly total volume sampled, catch density, and total catch for each river segment and life stage for the 17 RIS fish from 1979 through 2005. The weekly volume, total catch, and catch density were the combined results of each gear type. Analysis of the river-segment and riverwide trends provided a measure of potential injury. The NRC staff used the ASMFC assessment of coastal harvest data as ancillary information to evaluate Hudson River population trends.

Metrics Used by NRC Staff to Evaluate Population Trends

Abundance Index

The abundance index for YOY for each species was based on the catch from a selected sampling program and used by the applicant and its contractors to estimate riverwide mean RIS abundances. The selection process considered the expected location of each species in the river, based on life-history characteristics and the observed catch rates from previous sampling. The abundance index was constructed to account for the stratified random sampling design used by each of the surveys. For the LRS and the FSS, sampling within a river segment was further stratified by river depth and sampled with a separate gear type. For blueback herring, alewife, bay anchovy, hogchoker, weakfish, and rainbow smelt, the YOY abundance index was based on the catch from a single gear type.

The LRS (L_A) and the FJS abundance index (F_A) were similarly constructed and provided unbiased estimates of the total and mean riverwide population abundance for selected species, respectively (Cochran 1997). For Atlantic tomcod, weeks 19 through 22 of the LRS samples were used to calculate the abundance index. The L_A is strictly a sum of the weighted average species densities over sampling weeks (w) instead of an average over weeks as for the F_A.

For the FJS and each gear type, F_A is constructed as a weighted mean of the average species density ($\bar{d}_{rsw}$) for a given river segment (r = 0 to 12), sampling stratum (s = 1 to 3), and week (w = 33 to 40), i.e., $F_A = \frac{1}{n}\sum_w \left(\frac{\sum_r \sum_s v_{rs}\bar{d}_{rsw}}{\sum_r \sum_s v_{rs}} \right) I(0,1)$ for n equal to the number of weeks sampled, v_{rs} equal to the volume of the given river segment and strata sampled, and the indicator function I(0,1) equaling 1 if a given week was sampled and 0 otherwise (CHGEC 1999). For the FJS, strata sampled were the channel, bottom, and shoal for a given river segment. Poughkeepsie and West Point river segments had the greatest channel volume, Poughkeepsie and Tappan Zee had the greatest bottom volume, and Tappan Zee had the greatest shoal volume. Because the river segment associated with IP2 and IP3 did not have large bottom or shoal volumes, the abundance index would not be sensitive to changes in population trends within the vicinity of IP2 and IP3.

The construction of the BSS abundance index (B_A) provided an unbiased estimate of the mean riverwide population abundance for striped bass, white perch, American shad, bluefish, spottail shiner, and white catfish. A single gear type was used for all years; thus, B_A was constructed as a weighted average density or catch per haul ($\bar{c}_{rw}$) for a given river segment (r = 0 to 12) and week (w = 33 to 40), i.e., $B_A = \frac{1}{n}\sum_w \left(\frac{\sum_r W_r \bar{c}_{rw}}{\sum_r W_r} \right) I(0,1)$ for n equal to the number of weeks sampled, W_r equaled the number of beach segments in the sampling design for a given river segment, and the indicator function I(0,1) equaled 1 if a given week was sampled and 0 otherwise (CHGEC 1999).

Catch-Per-Unit-Effort

NRC Staff used the CPUE to evaluate riverwide and river-segment population trends and was defined for a given species as the sum of the fish caught within a given year divided by the total volume sampled. The CPUE for a given region is a biased (by the ratio of v_s/V) estimate of the population abundance, i.e.,

$$E(CPUE) = E\left(\frac{\sum_s y_s}{\sum_s v_s} \right) = \sum_s \frac{v_s}{V} \mu_s$$

where y_s is the number of fish caught in a given stratum (s = 1 to 3),

μ_s is the mean density of fish in a given stratum,

v_s is the volume sampled in the given stratum, and

V is the total volume sampled).

For the LRS and FJS, a greater fraction of the volume sampled was from the bottom and shoal strata; therefore, the CPUE from each river segment is not sensitive to changes in abundance associated with fish sampled in the channel. For the BSS, there was only one gear type (beach seine); thus, the CPUE from each river segment was equivalent to the density ($\bar{d}_{rsw}$) from the BSS. The river-segment CPUE from the BSS was not used in the analysis.

The staff assumed that the river-segment densities for each of the surveys provided by the applicant were the same average species densities, $\bar{d}_{rsw}$ and $\bar{c}_{rw}$, used to derive the abundance indices. Because multiple gear types were used in the LRS and FJS, the NRC staff assumed that the densities for each gear type probably represented a weighted average.

<u>Analysis of Population Impacts</u>

To assess potential impacts to RIS populations near the IP2 and IP3 facility and within the lower Hudson River, the NRC staff evaluated environmental data from FSS, BSS, and LRS studies, and coastal trends, when available. Detailed information is presented in Appendix I.

River Segment 4

To assess potential impacts to RIS populations near the IP2 and IP3 facilities, the NRC staff evaluated environmental data from FSS, BSS, and LRS studies for River Segment 4, which is located at river kilometers (RKM) 63–76 (RM 39–46) (Figure 2-10 in the main text). The two measurement metrics evaluated using the environmental data were density (estimated number of RIS per given volume of water provided by the applicant) and CPUE (number of RIS captured by the sampler for a given volume of water, derived by the NRC staff). Using these two metrics, the staff detected population declines (assessment values ≥ 2.2) for alewife, American shad, Atlantic tomcod, blueback herring, bluefish, hogchoker, rainbow smelt, spottail shiner, weakfish, and white perch (Table H-13). The NRC staff was unable to detect population declines (assessment values < 2.2) for bay anchovy, striped bass, and white catfish. In addition, the staff could not determine if there was a decline for populations of Atlantic menhaden, Atlantic and shortnose sturgeon, gizzard shad, and blue crab because the river studies did not routinely catch these species. As described above, the NRC staff defined a detected decline for this river segment and a given RIS as a statistically significant negative slope in population abundance. The decision rules for this analysis are found in Section H.1.3; the complete analysis is presented in Appendix I.

Table H-13 Assessment of Population Trends for River Segment 4

Species	Density			Catch-per-Unit Effort		River Segment Assessment
	FSS	BSS	LRS	FSS	LRS	
Alewife	4	4	N/A[a]	4	N/A	4.0
American Shad	4	4	N/A	4	N/A	4.0
Atlantic Menhaden	N/A	N/A	N/A	N/A	N/A	Unknown
Atlantic Sturgeon	N/A	N/A	N/A	N/A	N/A	Unknown
Atlantic Tomcod	4	N/A	4	1	4	3.3
Bay Anchovy	4	1	N/A	1	N/A	2.0
Blueback Herring	4	4	N/A	1	N/A	3.0
Bluefish	1	4	N/A	4	N/A	3.0
Gizzard Shad	N/A	N/A	N/A	N/A	N/A	Unknown
Hogchoker	4	4	N/A	4	N/A	4.0
Rainbow Smelt	1	N/A	N/A	4	N/A	2.5
Shortnose Sturgeon	N/A	N/A	N/A	N/A	N/A	Unknown
Spottail Shiner	N/A	4	N/A	N/A	N/A	4.0
Striped Bass	1	1	N/A	1	N/A	1.0
Weakfish	4	N/A	N/A	1	N/A	2.5
White Catfish	1	N/A	N/A	N/A	N/A	1.0
White Perch	1	4	N/A	4	N/A	3.0
Blue Crab	N/A	N/A	N/A	N/A	N/A	Unknown

(a) N/A: not applicable; YOY not present in samples.
Note: tabled values for density and catch-per-unit effort data are either a 1 (undetected decline) or a 4 (detected decline). The river segment assessment is an average of the scores for the given row.

Lower Hudson River

The NRC staff evaluated abundance index data provided by the applicant and CPUE data obtained from the FJS, BSS, and LRS studies to assess RIS population trends for the lower Hudson River (RKM 0–245, RM 0–152) (Figure 2-10 in the main text). Analysis of riverwide data showed detectable population declines (assessment values ≥ 2.2) for American shad, Atlantic tomcod, blueback herring, bluefish, hogchoker, rainbow smelt, weakfish, white catfish, and white perch. The analysis failed to detect a decline (assessment values < 2.2) for alewife, bay anchovy, spottail shiner, and striped bass (Table H-14). Staff could not assess population trends for Atlantic menhaden, Atlantic and shortnose sturgeon, gizzard shad, and blue crab, because too few were caught during the monitoring studies.

Table H-14 Assessment of Population Trends for the Lower Hudson River

Species	Abundance Index	CPUE			Riverwide Assessment
		FJS	BSS	LRS	
Alewife	1	1	1	N/A[a]	1.0
American Shad	4	4	1	N/A	3.0
Atlantic Menhaden	N/A	N/A	N/A	N/A	Unknown
Atlantic Sturgeon	N/A	N/A	N/A	N/A	Unknown
Atlantic Tomcod	4	4	4	1	3.3
Bay Anchovy	4	1	1	N/A	2.0
Blueback Herring	4	4	4	N/A	4.0
Bluefish	1	4	4	N/A	3.0
Gizzard Shad	N/A	N/A	N/A	N/A	Unknown
Hogchoker	1	4	4	N/A	3.0
Rainbow Smelt	1	N/A	4	N/A	2.5
Shortnose Sturgeon	N/A	N/A	N/A	N/A	Unknown
Spottail Shiner	1	4	1	N/A	2.0
Striped Bass	1	1	1	N/A	1.0
Weakfish	4	N/A	1	N/A	2.5
White Catfish	4	N/A	4	N/A	4.0
White Perch	4	4	4	N/A	4.0
Blue Crab	N/A	N/A	N/A	N/A	Unknown

(a) N/A: not applicable; YOY not present in samples.
Note: tabled values for the abundance index and CPUE data are either a 1 (undetected decline) or a 4 (detected decline). The riverwide assessment is an average of the scores for the given row.

WOE Summary of Population Trends

The NRC staff used a WOE analysis to integrate all of the available RIS population data for IP2 and IP3 and the lower Hudson River. An overview of this analysis is presented at the beginning of Section H.1.3; detailed information is presented in Appendix I. The results for this analysis and impact conclusions are presented in Table H-15. The staff's analysis detected population declines for eight YOY RIS: American shad, Atlantic tomcod, blueback herring, bluefish, hogchoker, spottail shiner, and white perch. This analysis did not detect population declines for bay anchovy and striped bass. Four species (alewife, rainbow smelt, weakfish, and white catfish) exhibited variable population trend responses, meaning some data showed a detectable population decline for a species, whereas others did not. Staff could not resolve population trends for Atlantic menhaden, Atlantic sturgeon, gizzard shad, shortnose sturgeon, and blue crab because Hudson River monitoring programs did not collect enough of them to support a trend analysis. The decision rules for these analyses are found at the beginning of Section H-3; the complete analysis is presented in Appendix I.

Table H-15 Weight of Evidence Results for the Population Trend Line of Evidence

Measurement	River Segment Assessment Score	Riverwide Assessment Score	WOE Score[b]	Impact Conclusion
Utility Score[a]	2.4	1.7		
Alewife	4.0	1.0	2.8	Variable
American Shad	4.0	3.0	3.6	Detected Decline
Atlantic Menhaden	Unknown	Unknown	Unknown	Unresolved[c]
Atlantic Sturgeon	Unknown	Unknown	Unknown	Unresolved[c]
Atlantic Tomcod	3.3	3.3	3.3	Detected Decline
Bay Anchovy	2.0	2.0	2.0	Undetected Decline
Blueback Herring	3.0	4.0	3.4	Detected Decline
Bluefish	3.0	3.0	3.0	Detected Decline
Gizzard Shad	Unknown	Unknown	Unknown	Unresolved[c]
Hogchoker	4.0	3.0	3.6	Detected Decline
Rainbow Smelt	2.5	2.5	2.5	Variable
Shortnose Sturgeon	Unknown	Unknown	Unknown	Unresolved[c]
Spottail Shiner	4.0	2.0	3.2	Detected Decline
Striped Bass	1.0	1.0	1.0	Undetected Decline
Weakfish	2.5	2.5	2.5	Variable
White Catfish	1.0	4.0	2.2	Variable
White Perch	3.0	4.0	3.4	Detected Decline
Blue Crab	Unknown	Unknown	Unknown	Unresolved[c]

(a) Overall Use and Utility Score: Low = < 1.5, Medium ≥1.5 but ≤ 2.0, High > 2.0.

(b) WOE Score: Undetected Decline <2.2; Variable ≥ 2.2 but ≤ 2.8; Detected Decline >2.8.

(c) Unable to make a WOE conclusion because of a lack of data for trend assessment.

H.1.3.2. Analysis of Strength of Connection

The NRC staff conducted a strength-of-connection analysis to determine whether the operation of the IP2 and IP3 cooling systems had the potential to influence RIS populations near the facility or within the lower Hudson River. A summary of this analysis is in Section H.1.3; detailed information on the analysis is presented in Appendix I. The strength-of-connection analysis assumed that the IP2 and IP3 cooling systems can affect aquatic resources directly through impingement or entrainment and indirectly by impinging and entraining potential food (prey). By examining the distribution of the simulated differences in the cumulative annual abundance of YOY RIS with and without losses from impingement and entrainment, staff could assess the effect of the IP2 and IP3 cooling systems on the river segment population trend (e.g., how strongly are the affects of the cooling system connected to the RIS of interest). The results of this analysis indicated a High strength of connection for nine species (Table H-16). For those species, the IP2 and IP3 cooling systems were removing the species at levels that were proportionally higher than expected from of the observed abundance in the river. This is strong evidence that the operation of the cooling systems can affects these species. For four RIS, the strength of connection was Low (minimal evidence of connection). NRC staff could not model the strength of connection for Atlantic menhaden, Atlantic and shortnose sturgeon, gizzard shad, and blue crab, but concluded that the connection was Low because of the low rate of entrainment and impingement observed at IP2 and IP3 (Table H-16).

Atlantic menhaden did not occur in entrainment samples (1981, 1983-1987) and occurred in low numbers (approximately 630 annually) in impingement samples. The number impinged represented 0.05 percent of all fish and blue crab impinged (1975-1990). For this reason, the NRC staff concludes that the strength of connection for Atlantic menhaden is Low.

Atlantic and shortnose sturgeon did not occur in entrainment samples (1981, 1983-1987) and occurred in low numbers (approximately 15 and 2 annually) in impingement samples. The number impinged represented less than 0.005 percent of all fish and blue crab impinged (1975-1990). For this reason, the NRC staff concludes that the strength of connection for Atlantic and shortnose sturgeon is Low.

Gizzard shad did not occur in entrainment samples (1981, 1983-1987). Gizzard shad appeared regularly in impingement samples and increased from about 2400 annually from 1975 to 1984 to about 7700 annually from 1985 to 1990. Sampling for blue crab in impingement samples began in 1983. The numbers of impinged blue crab increased from approximately 2000 annually from 1983 to1987 to 56,600 annually from 1988 to 1990. Despite the increase in impingement, gizzard shad and blue crab represented only one percent of all RIS impinged. For this reason, the NRC staff concludes that the strength of connection for gizzard shad and blue crab is Low.

Table H-16 Weight of Evidence for the Strength-of-Connection Line of Evidence for YOY RIS Based on the Monte Carlo Simulation

RIS	Strength of Connection	RIS	Strength of Connection
Alewife	High	Hogchoker	High
American Shad	Low	Rainbow Smelt	High
Atlantic Menhaden	Cannot be Modeled[a]	Shortnose Sturgeon	Cannot be Modeled[a]
Atlantic Sturgeon	Cannot be Modeled[a]	Spottail Shiner	High
Atlantic Tomcod	Low	Striped Bass	High
Bay Anchovy	High	Weakfish	High
Blueback Herring	High	White Catfish	Low
Bluefish	Low	White Perch	High
Gizzard Shad	Cannot be Modeled[a]	Blue Crab	Cannot be Modeled[a]

[a] Estimates for model parameters were unavailable or information was lacking. Strength of connection assumed to be Low based on review of impingement and entrainment data.

H.1.3.3. Impingement and Entrainment Impact Summary

The final integration of population-level and strength-of-connection LOE is presented in Table H-17. This table shows the final conclusions for both LOE—population trends and strength of connection. Assignment of an NRC level of impact (small, moderate, or large) requires information on both a measurable response in the RIS population and clear evidence that the RIS is influenced by the operation of the IP2 and IP3 cooling systems. Thus, when the strength of connection is low, it is not possible to assign an impact level greater than small, because of little evidence that a relationship between the cooling system and RIS exists. Conversely, for an RIS with a high strength of connection to the IP2 and IP3 cooling system operation but evidence of no population decline, the final determination must be small.

As discussed previously, the NRC staff believes that long-term population trends for RIS in the lower Hudson River provide the best evidence of whether adverse effects are present. Synoptic sampling of the river for almost four decades has produced a long-term data set that provides a useful way to evaluate status of individual species commonly found in the river, and the complex food web that sustains them. In addition to synoptic sampling from the mouth of the Hudson to the Troy Dam, the environmental sampler that is the IP2 and IP3 cooling system provides important information on the species composition near the plant. By using reported entrainment and impingement losses for YOY fish as input to population models and using Monte Carlo simulations, staff can evaluate how population trajectories might change with and without the presence of Indian Point, thus providing a way to assess the relationship between the cooling system and the aquatic resources. Taken together, the NRC staff used these two lines of evidence to determine whether the once-through cooling systems associated with IP2 and IP3 had the potential to adversely affect important aquatic resources. To conclude the occurrence of an adverse effect for a particular RIS that was attributable to Indian Point, the staff required that there must be evidence of a detectable, long-term RIS population decline, and evidence that the operation of the Indian Point cooling system influenced the RIS.

Based on the WOE assessment (Table H-17), the NRC staff concludes that the impact levels s are Small for eleven species: American shad, Atlantic menhaden, Atlantic sturgeon, Atlantic tomcod, bay anchovy, bluefish, gizzard shad, shortnose sturgeon, striped bass, white catfish, and blue crab. Further, the staff concludes that the impacts are Moderate for three species: alewife, rainbow smelt, and weakfish. Finally, the staff concludes that the impacts are Large for four species: blueback herring, hogchoker, spottail shiner, and white perch. A brief discussion of the WOE results for species with Large or moderate impact levels is presented below. Environmental data sets used by the NRC staff to support population trend analysis include river-wide abundance and CPUE data, river segment 4 (Indian Point) density, and CPUE information from the FSS, BSS, and LRC studies for each RIS.

Table H-17 Impingement and Entrainment Impact Summary for Hudson River YOY RIS

Species	Population Trend Line of Evidence	Strength of Connection Line of Evidence	Impacts of IP2 and IP3 Cooling Systems on YOY RIS
Alewife	Variable	High	Moderate
American Shad	Detected Decline	Low	Small
Atlantic Menhaden	Unresolved[(a)]	Low[(b)]	Small
Atlantic Sturgeon	Unresolved[(a)]	Low[(b)]	Small
Atlantic Tomcod	Detected Decline	Low	Small
Bay Anchovy	Undetected Decline	High	Small
Blueback Herring	Detected Decline	High	Large
Bluefish	Detected Decline	Low	Small
Gizzard Shad	Unresolved[(a)]	Low[(b)]	Small
Hogchoker	Detected Decline	High	Large
Rainbow Smelt	Variable	High	Moderate-Large[(c)]
Shortnose Sturgeon	Unresolved[(a)]	Low[(b)]	Small
Spottail Shiner	Detected Decline	High	Large
Striped Bass	Undetected Decline	High	Small
Weakfish	Variable	High	Moderate
White Catfish	Variable	Low	Small
White Perch	Detected Decline	High	Large
Blue Crab	Unresolved[(a)]	Low[(b)]	Small

(a) Population LOE could not be established using WOE; therefore, population LOE could range from small to large.
(b) Strength of connection could not be established using Monte Carlo simulation; therefore, strength of connection was based on the rate of entrainment and impingement.
(c) Section 4.1.3.3 provides supplemental information.

Blueback Herring

The NRC staff concludes that a Large impact is present for YOY blueback herring because a detectable population decline occurred in most of the river-wide (3 of 3) and river segment (2 of 3) data sets used in the analysis, and there was a high strength of connection with the IP2 and IP3 cooling system. Blueback herring, which along with alewife are known as river herring, share life history and distribution characteristics with alewife. An anadromous species, blueback herring migrate upriver to spawn during the spring and live about seven to eight years. This species feeds primarily on insect larvae and copepods and is prey for bluefish, weakfish, and striped bass (Hass-Castro 2006). Hass-Castro (2006) also reports that river herring populations are well below historic levels of the mid 20th century, possibly because of overfishing, habitat destruction, and states that a population assessment has been listed as a high priority by the ASMFC, given the blueback herring listing as a species of concern by the NMFS.

Hogchoker

The NRC staff concludes that a Large impact is present for YOY hogchoker because a detectable population decline occurred in most of the river-wide (2 of 3) and river segment (3 of 3) data sets, and strength of connection with the IP2 and IP3 cooling system was high. This species is a right-eyed flatfish that occurs in the Hudson River estuary and surrounding bays and coastal waters. Adults are generalists, and eat annelids, arthropods, and siphons of clams; adults and juveniles are prey of striped bass. Coastal population trend data were not available for this species.

Spottail Shiner

The NRC staff concludes that a Large impact is present for YOY spottail shiner because a detectable population decline occurred in the river-wide (1 of 3) and river segment (1 of 1) datasets, and there was a high strength of connection with the IP2 and IP3 cooling system. The habitat for the spottail shiner includes small streams, lakes, and large rivers, including the Hudson. This species feeds primarily on aquatic insect larvae, zooplankton, benthic invertebrates, and fish eggs and larvae, and is the prey of striped bass. Spottail shiners spawn from May to June or July (typically later for the northern populations) over sandy bottoms and stream mouths (Smith 1985; Marcy et al. 2005); water chestnut (*Trapa natans*) beds provide important spawning habitat (CHGEC 1999). Individuals older than three years are rare, but there is evidence of individuals living four or five years (Marcy et al. 2005). Coastal population trend data were not available for this species.

White Perch

The NRC staff concludes that a Large impact is present for YOY white perch because a detectable population decline occurred in the majority of the river-wide (3 of 3) and river segment (2 of 3) datasets, and there was a high strength of connection with the IP2 and IP3 cooling system. White perch are an estuarine species that is a year-round resident in the Hudson River, and is commonly entrained by IP2 and IP3. An opportunistic feeder, this species is prey to large piscivorous fish and terrestrial vertebrates. White perch have never been a recreationally or commercially important resource for the Hudson River, and commercial fishing was closed in 1976 because of polychlorinated biphenyl (PCB) contamination. White perch populations appear to be relatively stable in the Maryland portion of Chesapeake Bay, and commercial harvest has generally increased since 1980 in that area (Maryland DNR 2005).

Alewife

The NRC staff concludes that a Moderate impact is present for YOY alewife because a detectable population decline occurred in river segment 4 (3 out of 3 datasets) and there was a high strength of connection with the IP2 and IP3 cooling system. The NRC staff determined that the population trend results were variable because the declines observed in river segment 4 were not confirmed by river-wide population trends. YOY alewife (river herring) are present in the lower and upper reaches of the Hudson River, and feed as juveniles primarily on amphipods, zooplankton, and fish eggs and larvae, and as an adult on small fish. This species is also prey for bluefish, weakfish, and striped bass. ASMFC implemented a combined fisheries management plan for American shad and river herring in 1985. Although the herring fishery is one of the oldest fisheries in the United States, no commercial fishery for river herring currently exists in the Hudson River. River herring population declines have been reported in Connecticut, Rhode Island, and Massachusetts, and NMFS has listed river herring as a species of concern throughout its range Hass-Castro (2006).

Rainbow Smelt

The NRC staff concludes that a Moderate to Large impact level is present for rainbow smelt because detectable population declines occurred in river-wide (1 of 2) and river segment (1 of 2) data sets, and there was a high strength of connection with the IP2 and IP3 cooling system. Although detectable population declines occurred in two of four river data sets, indicating population trend results were variable, the staff concluded that a Moderate-Large impact was present based on the dramatic population declines observed for this species over the past three decades. Rainbow smelt is an anadromous species once commonly found along the Atlantic Coast. Larval and juvenile smelt feed primarily on planktonic crustaceans; adults eat crustaceans, polychaetes, and small fish. Bluefish and striped bass are primary predators of rainbow smelt. Once a prevalent fish in the Hudson River, the rainbow smelt has undergone an abrupt population decline in the Hudson River since 1994, and the species may no longer have a viable population within the Hudson River. The last tributary run of rainbow smelt was recorded in 1988, and the Hudson River Utilities' Long River Ichthyoplankton Survey showed that PYSL essentially disappeared from the river after 1995 (Daniels et al. 2005). The NRC staff's regression analysis of rainbow smelt population trends was affected by the lack of rainbow smelt caught by the Hudson River field surveys after 1995. Detectable population declines were present for CPUE data set but not for density or abundance index data, given the disappearance of this species from the river. Thus, the WOE conclusion of moderate impact may, in fact, be an underestimate of the true impact; the staff concluded that a Moderate-Large impact assessment was appropriate.

Weakfish

The NRC staff concludes that a Moderate impact is present for weakfish because detectable population declines occurred in river-wide (1 of 2) and river segment (1 of 2) data sets, and there was a high strength of connection with the IP2 and IP3 cooling system. Because detectable declines occurred in two of four river data sets, staff determined that the population trend results were variable. The weakfish is historically one of the most abundant fish species along the Atlantic coast and is fished recreationally and commercially. Small weakfish prey primarily on crustacean, whereas larger individuals eat small fish. Bluefish, striped bass, and larger weakfish are primary predators of smaller weakfish. Weakfish are thought to be in decline based on decreased commercial landings in recent years. The weakfish stock declined suddenly in 1999 and approached even lower levels by 2003, which ASMFC determined to be because of higher natural mortality rates rather than fishing mortality (ASMFC 2007). A leading hypothesis suggests reduced prey availability and increased predation by striped bass may contribute significantly to rising natural mortality rates in the weakfish population (ASMFC 2007).

Integrated Assessment

The NRC staff developed a calculation for the overall impact of the IP2 and IP3 cooling system by integrating the numerical results for the WOE assessment (Table H-17). Staff used a scoring criteria (e.g. small potential for adverse impacts = 1, moderate impacts = 2, large impacts = 4) to obtain an average over all RIS that reflects an equally spaced interval on a logarithmic scale for which the magnitude of harm doubles at each step. From Table H-17, NRC staff concludes that there are eleven RIS showing a Small impact (scored as a 1), three RIS showing a Moderate impact (scored as a 2), and four RIS showing a Large impact (scored as a 4). The average of the 18 RIS scores rounded to the nearest whole number is 2.0 which equates to a Moderate impact. Thus, NRC staff concludes that the level of impact from the operation of IP2 and IP3 cooling water systems to the aquatic resources of the lower Hudson River during the relicensing period would be Moderate.

H.2 Cumulative Impacts on Aquatic Resources

In addition to the potential impacts associated with the IP2 and IP3 cooling water intake system described in Section H.1, it is possible that other natural or anthropogenic factors unrelated to the relicensing of Indian Point could influence the aquatic resources of the lower Hudson River. In this section, the NRC staff discusses and evaluates potential stressors that could contribute to the total impacts to the aquatic resources during the license renewal period. Potential stressors include other Hudson River facilities that withdraw water, the presence of zebra mussels in the freshwater portions of the river, fishing pressure associated with commercially and recreationally important species, habitat loss, interactions with other invasive species, and impacts associated with changes to water and sediment quality caused by short-term anthropogenic activities or long-term influences associated with global climate change.

Population trends should, in theory, reflect cumulative effects of all impacts on the population. Impacts attributable to the Indian Point cooling systems have already been analyzed. This section of the appendix concentrates on effects associated with the invasion of zebra mussels, using a WOE approach, as discussed in Section H.3. A qualitative assessment of effects associated with fishing pressure was also explored.

The NRC staff evaluated potential population-level impacts to RIS for the lower Hudson River (RKM 0–245, RM 0–152) (Figure 2-10 in the main text) in Section H.3.1. Riverwide data used in the analysis included the abundance index provided by the applicant and CPUE data obtained from FJS, BSS, and LRS studies. The results of this analysis were presented in Table H-14 and showed a large potential for adverse impacts for 7 of the 18 RIS caused by the CWIS.

An analysis conducted on behalf of Entergy (Barnthouse et al. 2008) used environmental risk-assessment techniques to evaluate the potential for adverse impacts to Hudson River RIS from a variety of natural and anthropogenic stressors, including the operation of the IP2 and IP3 CWIS, fishing pressure, the presence of zebra mussels, predation by striped bass, and water temperature. Barnthouse et al. (2008) concluded that the Indian Point CWIS had no effect on all seven of the RIS included in their study. Instead, the authors concluded that observed population declines in selected RIS were influenced by striped bass predation, mortality imposed by fishing, water temperature, and zebra mussel invasion.

Strayer et al. (2004) concluded that the abundance of juvenile American shad and white perch declined following the zebra mussel invasion. Further, the authors found that juvenile alewife abundance increased following the zebra mussel invasion. The NRC staff's analysis follows.

<u>Zebra Mussels</u>

To evaluate the effects of zebra mussels, the NRC staff applied a WOE approach. It is important to note, however, that the Hudson River monitoring surveys used in these analyses were designed to evaluate the population abundance of selected species. They were not designed to evaluate competing and confounded factors affecting population abundance. Coincident measures of zebra mussel abundance through time, water quality, changes to thermal discharges, changes in fishing pressure, and predator-prey interactions would be a minimal requirement to begin to rank stressor effects on each population. These measures are not available, and so the remaining analyses should be viewed as the development of hypotheses of potential impacts associated with zebra mussels.

The NRC staff analyzed the impact of zebra mussels on RIS populations that were caught in River Segment 12 (Albany). The NRC staff analyzed the 75th percentile of the weekly FJS and BSS density and CPUE data from this river segment and used this information to evaluate the population trend LOE for these species. Data for white perch, blueback herring, alewife, American shad, white catfish, spottail shiner, and striped bass were used in the analysis because all have high densities of YOY within this region. Only weeks 27 to 43 were used in the analysis for the FJS and weeks 22 to 43 for the BSS survey so that most years contained observations from the months July through October and June through October for each survey, respectively. Effects associated with changes in gear type for the FJS (1985) were also considered. Details of the analysis are presented in Appendix I.

Simple linear regression and segmented regression with a single join point were fit to the annual measure of abundance for each RIS, as described in Section H.1.3. If the estimated slope from the linear regression or either slope from the segmented regression, whichever was determined to be the better fitting model, was significantly less than zero, then an adverse population impact was considered detected.

The strength of connection to a potential impact associated with a zebra mussel invasion was determined by the temporality of the observed change in population trends and the year associated with invasion of the zebra mussels in the Hudson River (1991) based on work by Strayer et al. (2004). For any stressor to be considered a potential cause of an impact, the stress must occur before the response (Adams 2003). For the assessment of the observed response, the year associated with a change in population trend was estimated by the join point from the segmented regression or was considered pre-1991, if the linear model was the better fit to the density and CPUE data collected from Region 12 (Albany area). If the join point was before 1991, then the strength of connection was defined as low. If the segmented regression did not converge or was not the better fitting model, the linear regression was used to suggest that there was no change in slope following invasion; thus, the strength of connection was low. If the join point from the segmented regression was after 1991, then the strength of connection was defined as high.

Based on the WOE analysis (see Appendix I for details) and the decision rules presented in Section H.1.3, the NRC staff determined potential moderate-to-large population impacts within River Segment 12 (Albany) were possible for many RIS, including American shad, blueback herring, spottail shiner, white catfish, and white perch (Table H-18). NRC staff concluded a small potential for adverse population impacts was present for alewife and striped bass. The data tables for which the results of the strength of connection between adverse population impacts and the zebra mussel invasion are drawn are presented in Appendix I. None of the RIS evaluated had a statistically significant increase in population abundance in River Segment 12. The strength-of-connection analysis assumes that zebra mussels can affect aquatic resources indirectly by reducing potential food resources (prey) or by altering habitat (e.g. shelter). The results of the strength-of-connection analysis are presented in Table H-19 and show that a Low strength of connection was observed for all fish. For each RIS, two of the data sets out of a possible three suggested a Low strength of connection.

Table H-18 Population Trends after the invasion of Zebra Mussels in 1991 for Density and CPUE of YOY Collected from River Segment 12 (Albany)

Species	FSS Density	BSS Density	FJS CPUE	WOE	Hypothesized Level of Impact to Population Trend
Alewife	1	1	1	1.0	Undetected Decline
American Shad	4	4	1	3.0	Detected Decline
Blueback Herring	4	4	4	4.0	Detected Decline
Spottail Shiner	4	1	4	3.0	Detected Decline
Striped Bass	1	1	1	1.0	Undetected Decline
White Catfish	1	N/A	4	2.5	Variable
White Perch	4	4	4	4.0	Detected Decline

N/A is not applicable; YOY are not present in samples.

Table H-19 Strength of Connection between Population Trends and Zebra Mussel Invasion

Species	FJS Density	BSS Density	FJS CPUE	WOE	Hypothesized Strength of Connection
Alewife	1	1	4	2.0	Low
American Shad	4	1	1	2.0	Low
Blueback Herring	1	4	1	2.0	Low
Spottail Shiner	4	1	1	2.0	Low
Striped Bass	1	1	4	2.0	Low
White Catfish	1	N/A	1	1.0	Low
White Perch	1	4	1	2.0	Low

N/A is not applicable; YOY are not present in samples.

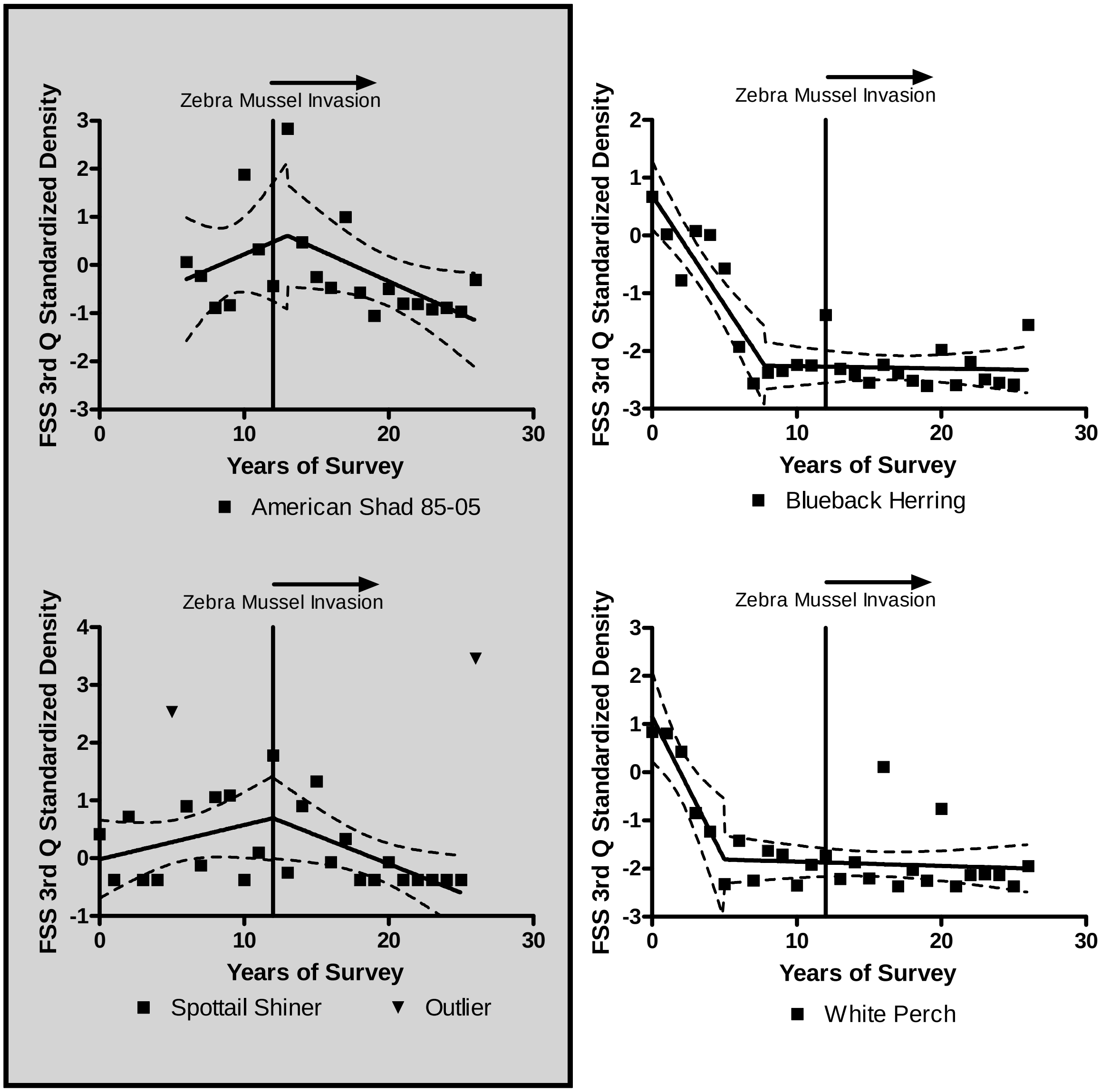
The final integration of population-level and strength-of-connection LOE is presented in Table H-20. This table shows the final NRC staff conclusions for both LOE—population trends and strength of connection. The conclusion of adverse impact requires both a measurable response in the RIS population and clear evidence that the RIS is influenced by the zebra mussel invasion. When the strength of connection is low, it is not possible to arrive at an impact level greater than small, because of little evidence that a relationship between the mussel invasion and population trends exists. Conversely, for an RIS with a High strength of connection to the zebra mussel invasion but evidence of no population decline, the final determination must be small.

Based on the final WOE assessment, the NRC staff concludes that there is a small potential for adverse impacts from the zebra mussel invasion for all seven of the RIS. Alewife and striped bass showed no evidence of population declines, and white catfish displayed a population decline but had a Low strength of connection. The Staff detected a potential large population impact for American shad, blueback herring, spottail shiner, and white perch, however there was an inconsistent assessment of strength of connection among the three data sets (Figures H-11, H-12, and H-13).

Table H-20 Weight of Evidence Associated with Potential Negative Impacts on Population Trends from Zebra Mussel Invasion

Species	Hypothesized Level of Impact to Population Trends	Hypothesized Strength of Connection	Hypothesized Impact to Population Trends from Zebra Mussel
Alewife	Undetected Decline	Low	Small
American Shad	Detected Decline	Low	Small
Blueback Herring	Detected Decline	Low	Small
Spottail Shiner	Detected Decline	Low	Small
Striped Bass	Undetected Decline	Low	Small
White Catfish	Variable	Low	Small
White Perch	Detected Decline	Low	Small

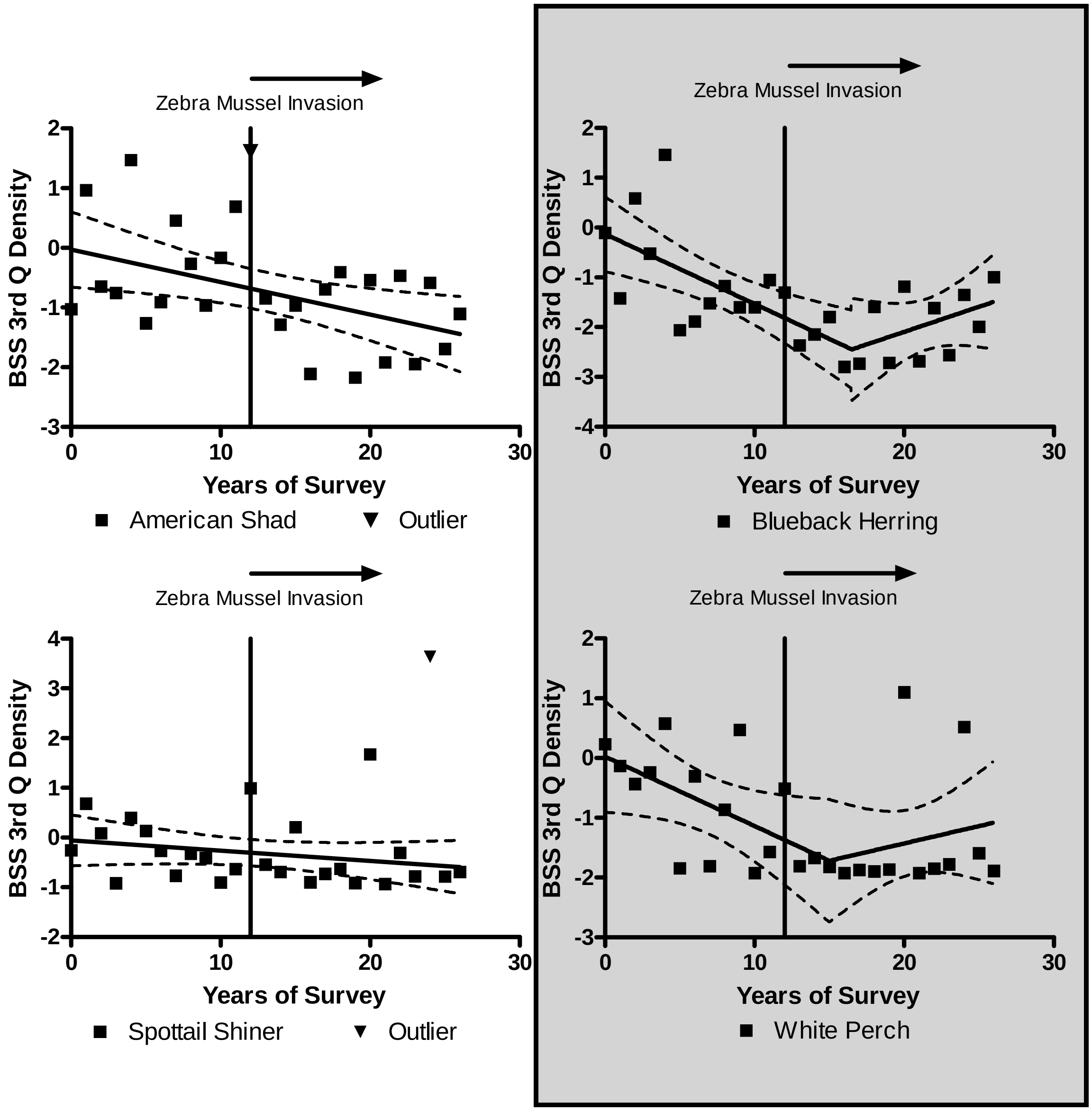
The NRC staff analysis concluded that a large potential adverse population impact was present for American shad in River Segment 12 (Albany) (Table H-20). For the WOE analysis, NRC staff used the post-1985 FSS River Segment 12 density data, since the catch efficiency of the beam trawl for YOY American shad was less than the epibenthic sled. The Staff also used the 1979 to 2005 BSS density data and the FSS CPUE data from River Segment 12. The relative population response and the timing of the effect of the zebra mussel invasion for each data set are presented in Figures H-11, H-12, and H-13. Strayer et al. (2004) used the riverwide abundance index to conclude that the abundance of American shad was affected by zebra mussels. The NRC staff found, however, that only the FSS River Segment 12 density data showed a decline for American shad following the mussel invasion (Figure H-11). The BSS density data suggested a continuous decline from 1979-2005 (Figure H-12), and the FSS CPUE showed a decline before the invasion (Figure H-13). Therefore, the NRC staff and Barnthouse et al. (2008) disagreed with Strayer et al. (2004) that zebra mussels were a potential cause of the American shad decline.



Source: Normandeau 2008

Figure H-9 Standardized population density data for River Segment 12 (RS12) Fall Juvenile Surveys (Normandeau 2008). Shaded plots indicate potential effects from zebra mussel invasion.

The NRC staff analysis concluded that a large potential population impact was present for juvenile blueback herring in River Segment 12 (Albany). However, the NRC staff and Barnthouse et al. (2008) disagreed with Strayer et al. (2004) that zebra mussels were a potential cause in the decline of blueback herring. Only the BSS data suggested a possible blueback herring response to the zebra mussel invasion (Figure H-12).



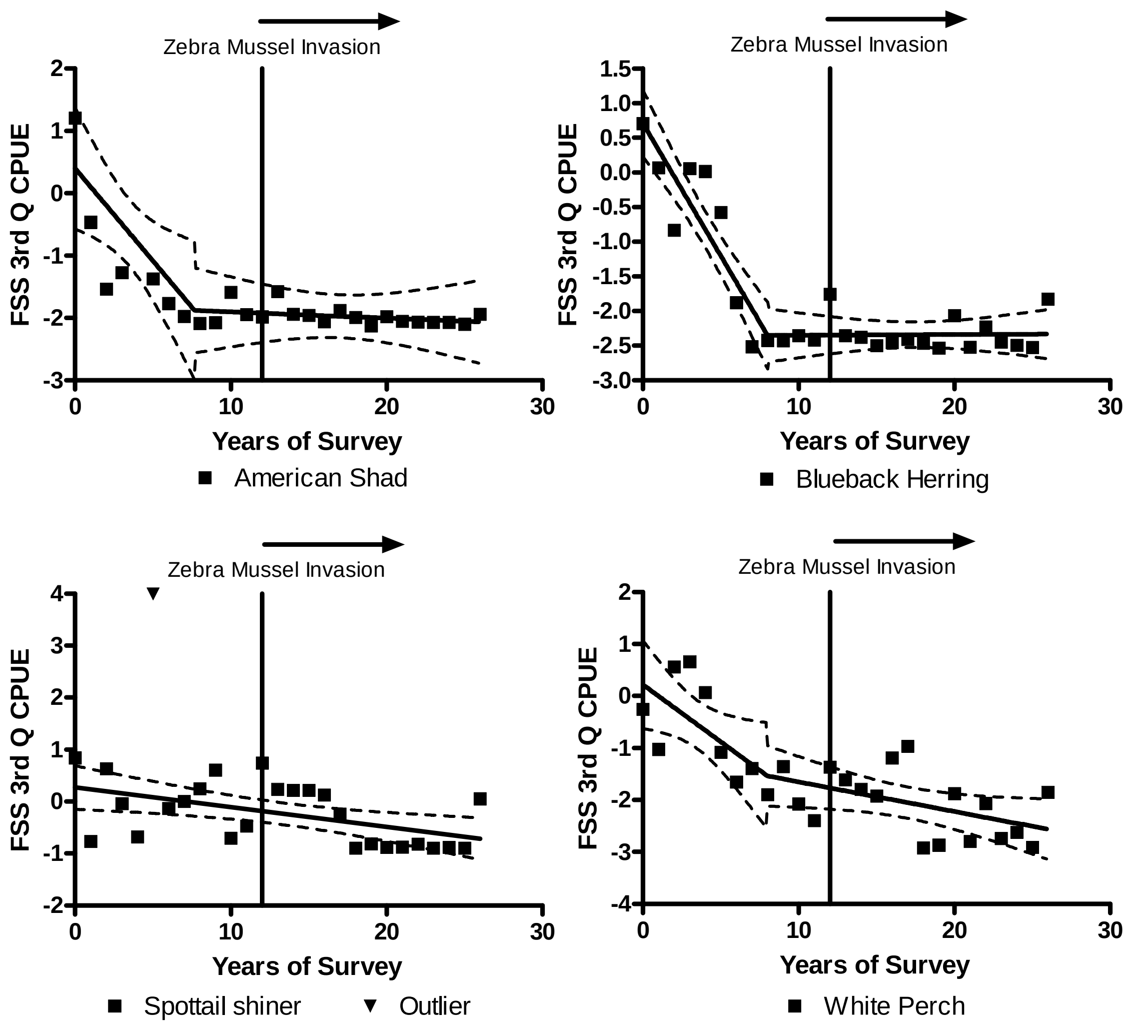
1 Source: Normandeau 2008

2 **Figure H-12 Standardized population density data for River Segment 12 (RS12) Beach**
3 **Seine Surveys.** Shaded plots indicate potential effects from zebra mussel invasion.

4 The NRC staff analysis concluded that a large potential population impact was present for
5 juvenile spottail shiner in River Segment 12 (Albany). Strayer et al. (2004) concluded that
6 there was no change in spottail shiner abundance, and Barnthouse et al. (2008) did not
7 evaluate spottail shiner population trends. The FSS density data was the only data set to

suggest a possible effect of the zebra mussel invasion (Figure H-11). The BSS and FSS CPUE showed a continuous decline from 1974 to 2005 (Figure H-12 and Figure H-13).

The NRC staff analysis concluded that a large potential population impact was present for juvenile white perch in River Segment 12 (Albany). White perch population trends obtained from the FSS were not affected by gear changes (year 6 of the survey). All three data sets indicated an early decline in fish density and CPUE in River Segment 12 (Figures H-11, H-102 and H-13). Thus, the NRC Staff concluded that a combination of stressors acting on the riverwide population is associated with a relatively greater adverse impact than the impact from the zebra mussel invasion.



Source: Normandeau 2008

Figure H-13 Standardized CPUE trend data for River Segment 12 (RS12) Fall Juvenile Surveys.

Water Quality and Climate Change

Sewage Treatment System Upgrades

As discussed in Section 2.2.5, the increasing populations along the river and within the watershed resulted in an increased discharge of sewage into the Hudson River and an overall degradation of water quality. Beginning in 1906 with the creation of the Metropolitan Sewerage Commission of New York, a series of studies were conducted to formulate plans to improve water quality within the region (Brosnan and O'Shea 1996). In the freshwater portion of the lower Hudson River, the most dramatic improvements in wastewater treatment were made between 1974 and 1985, resulting in a decrease in the discharge of suspended solids by 56 percent. Improvements in the brackish portion of the river were even greater. In the New York City area, the construction and upgrading of water treatment plants reduced the discharge of untreated wastewater from 450 million gallons per day (mgd) in 1970 to less than 5 mgd in 1988 (CHGEC 1999). The discharge of raw sewage was further reduced between 1989 and 1993 due to the implementation of additional treatment programs (Brosnan and O'Shea 1996).

During the 1990s, three municipal treatment plants located in the lower Hudson River converted to full secondary treatment—North River (1991), North Bergen MUA-Woodcliff (1991), and North Hudson Sewerage Authority West New York (1992). In addition, the North Hudson Sewerage Authority-Hoboken plant, located on the western bank of the Hudson River opposite Manhattan Island, went to full secondary treatment in 1994 (CHGEC 1999). Upgrades to the Yonkers Joint Treatment Plant in 1988 and the Rockland County Sewer District #1 in 1989 also resulted in improvements in water quality in the brackish portion of the Hudson River. In the mid-1990s, the Rockland County Sewer District #1 and Orangetown Sewer District plants were also upgraded. (CHGEC 1999)

Trends in Dissolved Oxygen

A review of long-term trends in dissolved oxygen (DO) and total coliform bacteria concentrations by Brosnan and O'Shea (1996) has shown that improvements to water treatment facilities have improved water quality. The authors noted that, between the 1970s and 1990s, DO concentrations in the Hudson River generally increased. The increases coincided with the upgrading of the 170 million mgd North River plant to secondary treatment in the spring of 1991. DO, expressed as the average percent saturation, exceeded 80 percent in surface waters and 60 percent in bottom waters during summer in the early 1990s. DO minimums also increased from less than 1.5 milligrams per liter (mg/L) in the early 1970s to more than 3.0 mg/L in the 1990s, and the duration of low DO (hypoxia) events was also reduced (Brosnan and O'Shea 1996). Similar trends showing improvements in DO were noted by Abood et al. (2006) from an examination of two long-term data sets collected by NYCDEP in the lower reaches of the river. Brosnan and O'Shea (1996) also noted a strong decline in total coliform bacteria concentrations that began in the 1970s and continued into the 1990s, coinciding with sewage treatment plant upgrades.

Chemical Contaminants

As discussed in Section 2.2.5, the lower Hudson River currently appears on the EPA 303-d list as an impaired waterway, because of the presence of PCBs and the need for fishing restrictions (EPA 2004). Contamination of the sediment, water, and biota of the Hudson River estuary resulted from the manufacture of capacitors and other electronic equipment in the towns of Fort

Edward and Hudson Falls, New York, from the 1940s to the 1970s. Investigations conducted by the EPA and others over the past 25 years have delineated the extent and magnitude of contamination, and numerous cleanup plans have been devised and implemented. Recently, EPA Region 2 released a “Fact Sheet” describing a remedial dredging program designed to remove over 1.5 million cubic yards of contaminated sediment covering 400 acres, extending from the Fort Edwards Dam to the Federal Dam at Troy (EPA 2008). Concentrations of PCBs in river sediments below the Troy Dam are much lower. Work summarized by Steinberg et al. (2004) suggests the sediment-bound concentrations of PCBs and dioxins have generally declined in the lower Hudson River since the 1970s and are now at or below ER-M limits.

Chemical contaminants present in the tissues of fish in the Hudson River estuary have been extensively studied for many years and resulted in the posting of consumption advisories by the States of New York and New Jersey. Current information summarized in Steinberg et al. (2004) suggests that many recreationally and important fish and shellfish still contain levels of metals, pesticides, PCBs, and dioxins above the Food and Drug Administration (FDA) guidance values for commercial sales. Tissue concentrations of mercury were of concern only for striped bass; other fish, and shellfish, including flounder, perch, eels, blue crab, and lobster, contained concentrations of mercury in their tissues well below the FDA limit of 2 parts per million (ppm) for commercial sale. Concentrations of chlordane in white perch, American eels, and the hepatopancreas (green gland) of blue crabs were also above FDA guidelines. DDT concentrations in the tissues of most recreationally and commercially valuable fish and shellfish in the estuary were below the 2 ppm FDA limit with the exception of American eel. Unfortunately, the concentrations of 2,3,7,8-TCDD (a dioxin compound) and total PCBs in fish and shellfish tissues were often above FDA guidance limits, suggesting fish and shellfish obtained from some locations within the estuary should be eaten in moderation or not at all.

The results described above suggest that, although a wide variety of contaminants still exist in sediment, water, and biota in the lower Hudson River, the overall levels appear to be decreasing because of the imposition of strict discharge controls by Federal and State regulatory agencies and improvements in wastewater treatment. These trends appear to be confirmed, based on the results of a NOAA-sponsored toxicological evaluation of the estuary in 1991, as described in Wolfe et al. (1996). There is continuing concern, however, that legacy PCB waste may still pose a threat to invertebrate, fish, and human populations. A study by Achman et al. (1996) suggested that PCB concentrations in sediment measured at several locations in the lower Hudson River from the mouth to Haverstraw Bay are above equilibrium with overlying water and may be available for transfer within the food web. The implications of this study are that, in some locations within the lower river, the sediments could act as a source of PCBs and pose a long-term chronic threat. The authors concluded, however, that fate and transport modeling would be required to fully understand the implications of this potential contaminant source.

Based on the above information, it appears that the overall water quality in the lower Hudson River is generally improving, although the presence of legacy contaminants still presents a concern to regulatory agencies. Based on the information reviewed, the NRC staff concludes that the cumulative impact of water quality on RIS should decline if efforts continue to address point- and non-point pollution and legacy waste removal and treatment.

Climate Change

The potential cumulative effects of climate change on Hudson River RIS could result in a variety of fundamental changes to watersheds that would affect aquatic resources. The environmental factors of significance identified by Kennedy (1990) that would affect estuarine systems included sea level rise, temperature increase, salinity changes, and wind and water circulation changes. Changes in sea level could result in dramatic effects on nearshore communities, including the reduction or redistribution of submerged aquatic vegetation, changes to marsh communities, and influences to wetland areas adjacent to nearshore systems. Water temperature increases could affect spawning patterns or success, or influence the distribution of key RIS when cold-water species move poleward while warm-water species become established in new habitats. Changes to river salinity and the presence of the salt front could influence the spawning and distribution of RIS, and the range of exotic or nuisance species. Fundamental changes in precipitation could profoundly influence water circulation and change the nature of allochothonous and autochothonous inputs to the system. This could result in fundamental changes to primary production and influence the estuarine food web on many levels. Kennedy (1990) also concluded that some fisheries and aquaculture enterprises and communities might benefit from the results of climate change, while others would suffer extensive economic losses that could lead to population shifts.

The extent and magnitude of climate change impacts to the aquatic resources of the lower Hudson River are an important component of the cumulative assessment analyses. This assessment is beyond the scope of this review and will need to be explored and evaluated by others. A minimal evaluation of shifts in the distribution of RIS standardized mean density for 1979 to 1983 and for 2001 to 2005 was explored in Appendix H. Several RIS (striped bass, alewife, spottail shiner, hogchoker, and white perch) may be shifting their distribution slightly upriver while bay anchovies may be shifting their distribution seaward. This analysis attempts only to explore hypotheses about potential redistribution of fish; definitive statements cannot be made because of data limitations. Thus, the NRC staff has concluded that the cumulative effects of climate change cannot be determined.

H.3 References

10 CFR Part 51. *U.S. Code of Federal Regulations*, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” Part 51, Chapter 1, Title 10, “Energy.”

Abood, K.A., T.L. Englert, S.G. Metzger, C.V. Beckers, Jr., T.J. Groninger, and S. Mallavaram. 2006. “Current and Evolving Physical and Chemical Conditions in the Hudson River Estuary.” *American Fisheries Society Symposium* 51, pp. 39–61.

Achman, D.R., B.J. Brownawell, and L. Zhang. 1996. “Exchange of Polychlorinated Biphenyls Between Sediment and Water in the Hudson River Estuary.” *Estuaries* 19:4, pp. 950–965.

Adams, S.M. 2003. “Establishing Causality Between Environmental Stressors and Effects on Aquatic Ecosystems.” *Human and Ecological Risk Assessment*, Vol. 9, No.1, pp. 17–35.

Atlantic States Marine Fisheries Commission (ASMFC). 2006. Species profile: Atlantic striped bass, the challenges of managing a restored stock. Accessed at:

http://www.asmfc.org/speciesDocuments/stripedBass/speciesprofile.pdf. on December 10, 2007.

Atlantic Striped Bass Conservation Act of 1984. 16 USC 5151–5158, *et seq*.

Baird, D., and R.E. Ulanowicz. 1989. “The Seasonal Dynamics of the Chesapeake Bay Ecosystem.” *Ecological Monographs* 59(4), pp. 329–364.

Barnthouse, L.W., C.C. Coutant, and W. Van Winkle. 2002. “Status and Trends of Hudson River Fish Populations and Communities Since the 1970’s: Evaluation of Evidence Concerning Impacts of Cooling Water Withdrawals.” January 2002. ADAMS Accession No. ML083360704.

Barnthouse, L.W., D.G. Heimbuch, W. Van Winkle, and J. Young. 2008. “Entrainment and Impingement at Indian Point: A Biological Impact Assessment.” January 2008. ADAMS Accession No. ML080390059.

Brosnan, T.M. and M.L. O’Shea. 1996. “Long-term Improvements in Water Quality Due to Sewage Abatement in the Lower Hudson River.” *Estuaries* 19:4, pp. 890–900.

Central Hudson Gas and Electric Corporation (CHGEC). 1999. *Draft Environmental Impact Statement for State Pollutant Discharge Elimination System Permits for Bowline Point, Indian Point 2 and 3, and Roseton Steam Electric Generating Stations.* Consolidated Edison Company New York, Inc. New York Power Authority and Southern Energy New York. December 1999. ADAMS Accession No. ML083400128.

Clean Water Act of 1977 (CWA). 33 USC 1326 et seq. (common name of the Federal Water Pollution Control Act of 1977).

Cochran, W.G. 1997. *Sampling Techniques*, John Wiley and Sons, New York.

Consolidated Edison Company of New York (Con Edison). 1976. “Indian Point Impingement Study Report for the Period 1 January 1975–31 December 1975.” Prepared by Texas Instruments, Inc. ADAMS Accession No. ML083360750.

Consolidated Edison Company of New York (Con Edison). 1977. “Hudson River Ecological Study in the Area of Indian Point 1976 Annual Report.” Prepared by Texas Instruments, Inc. ADAMS Accession No. ML08309161.

Consolidated Edison Company of New York (Con Edison). 1979. “Hudson River Ecological Study in the Area of Indian Point 1977 Annual Report.” Prepared by Texas Instruments, Inc. ADAMS Accession No. ML083091068.

Consolidated Edison Company of New York (Con Edison). 1980. “Hudson River Ecological Study in the Area of Indian Point 1979 Annual Report.” Prepared by Texas Instruments, Inc. ADAMS Accession No. ML083360740.

Consolidated Edison Company of New York (Con Edison). 1984a. “Hudson River Ecological Study in the Area of Indian Point 1981 Annual Report.” ADAMS Accession No. ML083091069.

Consolidated Edison Company of New York (Con Edison). 1984b. “Precision and Accuracy of Stratified Sampling to Estimate Fish Impingement at Indian Point Unit No. 2 and Unit No. 3.” Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083360792.

Consolidated Edison Company of New York (Con Edison) and New York Power Authority (NYPA). 1986. "Hudson River Ecological Study in the Area of Indian Point 1985 Annual Report." Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083091074.

Consolidated Edison Company of New York (Con Edison) and New York Power Authority (NYPA). 1987. "Hudson River Ecological Study in the Area of Indian Point 1986 Annual Report." Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083091087.

Consolidated Edison Company of New York (Con Edison) and New York Power Authority (NYPA). 1988. "Hudson River Ecological Study in the Area of Indian Point 1987 Annual Report." Prepared by EA Science and Technology. ADAMS Accession No. ML083091084.

Consolidated Edison Company of New York (Con Edison) and New York Power Authority (NYPA). 1991. "Hudson River Ecological Study in the Area of Indian Point 1990 Annual Report." Prepared by EA Science and Technology. ADAMS Accession No. ML083091086.

Daniels, R.A., K.E. Limburg, R.E. Schmidt, D.L. Strayer, and R.C. Chambers. 2005. "Changes in Fish Assemblages in the Tidal Hudson River, New York." *American Fisheries Society Symposium* 45: pp. 471–503. Accessed at http://www.ecostudies.org/reprints/daniels_et_al_2005.pdf on March 13, 2008

Ecological Analyses, Inc. (EA). 1981a. *Indian Point Generating Station Entrainment Survival and Related Studies. 1979 Annual Report*. Prepared for Consolidated Edison Company of New York, Inc., and Power Authority of the State of New York. Ecological Analysts, Inc. January 1982. ADAMS Accession No. ML073330733.

Ecological Analyses, Inc. (EA). 1981b. *1981 Con Edison Automated Abundance Sampling (AUTOSAM) and Laboratory Processing Standard Operating Procedures.* Prepared for Consolidated Edison Company of New York, Inc. Ecological Analysts, Inc. May 1981. ADAMS Accession No. ML083100602.

Ecological Analyses, Inc. (EA). 1982. *Indian Point Generating Station Entrainment Survival and Related Studies. 1980 Annual Report*. Prepared for Consolidated Edison Company of New York, Inc., and Power Authority of the State of New York. Ecological Analysts, Inc. April 1981. ADAMS Accession No. ML073330737.

Ecological Analyses, Inc. (EA). 1984. *Indian Point Generating Station Entrainment Abundance and Outage Evaluation, 1983 Annual Report*. Prepared for Consolidated Edison Company of New York, Inc., and Power Authority of the State of New York. EA Engineering, Science and Technology, Inc. September 1984. ADAMS Accession No. ML083101084.

Ecological Analyses, Inc. (EA). 1985. *Indian Point Generating Station Entrainment Abundance and Outage Evaluation, 1983 Annual Report*. Prepared for Consolidated Edison Company of New York, Inc., and Power Authority of the State of New York. EA Engineering, Science and Technology. July 1985. ADAMS Accession No. ML083101091.

Ecological Analyses, Inc. (EA). 1989. *Indian Point Generating Station 1988 Entrainment Survival Study.* Prepared for Consolidated Edison Company of New York, Inc., and Power Authority of the State of New York. EA Engineering, Science and Technology, Northeast Regional Operations, Report No. 10648.03. August 1989. ADAMS Accession no. ML083101103.

Entergy Nuclear Operations Inc. (Entergy). 2003. *Indian Point Nuclear Power Plant, Units No. 1, 2, and 3—Annual Radiological Environmental Operating Report [for 2002]*. Docket Numbers 50-03, 50-247, and 50-286, Buchanan, New York. Agencywide Documents Access and Management System (ADAMS) Accession No. ML031220085.

Entergy Nuclear Operations Inc. (Entergy). 2004. *Indian Point Nuclear Power Plants, Units 1, 2, and 3—Indian Point's Annual Radiological Environmental Operating Report for 2003*. Docket Numbers 50-003, 50-247, and 50-286, Buchanan, New York. Adams Accession No. ML041340492.

Entergy Nuclear Operations Inc. (Entergy). 2005. *Indian Point Units 1, 2, and 3—2004 Annual Radiological Environmental Operating Report*. Docket Numbers 50-3, 50-247, and 50-286, Buchanan, New York. ADAMS Accession No. ML051220210.

Entergy Nuclear Operations Inc. (Entergy). 2006. *Indian Point Nuclear Power Plants, Units 1, 2 and 3—Annual Radiological Environmental Operating Report for 2005*. Docket Numbers 50-3, 50-247, and 50-286, Buchanan, New York. ADAMS Accession No. ML061290085.

Entergy Nuclear Operations, Inc. (Entergy). 2007. "Applicant's Environmental Report, Operating License Renewal Stage." (Appendix E of "Indian Point Units 2 and 3, License Renewal Application.") April 23, 2007. ADAMS Accession No. ML 071210530.

Entergy Nuclear Operations, Inc. (Entergy). 2008. Letter from F. Dacimo, Vice President, Entergy Nuclear Operations, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Reply to Document Request for Additional Information Regarding Site Audit Review of License Renewal Application for Indian Point Nuclear Generating Unit Nos. 2 and 3. April 23, 2008. ADAMS Accession No. ML081230243.

Entergy Nuclear Operations, Inc. (Entergy). 2009. Letter from F. Dacimo, Vice President, Entergy Nuclear Operations, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Request for Additional Information Related to License Renewal, Indian Point Nuclear Application Environmental Report – Impingement Data, Indian Point Nuclear Generating Unit Nos. 2 & 3 Docket Nos. 50-247 and 50-286, License Nos. DPR-26 and DPR-64. November 24, 2009. ADAMS Accession No. ML093420528.Environmental Protection Agency (EPA). 1992. *Framework for Ecological Risk Assessment*. EPA/630/R-92-001. Risk Assessment forum, Washington, D.C. 41 pp. Accessed at http://rais.ornl.gov/homepage/FRMWRK_ERA.PDF

Environmental Protection Agency (EPA). 2004. *Total Maximum Daily Loads, Listed Water Information, Cycle: 2004. Hudson River, Lower Hudson River*. Accessed at: http://oaspub.epa.gov/tmdl/enviro.control?p_list_id=NY-1301-0002andp_cycle=2004 on February 23, 2008.

Environmental Protection Agency (EPA). 2008. *Hudson River PCB Superfund Site, Dredge Area 2 Delineation Fact Sheet, 2008*. Accessed at: http://www.epa.gov/hudson/factsheet_2nd_phaselow.pdf on February 4, 2008.

Fish and Wildlife Service (FWS). 2007. Letter from R. A. Niver, Endangered Species Biologist, to Rani Franovich, Branch Chief, Projects Branch 2, Division of License Renewal, Office of Nuclear Reactor Regulation, NRC, Washington, DC. Response to letter from NRC requesting information on federally listed, proposed, and candidate species and critical habitat in the vicinity of Indian Point Nuclear Generating Station Unit Nos. 2 and 3. August 29.

Fletcher, R.I. 1990. "Flow dynamics and fish recovery experiments: Water intake systems." *Transactions of the American Fisheries Society*, 119:393–415.

Frank, K.T., B. Petrie, and N.L. Shackell. 2007. "The Ups and Downs of Trophic Control in Continental Shelf Ecosystems." *Trends in Ecology and Evolution* 22:5, pp. 236–242.

Greenwood, M.F.D. 2008. "Trawls and Cooling-water Intakes as Estuarine Fish Sampling Tools: Comparisons of Catch Composition, Trends in Relative Abundance, and Length Selectivity," *Estuarine, Coastal and Shelf Science* 76:121–130.

Haas-Castro, R. 2006. "Status of Fishery Resources off the Northeastern U.S.: River Herring." Northeast Fisheries Science Center Resource Evaluation and Assessment Division, National Oceanic and Atmospheric Administration. Accessed at: http://www.nefsc.noaa.gov/sos/spsyn/af/herring/archives/38_RiverHerring_2006.pdf on December 17, 2007. ADAMS No. ML083390029.

Marcy, B.C., D.E. Fletcher, F.D. Martin, M.H. Paller, and M.J.M. Reichert. 2005. "Spottail Shiner." In: Fishes of the Middle Savannah River Basin. Athens, GA: University of Georgia Press, pp. 153–156.

Maryland Department of Natural Resources, Fisheries Service, Chesapeake Finfish Program (MDNR). February 2005. 2004 Stock Assessment of Selected Resident and Migratory Recreational Finfish Species within Maryland's Chesapeake Bay. Accessed at http://dnr.maryland.gov/fisheries/management/FMP/FMPWhitePerch04.pdf on February 4, 2010.

Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig, 2000. "A Comparative Review of Entrainment Survival Studies at Power Plants in Estuarine Environments," *Environmental Science and Policy 3*, pp. 295–301.

Menzie, C., M. H. Henning, J. Cura, K. Finkelstein, J. Gentile, J. Maughan, D. Mitchell, S. Petron, B. Potocki, S. Svirsky, and P. Tyler. 1996. "Report of the Massachusetts Weight-of-Evidence Workgroup: A Weight-of-Evidence Approach for Evaluating Ecological Risks." *Human and Ecological Risk Assessment 2*:277–304.

Newbold, Steven C. and Rich Iovanna. 2007. Ecological effects of density-independent mortality: application to cooling-water withdrawals. Ecological Applications, 17:390-406.

New York Power Authority (NYPA). 1986. "Size selectivity and relative catch efficiency of a 3-m beam trawl and a 1-m^2 epibenthic sled for sampling young of the year striped bass and other fishes in the Hudson River estuary." Prepared by Normandeau Associates, Inc. January 1986. (HR Library #7180). ADAMS Accession No. ML083360641.

New York State Department of Environmental Conservation (NYSDEC). 2003a. *Final Environmental Impact Statement Concerning the Applications to Renew New York State Pollutant Discharge Elimination System (SPDES) Permits for the Roseton 1and2 Bowline 1and2 and IP2 and IP3 2and3 Steam Electric Generating Stations, Orange, Rockland and Westchester Counties. Hudson River Power Plants FEIS.* June 25, 2003. ADAMS Accession No. ML083360752.

New York State Department of Environmental Conservation (NYSDEC). 2003b. *Fact Sheet. New York State Pollutant Discharge Elimination System (SPDES) Draft Permit Renewal with Modification, IP2 and IP3 Electric Generating Station, Buchanan, NY November 2003.*

Accessed at http://www.dec.ny.gov/docs/permits_ej_operations_pdf/IndianPointFS.pdf on July 12, 2007. ADAMS Accession No. ML083360743.

New York State Department of Environmental Conservation (NYSDEC). 2007. "State of New York Petition submitted to the U.S. Nuclear Regulatory Commission, November 30, 2007, on the Application of Entergy Nuclear Operations, Inc., for the 20-year Relicensing of Indian Point Nuclear Power Plants 1 and 2, Buchanan, New York." Summary of Some of the Key Contentions. Accessed at http://www.dec.ny.gov/permits/40237.html on March 18, 2008. ADAMS Accession No. ML083360757.

Normandeu Associates (Normandeu). 1987a. *IP2 and IP3 Generating Station Entrainment Abundance Program, 1985 Annual Report.* Prepared for Consolidated Edison Company of New York, Inc., and New York Power Authority. Prepared by Normandeu Associates, Inc. Report R-332–1062. April 1987. ADAMS Accession No. ML0803091074.

Normandeu Associates (Normandeu). 1987b. *IP2 and IP3 Generating Station Entrainment Abundance Program, 1986 Annual Report.* Prepared for Consolidated Edison Company of New York, Inc., and New York Power Authority. Prepared by Normandeu Associates, Inc. Report R-220. June 1987. ADAMS Accession No. ML083091087.

Normandeu Associates (Normandeu). 1988. *IP2 and IP3 Generating Station Entrainment Abundance Program, 1987 Annual Report.* Prepared for Consolidated Edison Company of New York, Inc., and New York Power Authority. Prepared by Normandeu Associates, Inc. Report R-1110. May 1988. ADAMS Accession No. ML083360798.

Nuclear Regulatory Commission (NRC). 1996. "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants." NUREG-1437, Volumes 1 and 2, Washington, DC.

Nuclear Regulatory Commission (NRC). 1999. "Generic Environmental Impact Statement for License Renewal of Nuclear Plants Main Report," Section 6.3—Transportation, Table 9.1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants." NUREG-1437, Volume 1, Addendum 1, Washington, DC.

Rose, Kenneth A. 2000. Why are quantitative relationships between environmental quality and fish populations so elusive? Ecological Applications, 10:367-385.

Secor, D.H. and E D. Houde. 1995. "Temperature Effects on the Timing of Striped Bass Egg Production, Larval Viability, and Recruitment Potential in the Patuxent River (Chesapeake Bay)." *Estuaries* 18, pp. 527–533.

Shepherd G. 2006a. "Atlantic Striped Bass." Accessed at http://www.nefsc.noaa.gov/sos/spsyn/af/sbass/archives/40_StripedBass_2006.pdf on December 10, 2007.

Shepherd G. 2006b. "Bluefish." Accessed at http://www.nefsc.noaa.gov/sos/spsyn/op/bluefish/archives/25_Bluefish_2006.pdf.

Smith, C.L. 1985. "Spottail Shiner." The Inland Fishes of New York State, pp. 194–195. New York State Department of Environmental Conservation, Albany, NY.

Snedecor G.W. and W.G. Cochran. 1980. *Statistical Methods*. The Iowa State University Press, Ames, Iowa.

Steinberg, N., D.J. Suszkowski, L. Clark, and J. Way. 2004. *Health of the Harbor: The First Comprehensive Look at the State of the NY, NY Harbor Estuary*. A Report to the New York/New Jersey Harbor Estuary Program. Hudson River Foundation, New York.

Strayer, D.L., K.A. Hattala, and A.W. Kahnle. 2004. "Effects of an Invasive Bivalve (*Dreissena polymorpha*) on Fish in the Hudson River Estuary." *Canadian Journal of Fisheries and Aquatic Sciences* 61, pp. 924–941.

Ulanowicz, R.E. 1995. "Trophic Flow Networks as Indicators of Ecosystem Stress." In: G.A. Polis and K.O. Winemiller (eds). *Food Webs: Integration of Patterns and Dynamics*, Chapman and Hall, NY, pp. 358–368.

U.S. EPA. 1998. Guidelines for Ecological Risk Assessment. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, EPA/630/R095/002F. Accessed at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460

Wolfe, D.A., E.R. Long, and G.B. Thursby. 1996. "Sediment Toxicity in the Hudson-Raritan Estuary: Distribution and Correlations with Chemical Contamination." *Estuaries* 19:4, pp. 901–912.

Appendix I

Statistical Analyses Conducted for Chapter 4 Aquatic Resources and Appendix H

Appendix I

Statistical Analyses Conducted for Chapter 4 Aquatic Resources and Appendix H

Supporting analyses and data tables are presented by section as referenced in the Aquatic Resources sections of Appendix H. Major section headings are maintained to allow mapping between appendices. This appendix includes supporting information for the U.S. Nuclear Regulatory Commission (NRC) staff assessment of impingement impacts (Appendix H, Section 1.3), the assessment of population trends (Appendix H, Section 3.1), the analysis of strength of connection (Appendix H, Section 3.2), and the cumulative impacts on aquatic resources (Appendix H, Section 4).

I.1 Impingement of Fish and Shellfish

I.1.1. NRC Staff Assessment of Impingement Impacts

NRC staff conducted simple linear regression over years on the number of days of operation and the combined volume of water discharged for Indian Point Nuclear Generating Station Unit Nos. 2 and 3 (IP2 and IP3) between 1975 and 1990 (Table I-1). Days of operation from 1975 to 1981 were obtained from impingement data provided by Entergy Nuclear Operations, Inc. (the applicant) (Entergy 2007b). Days of operation for the remaining years and the combined volume discharged were compiled from the annual reports for the Hudson River Ecological Study in the area of IP2 and IP3 (Con Edison 1980; Con Edison 1984, 1986–1991). The number of days of operation at IP2 and IP3 had a general increase of eight days per year for IP2 and five days per year for IP3 (linear regression, $p = 0.004$ and $p = 0.286$ for IP2 and IP3, respectively). The total volume circulated at IP2 and IP3 combined also had a general increase of 26.2×10^6 cubic meters (m^3; linear regression, $p = 0.164$).

Table I-1 Number of Days of Operation at IP2 and IP3 and Combined Discharge

Year	Days of Operation		Combined Volume (millions m^3)
	IP2	IP3	
1975	307		1119
1976	176	239	1329
1977	265	259	2159
1978	234	270	2030
1979	246	227	1935
1980	263	261	1822
1981	276	297	1617
1982	304	135	1273
1983	340	48	1286
1984	238	306	1710
1985	365	266	1977
1986	285	357	1892
1987	346	265	1815
1988	357	352	2322
1989	302	301	1748
1990	365	272	1902

Source: Days of Operation: Entergy 2007b; Con Edison 1984, 1986–1991
Volume Discharged: Con Edison 1980, 1991.

I.2 Combined Effects of Impingement and Entrainment

I.2.1. Assessment of Population Trends

Studies Used To Evaluate Population Trends

The Hudson River utilities conducted the Fall Juvenile Shoals Survey (FSS) from 1974 to 2005 and targeted juveniles, yearlings, and older fish. Between 1974 and 1984, a 1-square meter (m^2) Tucker trawl with a 3-millimeter (mm) mesh was used to sample the channel and a 1-m^2 epibenthic sled with a 3-mm mesh was used to sample the bottom and shoal strata. From 1985 to 2005, a 3-meter (m) beam trawl with a 38-mm mesh on all but the cod-end replaced the epibenthic sled. Size selectivity and relative catch efficiency between gear types was tested during nocturnal samplings between August and September 1984. Bay anchovy, American shad, and weakfish were sampled with less efficiency with the beam trawl (Table I-2) (NYPA 1986). Further, the number and volume of samples in the bottom and shoal strata were generally greater than 2.5 times those in the channel (Table I-3).

The Beach Seine Survey (BSS) was conducted from 1974 to 2005 and targeted young of the year (YOY) and older fish in the shore-zone (extending from the shore to a depth of 10 feet [ft]). Samples were collected from April to December but generally every other week from mid-June through early October (Table I-4). For all years, a 100-ft bag beach seine was used to collect 100 samples during each sampling period from beaches selected according to a stratified random design. Even though the catch-per-unit-effort (CPUE) for representative important species (RIS) differed in magnitude between the BSS and FSS (Table I-5), standardizing the data (observed CPUE minus the mean CPUE and divided by the standard deviation across years) allowed a comparison of the shape of the data over time. Thus, NRC staff conducted a visual and statistical comparison of the standardized BSS and FSS data to determine if a shift in gear types was affecting the observed FSS trend. The standardized FSS data were considered consistently less than the standardized BSS data after 1985 if greater than 90 percent of the standardized FSS observations were less than the BSS and the median absolute difference between the standardized FSS and BSS was greater than 0.5 based on a sign test ($\alpha = 0.1$). If these two metrics were met, a gear effect was assumed, and the pre- and post-1985 data were evaluated separately. If less than 25 percent of the standardized FSS observations were less than the BSS and either (1) the median absolute difference between the standardized FSS and BSS was greater than 0.5 based on a sign test ($\alpha = 0.1$) or (2) the absolute difference of the percentage of FSS observations less than BSS observations before and after the gear change was greater than 0.3, then the magnitude of FSS data was considered greater than the magnitude of BSS data. If 25 percent to 90 percent of the standardized FSS observations were less than the BSS, then the FSS and BSS data were considered not biologically different.

Table I-2 Catch by Gear or Gear Efficiency (catch per 1000 m^2) from August to September 1984

	Young of the Year				Yearling and Older			
	3-m Beam Trawl (n = 257)		1-m^2 Epibenthic Sled (n = 322)		3-m Beam Trawl (n = 257)		1-m^2 Epibenthic Sled (n = 322)	
Species	**Mean Density**	**Standard Error**	**Mean Density**	**Standard Error**	**Mean Density**	**Standard Error**	**Mean Density**	**Standard Error**
Bay Anchovy	29.0	3.0	1261	61.9	0.6	0.1	11.2	1.2
American Shad	0.4	0.1	4.4	3.0	0.0	0.0	0.0	0.0
Bluefish	0.1	<0.1	0.3	0.1	0.0	0.0	0.0	0.0
Hogchoker	0.1	<0.1	0.1	<0.1	5.4	0.4	1.5	0.2
Striped Bass	13.3	0.8	3.4	0.4	0.2	<0.1	0.1	<0.1
White Catfish	0.0	0.0	0.0	0.0	1.6	0.2	1.0	0.1
White Perch	1.3	0.2	0.1	<0.1	22.1	1.6	6.4	1.3
Weakfish	0.7	0.1	1.9	0.3	0.0	0.0	0.0	0.0

Source: NYPA 1986.

Table I-3 Changes to the Design and Gear Used During the Fall Juvenile Survey

Year	Volume (m^3)	Number of Samples	Samples per Gear: Epibenthic Sled	Samples per Gear: Tucker Trawl	Samples per Gear: Beam Trawl	Sample Collection Dates
1974	728083	1690	100/wk			Weekly, Aug–Dec
1975	317749	901	100/wk			Biweekly, Aug–Dec
1976	365903	881	100/wk			Biweekly, Aug–Dec
1977	368134	826	100/wk			Biweekly, Aug–Dec
1978	352420	900	100/wk			Biweekly, Aug–Dec
1979	1,006,411	2387	150/wk	50/wk		Biweekly, July–Dec
1980	771291	2103	150/wk	50/wk		Biweekly, July–Dec
1981	479591	1199	150/wk	50/wk		Biweekly, Aug–Oct
1982	400969	1000	150/wk	50/wk		Biweekly, Aug–Oct
1983	477057	1199	150/wk	50/wk		Biweekly, Aug–Oct
1984	601459	1601	150/wk	50/wk		Biweekly, July–Oct
1985	1886754	1802		~500	~1,500	Biweekly, July–Nov
1986	2,298,395	2098		549	1,549	Biweekly, July–Dec
1987	2035472	1891		495	1,396	Biweekly, July–Nov
1988	1826692	1680		440	1,240	Biweekly, July–Oct
1989	1590118	1679		439	1,240	Biweekly, July–Oct
1990	1252994	1680		439	1,241	Biweekly, July–Oct
1991	1707319	1678		440	1,238	Biweekly, July–Oct
1992	1865451	1680		440	1,240	Biweekly, July–Oct
1993	2010222	1680		440	1,240	Biweekly, July–Oct
1994	2018494	1681		440	1,241	Biweekly, July–Oct
1995	1782199	1680		440	1,240	Biweekly, July–Oct
1996	1824802	1669		484	1,185	Biweekly, July–Oct
1997	1995519	2015		826	1,189	Biweekly, July–Nov
1998	2214707	2130		825	1,305	Biweekly, July–Dec
1999	2160009	2085		823	1,262	Biweekly, July–Dec
2000	2174896	2113		816	1,297	Biweekly, July–Nov
2001	2097877	2084		818	1,266	Biweekly, July–Oct
2002	2105272	2128		821	1,307	Biweekly, July–Dec
2003	1891135	2131		825	1,306	Biweekly, July–Dec
2004	2106874	2128		823	1,305	Biweekly, July–Dec
2005	2063654	2128		824	1,304	Biweekly, July–Dec

Note: Compiled from the annual Year Class Reports for the Hudson River Estuary Monitoring Program; ASA 1999, 2001a, 2001b, 2003, 2004a, 2004b, 2005–2007; Battelle 1983; ConEd undated a, undated b, 1996; EA 1990, 1995, 1991; LMS 1989, 1991, 1996; MMES 1983; Versar 1987; TI 1977–1981; NAI 1985a, 1985b, 2007.

There were four basic combinations of sampling intensities, duration, and gear types used during the FSS (Table I-3). Likewise, there were roughly three levels of sampling intensity used during the BSS (Table I-4). Thus, for data provided on a weekly basis, only weeks 27 to 43 were used in the analysis for the FSS and weeks 22 to 43 for the BSS survey, so that most years contained observations from the months of July through October and June through October for each survey, respectively.

Table I-4 Number of Weeks Sampled Each Month During the BSS

Year	April	May	June	July	August	September	October	November	December
1974	4	4	4	5	4	5	4	4	3
1975	5	4	4	5	4	5	4	4	3
1976	5	4	4	5	4	5	4	4	2
1977	4	4	4	5	4	5	4	4	3
1978	4	4	4	5	4	5	4	4	4
1979	5	4	4	5	4	5	4	4	2
1980	5	4	4	5	4	2	2	2	1
1981	0	0	0	0	2	3	2	0	0
1982	0	0	0	0	1	3	1	0	0
1983	0	0	0	0	2	3	1	0	0
1984	0	0	0	1	2	2	2	1	0
1985	0	0	0	2	2	2	2	2	0
1986	0	0	0	2	2	2	2	2	0
1987	0	0	1	2	2	3	2	1	0
1988	0	0	1	3	2	2	2	1	0
1989	0	0	1	3	2	2	2	1	0
1990	0	0	1	3	2	2	2	0	0
1991	0	0	1	2	2	3	2	0	0
1992	0	0	1	2	2	3	2	0	0
1993	0	0	0	3	2	2	2	1	0
1994	0	0	0	3	2	2	2	1	0
1995	0	0	1	2	2	3	2	0	0
1996	0	0	1	3	2	2	2	0	0
1997	0	0	1	3	2	2	2	0	0
1998	0	0	1	3	2	2	2	0	0
1999	0	0	1	3	2	2	2	0	0
2000	0	0	1	3	2	2	2	0	0
2001	0	0	1	3	2	2	2	0	0
2002	0	0	1	3	2	2	2	0	0
2003	0	0	1	3	2	2	2	0	0
2004	0	0	1	3	2	2	2	0	0
2005	0	0	1	3	2	2	2	0	0

Source: NRC Request for Sampling Effort and Abundance Data from Three Hudson River Sampling Programs for 16 Selected Fish Species from 1974 through 2005, Normandeau Associates Inc., February 25, 2008.

Metrics Used To Evaluate Population Trends

Abundance Index

The abundance index for YOY for each species was based on the catch from a selected sampling program and was used by the applicant and its contractors to estimate riverwide mean RIS abundances. The selection process considered the expected location of each species in the river, based on life-history characteristics and the observed catch rates from previous sampling. The abundance index was constructed to account for the stratified random sampling design used by each of the surveys. For the Long River Survey (LRS) and the FSS, sampling within a river segment was further stratified by river depth and sampled with separate gear types. For blueback herring, alewife, bay anchovy, hogchoker, weakfish, and rainbow smelt, the YOY abundance index was based on the catch from a single gear type (Table I-5).

The construction of the LRS (L_A) and the FSS abundance index (F_A) were similar and provided an unbiased estimate of the total and mean riverwide population abundance for selected species, respectively (Cochran 1997). For the FSS and each gear type, F_A was constructed as a weighted mean of the average species density with weight given by the volume of each stratum for a given river segment. For the FSS, strata sampled were the channel, bottom, and shoal for a given river segment. Poughkeepsie and West Point river segments had the greatest channel volume, Poughkeepsie and Tappan Zee had the greatest bottom volume, and Tappan Zee had the greatest shoal volume (Table I-6). Because the river segment associated with IP2 and IP3 did not have large bottom or shoal volumes, the abundance index was not sensitive to changes in population trends within the vicinity of IP2 and IP3.

Table I-5 Sampling Program Used To Calculate the Abundance Index for YOY and Yearling Fish and the Median Catch-per-Unit-Effort Over Time

Species	Sampling Program	Riverwide FSS Median YOY Catch-per-Unit-Effort	Riverwide BSS Median YOY Catch–per-Unit-Effort
Alewife	FSS-Channel	4.35E-04	1.05
Bay Anchovy	FSS-Channel	2.61E-02	6.70
American Shad	BSS	8.12E-04	9.17
Bluefish	BSS	3.18E-05	3.36E-01
Hogchoker	FSS-Bottom	1.03E-02	2.30E-01
Blueback Herring	FSS-Channel	1.12E-02	2.86E+01
Rainbow Smelt	FSS-Channel	N/A[a]	< 0.0001
Spottail Shiner	FSS-Channel	1.10E-04	7.25
Stripped Bass	BSS	2.47E-03	6.47
Atlantic Tomcod	LRS	2.69E-03	6.70E-02
White Catfish	BSS	N/A	2.50E-02
White Perch	BSS	5.89E-03	10.4
Weakfish	FSS-Channel	N/A	5.00E-03

[a] N/A = not applicable; YOY not present in samples.
Source: CHGE 1999.

Table I-6 Volume of Sampling Strata by River Segment

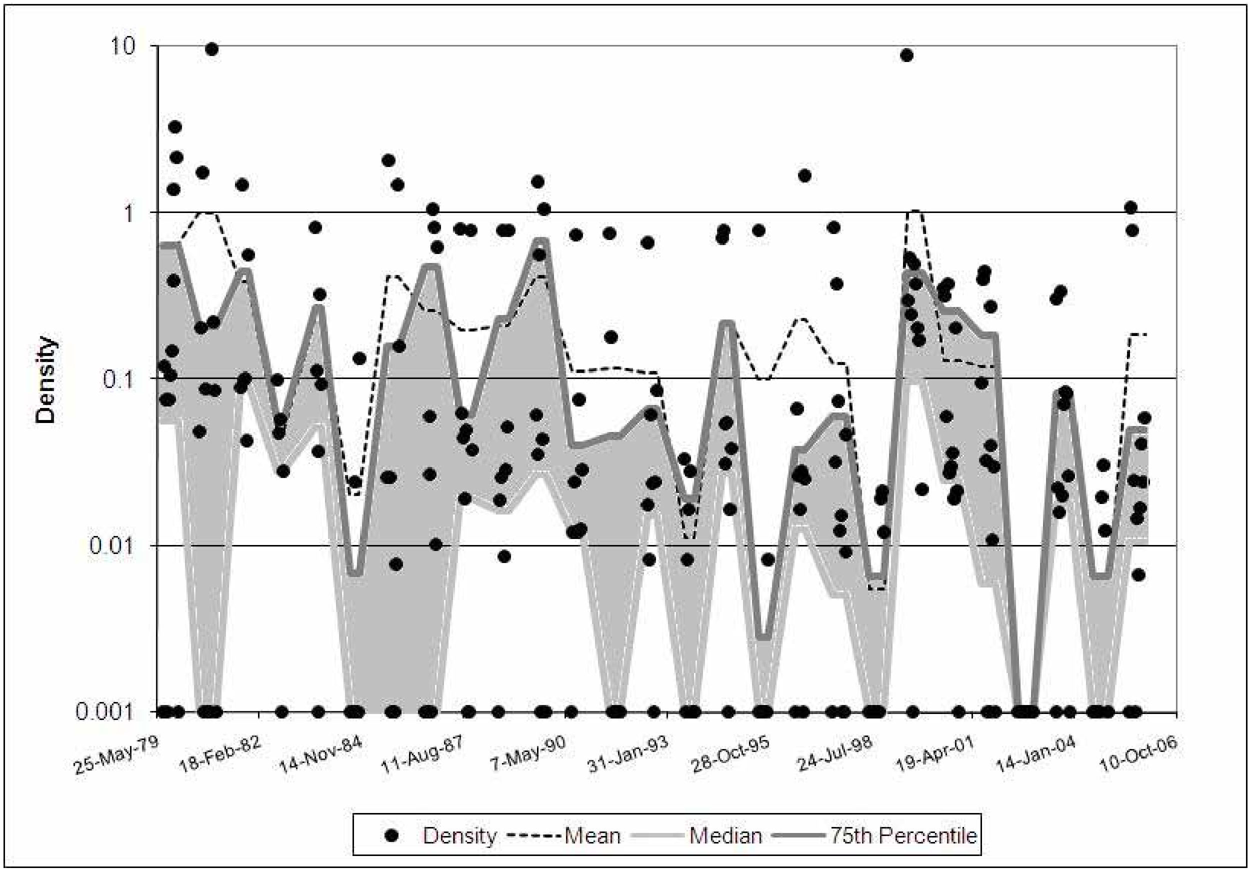
Region	River Segment	Volume (m^3) Channel	Bottom	Shoal	Region	Area (m^2) Shore Zone
Battery	0	141,809,822	48,455,129	18,747,833	209,012,784	N/A
Yonkers	1	143,452,543	59,312,978	26,654,767	229,420,288	3,389,000
Tappan Zee	2	138,000,768	62,125,705	121,684,992	321,811,465	20,446,000
Croton-Haverstraw	3	61,309,016	32,517,633	53,910,105	147,736,754	12,101,000
Indian Point	4	162,269,471	33,418,632	12,648,163	208,336,266	4,147,000
West Point	5	178,830,022	25,977,862	2,647,885	207,455,769	1,186,000
Cornwall	6	94,882,267	36,768,629	8,140,123	139,791,019	4,793,000
Poughkeepsie	7	228,975,052	63,168,132	5,990,260	298,133,444	3,193,000
Hyde Park	8	131,165,041	32,012,000	2,307,625	165,484,666	558,000
Kingston	9	93,657,021	35,479,990	12,332,868	141,469,879	3,874,000
Saugerties	10	113,143,296	42,845,077	20,307,338	176,295,711	7,900,000
Catskill	11	83,924,081	42,281,206	34,526,456	160,731,743	8,854,000
Albany	12	32,025,080	13,517,183	25,606,842	71,149,105	6,114,000

N/A – not applicable. Data from Entergy 2007b.

Analysis of Population Impacts

As discussed in Section H.1.3, the analysis was based on YOY fish to assess the population trends. For the river-segment analysis, the median and the 75th percentile of the densities of YOY caught within a given year in the vicinity of IP2 and IP3 (River Segment 4) were used to bound population trends for a visual representation. The median and 75th percentile are less sensitive to extreme values than the mean. Fish population sizes and the chance of catching fish were highly variable, and a few large catches can influence the mean and potentially distort a trend analysis. For example, the mean density for alewives caught during the FSS in the vicinity of IP2 and IP3 tended to be equal to or greater than the 75th percentile of the density for most years because of the relatively fewer large observations (Figure I-1). Further, seasonal and interannual differences in the salt front position may influence the pattern of trends in total or mean abundance between river segments. Evaluating the 75th percentile of the weekly data removed the influence from any given week associated with potentially extreme environmental characteristics.

River-segment data collected from 1979 to 2005 (n = 27 for each RIS) was standardized by subtracting the first 5-year mean and dividing by the standard deviation based on all years. Because of the large variability between years (coefficients of variation [CVs] ranging from 67 to 247 percent), a 3-year moving average was used to smooth the river-segment data before the trend analysis. Two competing models, simple linear regression and segmented regression with a single join point, were statistically fit to the smoothed and standardized 75th percentile of the annual observed densities for each taxon. The model with the smallest mean square error (MSE) was chosen as the better fitting model and used to determine the level of potential injury. Extreme outliers (values greater than 2 standard deviations from the mean) were removed from the analysis if the segmented regression was unable to converge; results with and without outliers were recorded. All data (1979–2005) from the FSS were compared to the BSS to determine if changes in the gear type affected the observed trend. When the standardized FSS data were consistently less than the standardized BSS data after 1985 (based on the percentage of FSS observations less than the BSS and the median absolute difference between the FSS and BSS standardized observations), the pre- and post-1985 data were evaluated separately.



Note: The value 0.001 was added to all numbers so that the log scale could be used for plotting.

Figure I-1 Relationship among the mean, the median, and the 75th percentile of the fish density for alewives caught during the FSS in River Segment 4

For the riverwide data collected from 1979 to 2005 (n = 27 for each RIS), the FSS CPUE, the BSS CPUE, and the abundance index for the YOY were used to assess the population trends. Riverwide data consisted of a single number per year for a given taxon and life stage. CVs ranged from 60 percent to 154 percent for the FSS, 41 percent to 302 percent for the BSS, and 49 percent to 319 percent for the abundance index. Simple linear regression and segmented regression with a single join point were fit to the standardized data (using the first 5-year mean and the standard deviation based on all years). Extreme outliers were removed from the analysis if the segmented regression was unable to converge; results with and without outliers were recorded. The model with the smallest MSE was chosen as the best-fit model and used to determine the level of potential injury. All data (1979–2005) from the FSS were compared to the BSS to determine if changes in the gear type affected the observed trend. When the standardized FSS data were consistently less than the standardized BSS data after 1985, NRC staff evaluated the pre- and post-1985 data separately. Consistency of a gear effect was defined as (1) greater than 90 percent of the standardized FSS observations less than the associated BSS observations, and (2) the rejection of the one-sample, one-sided, sign test of the null hypothesis, H0: the median of the absolute difference (FSS-BSS standardized density) is less than or equal to 0.5 ($\alpha = 0.1$).

The FSS density and CPUE for a given RIS can be highly correlated when nearly all of the fish are caught from a single habitat (channel, shoal, or bottom) for the majority of sampling events. For these RIS, the weight-of-evidence (WOE) analysis was conducted both with and without the FSS CPUE results. Because of the slight variation in response between the two measures of population trend, different result scores can occur. However, for all RIS, the final determination of the level of impact associated with the IP2 and IP3 cooling systems was the same by either method. Thus, the correlation between measures was ignored.

For each data set, the results of the linear and segmented regression were presented in a series of three tables and a figure if a conclusion of potential large impact to any RIS population was made. The first table contained the initial values used in the fitting of the segmented regression which was conducted with Prism Version 4 (GraphPad Software, Inc. 2003). The nonlinear fitting Levenberg-Marquardt (or Marquardt) method was used to estimate the intercept, the join point, and the two slopes in the segmented regression model. The Marquardt method uses the iterative method of steepest descent in the early iterations and then gradually switches to the Gauss-Newton approach until the difference in the error sum of squares is less than 1×10^{-7}. The statistics displayed in the second table included the mean squared error (MSE) for each model; the estimate of the linear slope and associated 95 percent confidence interval; the p-value associated with the significance test of the null hypothesis that the slope (S) associated with the simple linear model equals zero; the estimated 95 percent confidence interval (CI) of the two slopes from the segmented regression (Slope 1=S1 and Slope 2=S2); and the estimated join point. For the segmented regression, slopes were defined as significant if the CI did not include zero.

The best-fit model (defined as the model with the smaller MSE) was then characterized in a third table, based on the general trend depicted by the direction of the estimated slopes. If the slope was significantly different from 0, the trend was represented by either the statement $S > 0$ for a positive slope or $S < 0$ for a negative slope. If the slope was not significant, the statement depicting the lack of a trend was $S = 0$. A level of potential negative impact was then determined, based on the decision rules presented in Section 4.1 of the Supplemental Environmental Impact Statement (SEIS). If a large potential for a negative impact was concluded for any RIS, a figure of the data and the best-fit model was presented.

IP2 and IP3 River Segment 4

As stated above, there were two different gear types used during the FSS to sample the bottom and shoal habitats. From 1979 to 1984, an epibenthic sled was used, and from 1985 to 2005, a beam trawl was used. Because there were not enough annual observations from the 1979 to 1984 time period to conduct a segmented regression, a simple linear regression was conducted to assess the slope of the density of fish near IP2 and IP3. These data were standardized to the average of the first 2 years and divided by the standard deviation of all six observations. Only white perch had a significant negative slope ($n = 6$, $p = 0.01$; Figure I-2). Hogchoker and rainbow smelt appeared to have negative trends, but they were not significant (p= 0.33 and 0.15 respectively).

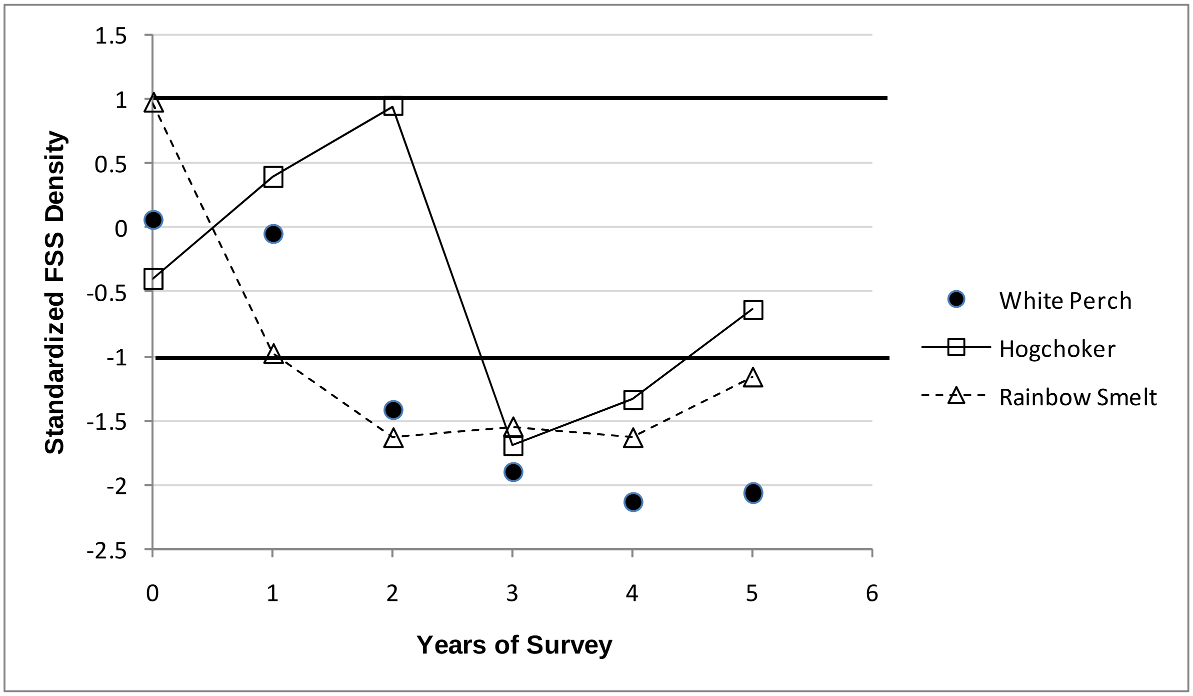


Figure I-2 River Segment 4 population trends based on the first 6 years (1979–1984) of FSS standardized density data for selected RIS

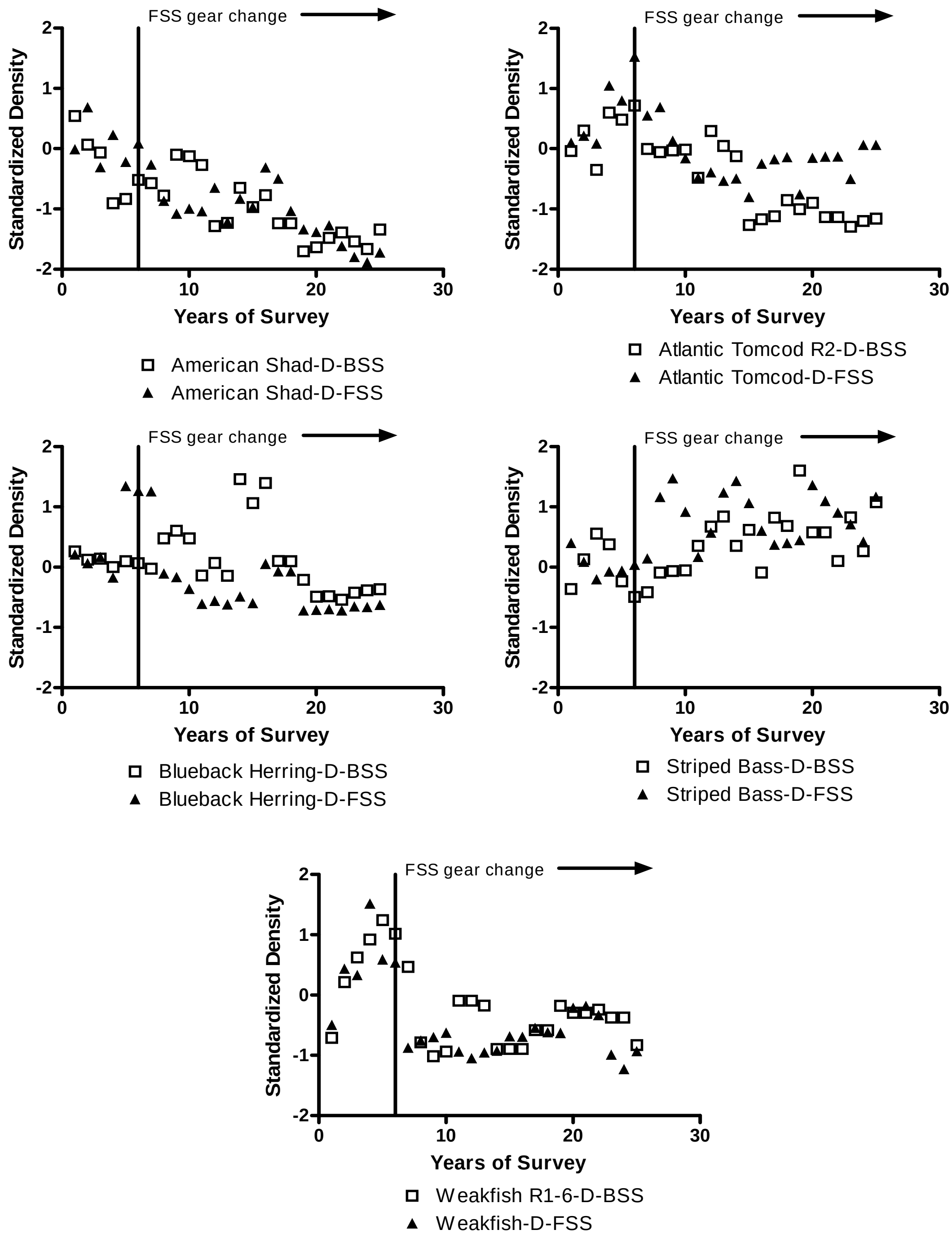
Data collected between 1985 and 2005 were temporally disconnected from the mid-1970s, when operation began at IP2 and IP3. There was a potential that fish populations responded earlier and stabilized to a lower abundance level. For this analysis, data were standardized with the average of 1985 to 1989 and the standard deviation of all data between 1985 and 2005; the data were not smoothed. This analysis was used only when the observed response from all data was biologically different from the BSS population density trend and had a decline potentially associated with the gear change.

A visual and statistical comparison (Table I-7) of the river-segment FSS standardized density with the BSS standardized density based on the proportion of the FSS observations less than the BSS following the gear change and the sign test of H_0: the median absolute difference ≤ 0.5 suggested that the trends were not biologically different for American shad (proportion FSS < BSS = 0.47; p = 0.99), Atlantic tomcod (proportion FSS < BSS = 0.26; p = 0.08), blueback herring (proportion FSS < BSS = 0.95; p = 0.68), striped bass (proportion FSS < BSS = 0.32; p = 0.50), and weakfish (proportion FSS < BSS = 0.58; p = 0.97; Figure I-3). Observations from the two surveys overlap and cross over each other. The post-1985 FSS observations for alewife (proportion FSS < BSS = 0.21; p = 0.32), bluefish (proportion FSS < BSS = 0.00; p = 0.01), hogchoker (proportion FSS < BSS = 0.00; p < 0.01), and white perch (proportion FSS < BSS =

0.00; $p < 0.01$) were greater than the BSS observations and did not show a decline associated with the gear change relative to the BSS (Figure I-4). Thus, for these eight RIS, all of the FSS data (1979–2005) were used in the regression analysis. The FSS density data for bay anchovy, however, did show a potential gear effect (proportion FSS < BSS = 1.00; $p < 0.01$; Figure I-5), and a pre- and post-1985 analysis was conducted.

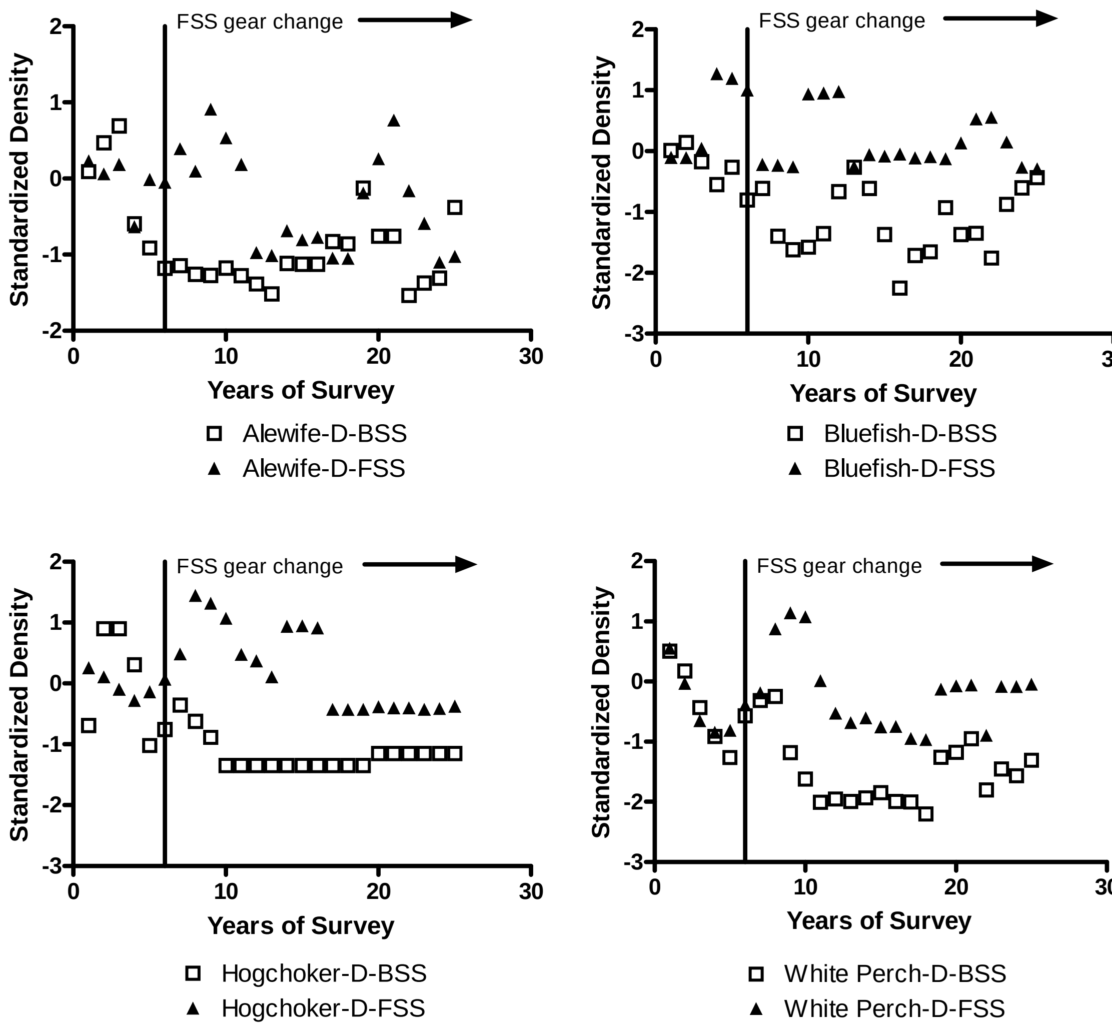
Table I-7 Evaluation of Gear Effect on FSS Population Trends in River Segment 4

Taxa	Proportion FSS < BSS		Absolute Difference in Proportions	Medan Absolute Difference		Significance of Sign Test	Conclusion
	1979-1984	1985-2005		1979-1984	1985-2005		
Alewife	0.60	0.21	0.39	0.41	0.65	0.324	FSS > BSS
American Shad	0.40	0.47	0.07	0.61	0.26	0.990	Not Biol. Different
Atlantic Tomcod	0.20	0.26	0.06	0.31	0.71	0.084	Not Biol. Different
Bay Anchovy	0.40	1.00	0.60	0.43	1.32	0.002	Separate Analysis
Blueback Herring	0.60	0.95	0.35	0.06	0.48	0.676	Not Biol. Different
Bluefish	0.40	0.00	0.40	0.25	1.36	0.010	FSS > BSS
Hogchoker	0.60	0.00	0.60	0.88	0.92	< 0.001	FSS > BSS
Striped Bass	0.60	0.32	0.28	0.46	0.52	0.500	Not Biol. Different
Weakfish	0.40	0.58	0.18	0.29	0.20	0.968	Not Biol. Different
White Perch	0.40	0.00	0.40	0.20	1.24	< 0.001	FSS > BSS



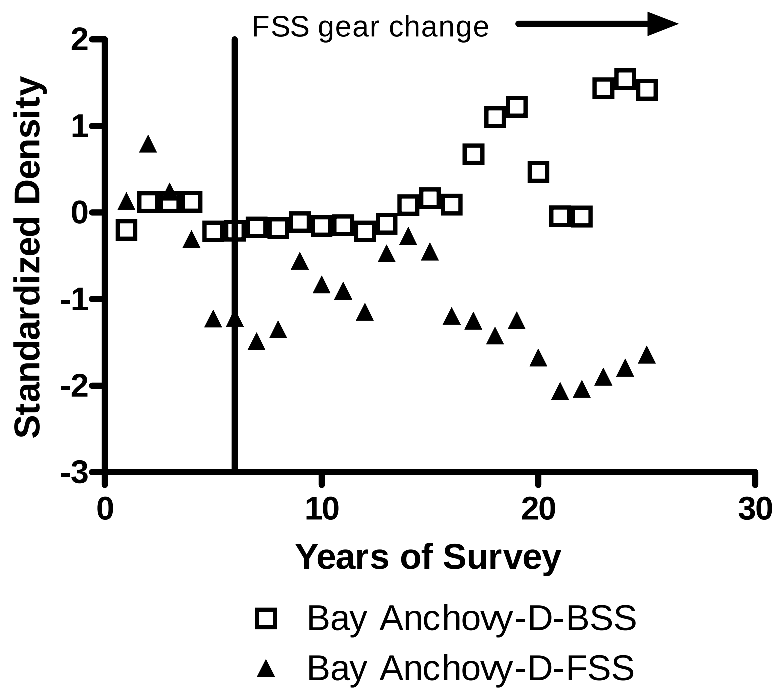
Note: All data were used in WOE analysis; R2 = River Segment 2, Yonkers; 1 – R6 = River Segments 1 – 6.

Figure I-3 River Segment 4 population trends based on the BSS and FSS standardized density (D) not considered biologically different



Note: All data were used in WOE analysis.

Figure I-4 River Segment 4 population trends based on the BSS and FSS standardized density (D) for which the FSS density is greater



1 Note: All years were analyzed separately for WOE analysis; R2 = River Segment 2, Yonkers.

Figure I-5 River Segment 4 population trends based on the BSS and FSS standardized density (D) for which the FSS may indicate a gear difference

The following tables are the intermediate analyses for the assessment of population trends associated with fish density sampled from River Segment 4. Results of these river-segment trend analyses are compiled in Table H-14 in Section H.1.3 of the SEIS Appendices. The data used in this analysis, in order of appearance, were the standardized 75th percentile of the weekly fish density for a given year collected from the FSS (Table I-8, Table I-9, Table I-10, and Figure I-6), BSS (Table I-11, Table I-12, Table I-13, and Figure I-7), and LRS for Atlantic tomcod only (Table I-14, Table I-15, Table I-16, and Figure 8).

Two FSS alewife density observations, not extreme outliers, were removed from the regression analysis to allow the segmented regression to converge (Tables I-9 and I-10). These observations corresponded to the peaks in two sporadic increases. Three FSS white catfish density observations, also not extreme outliers, were removed from the regression analysis to allow the segmented regression to converge. The results of both regression models with the observations removed were considered more conservative and were used for the trend analysis.

Table I-8. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used on FSS Population Trends of YOY Fish Density from River Segment 4

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife (2 values removed)	-0.04	-0.20	1990	0.02
American Shad (All data)	0.20	-0.06	1997	-0.10
Atlantic Tomcod (All data)	0.40	-0.01	1990	-0.08
Bay Anchovy (1985-2005)	-1.00	0.10	1990	-0.10
Blueback Herring (All data)	0.50	-0.08	1990	-0.02
Bluefish (All data)	0.30	-0.09	1996	-0.01
Hogchoker (All data)	0.03	0.05	1989	-0.10
Rainbow Smelt (1979-1997)	0.00	0.30	1991	-0.30
Striped Bass (All data)	-0.08	0.07	1990	0.00
Weakfish (All data)	0.40	-0.08	1990	-0.02
White Catfish (3 values removed)	-0.20	0.08	1986	0.10
White Perch (All data)	1.00	-0.07	1982	0.00

Table I-9. Competing Models Used To Characterize the Standardized River Segment 4 FSS Population Trends of YOY Fish Density Using a 3-Year Moving Average

	Linear Regression			Segmented Regression			
Species	**MSE**	**Slope**	**p-value**	**MSE**	**95 percent CI Slope 1**	**Join Point**	**95 percent CI Slope 2**
Alewife (All data)	0.58	-0.035 ± 0.016	0.040	Did Not Converge			
Alewife (2 values removed)	0.47	-0.041 ± 0.014	0.007	0.50	-0.070 to -0.007	2004	-3.93e+008 to 3.93e+008
American Shad (All data)	0.35	-0.079 ± 0.010	< 0.001	0.36	-0.106 to -0.031	1997	-0.226 to 0.008
Atlantic Tomcod (All data)	0.49	-0.040 ± 0.014	0.007	0.49	-0.510 to 0.691	1983	-0.085 to -0.012
Bay Anchovy 1979-1984	1.10	-0.102 ± 0.262	0.716	Not Fit			
Bay Anchovy 1985-2005	0.96	-0.058 ± 0.035	0.113	0.91	-0.170 to 0.481	1992	-0.287 to -0.004
Blueback Herring (All data)	0.49	-0.055 ± 0.014	0.001	0.51	-0.154 to 0.002	1992	-0.120 to 0.056
Bluefish (All data)	0.52	-0.019 ± 0.014	0.194	0.54	-0.081 to 0.039	1996	-0.178 to 0.153
Hogchoker (All data)	0.58	-0.034 ± 0.016	0.047	0.43	0.038 to 0.268	1988	-0.150 to -0.053
Rainbow Smelt (All data)	0.58	0.012 ± 0.029	0.67	0.51	-0.018 to 0.142	1993	-1.05 to 0.260
Striped Bass (All data)	0.46	0.034 ± 0.013	0.013	0.44	-0.014 to 0.241	1988	-0.045 to 0.053
Weakfish (All data)	0.56	-0.047 ± 0.016	0.006	0.52	-0.243 to -0.038	1990	-0.062 to 0.081
White Catfish (All data)	0.57	0.014 ± 0.016	0.37	Did Not Converge			
White Catfish (3 values removed)	0.10	0.007 ± 0.003	0.030	0.10	-0.025 to 0.070	1986	-0.006 to 0.013
White Perch (All data)	0.62	-0.014 ± 0.017	0.413	0.63	-2.43 to 1.27	1981	-0.047 to 0.035

CI = confidence interval.

Table I-10 River Segment 4 Assessment of the Level of Potential Negative Impact Based on the Standardized FSS Density Using a 3-Year Moving Average

Species	Best Fit	General Trend	Level of Potential Negative Impact
Alewife (All data)	LR	S < 0	4
Alewife (2 values removed)	LR	S < 0	4
American Shad	LR	S < 0	4
Atlantic Tomcod	LR	S < 0	4
Bay Anchovy 1979–1984	LR	S = 0	4
Bay Anchovy 1985–2005	SR	S1 = 0 S2 < 0	
Blueback Herring	LR	S < 0	4
Bluefish	LR	S = 0	1
Hogchoker	SR	S1 > 0 S2 < 0	4
Rainbow Smelt	SR	S1 = 0 S2 = 0	1
Striped Bass	SR	S1 = 0 S2 = 0	1
Weakfish	SR	S1 < 0 S2 = 0	4
White Catfish (All data)	LR	S = 0	1
White Catfish (3 values removed)	LR	S > 0	1
White Perch	LR	S = 0	1

LR = Linear Regression; SR = Segmented Regression.

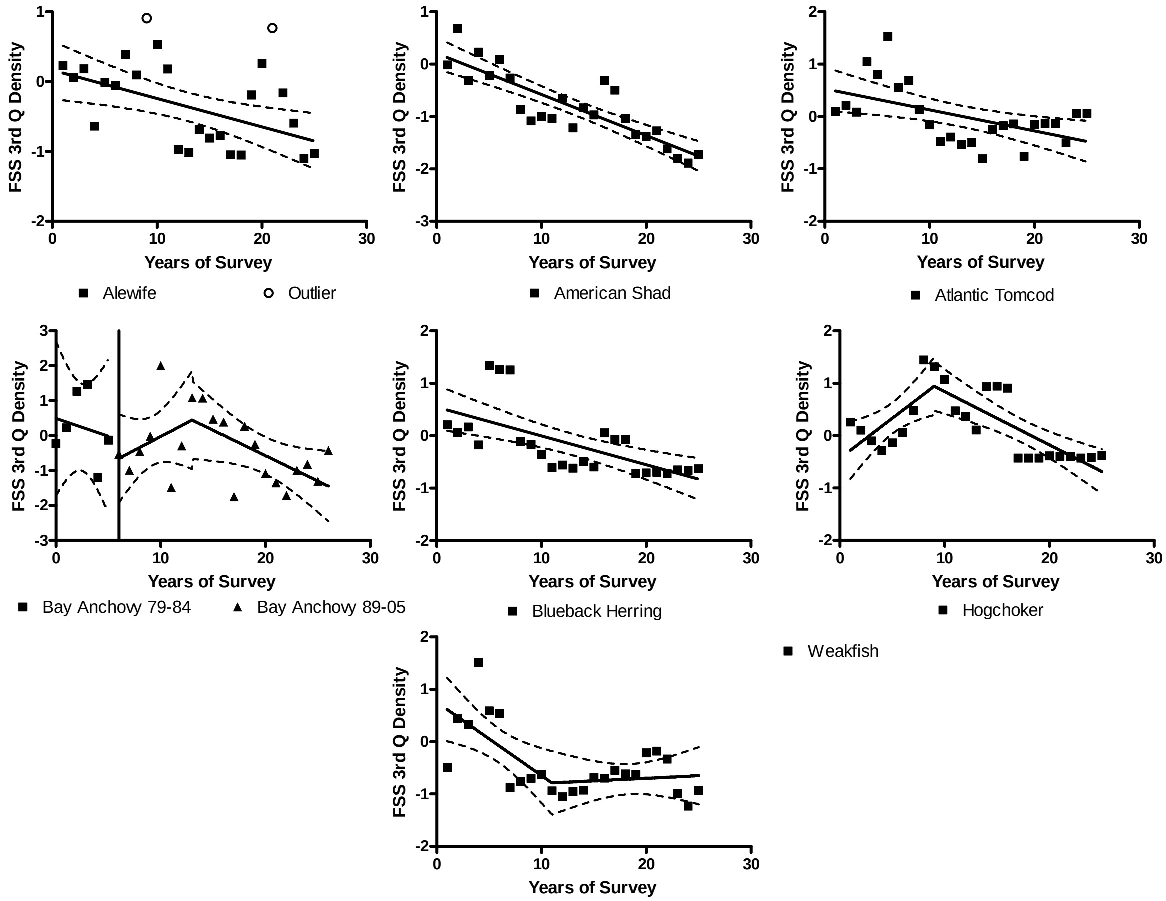


Figure I-6 River Segment 4 population trends based on the FSS standardized density assigned a large level of potential negative impact

Table I-11. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used on BSS Population Trends of YOY Fish Density from River Segment 4

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife	-0.04	-0.20	1990	0.02
American Shad	0.20	-0.04	1992	-0.07
Bay Anchovy	0.04	-0.06	1997	-0.11
Blueback Herring	0.50	0.07	1990	-0.08
Bluefish	0.30	-0.09	1996	-0.01
Hogchoker	0.03	0.05	1989	-0.10
Spottail shiner	1.30	-0.80	1982	0.00
Striped Bass	0.18	-0.04	1984	0.04
White Perch	0.30	-0.12	1991	-0.05

Table I-12 Competing Models Used To Characterize the Standardized River Segment 4 BSS Population Trends of YOY Fish Density Using a 3-Year Moving Average

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife	0.57	-0.030 ± 0.016	0.065	0.39	-0.459 to -0.156	1986	-0.010 to 0.063
American Shad	0.35	-0.069 ± 0.010	< 0.001	0.34	-0.724 to 0.270	1983	-0.083 to -0.036
Bay Anchovy	0.44	0.056 ± 0.012	0.000	0.39	-0.095 to 0.058	1991	0.055 to 0.161
Blueback Herring	0.53	-0.024 ± 0.015	0.120	0.42	-0.005 to 0.100	1994	-0.235 to -0.042
Bluefish	0.58	-0.038 ± 0.016	0.027	0.48	-0.146 to -0.047	1996	-0.021 to 0.287
Hogchoker	0.52	-0.059 ± 0.014	< 0.001	0.40	-0.250 to -0.092	1991	-0.034 to 0.076
Spottail Shiner	0.43	-0.017 ± 0.012	0.176	0.35	-0.469 to -0.004	1985	-0.014 to 0.043
Striped Bass	0.42	0.040 ± 0.012	0.002	0.43	-0.287 to 0.221	1985	0.013 to 0.087
White Perch	0.61	-0.062 ± 0.017	0.001	0.40	-0.247 to -0.122	1992	-0.007 to 0.133

Table I-13 River Segment 4 Assessment of the Level of Potential Negative Impact Based on the Standardized BSS Density Using a 3-Year Moving Average

Species	Best Fit	General Trend	Final Decision
Alewife	SR	S1 < 0 S2 = 0	4
American Shad	SR	S1 = 0 S2 < 0	4
Bay Anchovy	SR	S1 = 0 S2 > 0	1
Blueback Herring	SR	S1 = 0 S2 < 0	4
Bluefish	SR	S1 < 0 S2 = 0	4
Hogchoker	SR	S1 < 0 S2 = 0	4
Spottail Shiner	SR	S1 < 0 S2 = 0	4
Striped Bass	LR	S > 0	1
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.

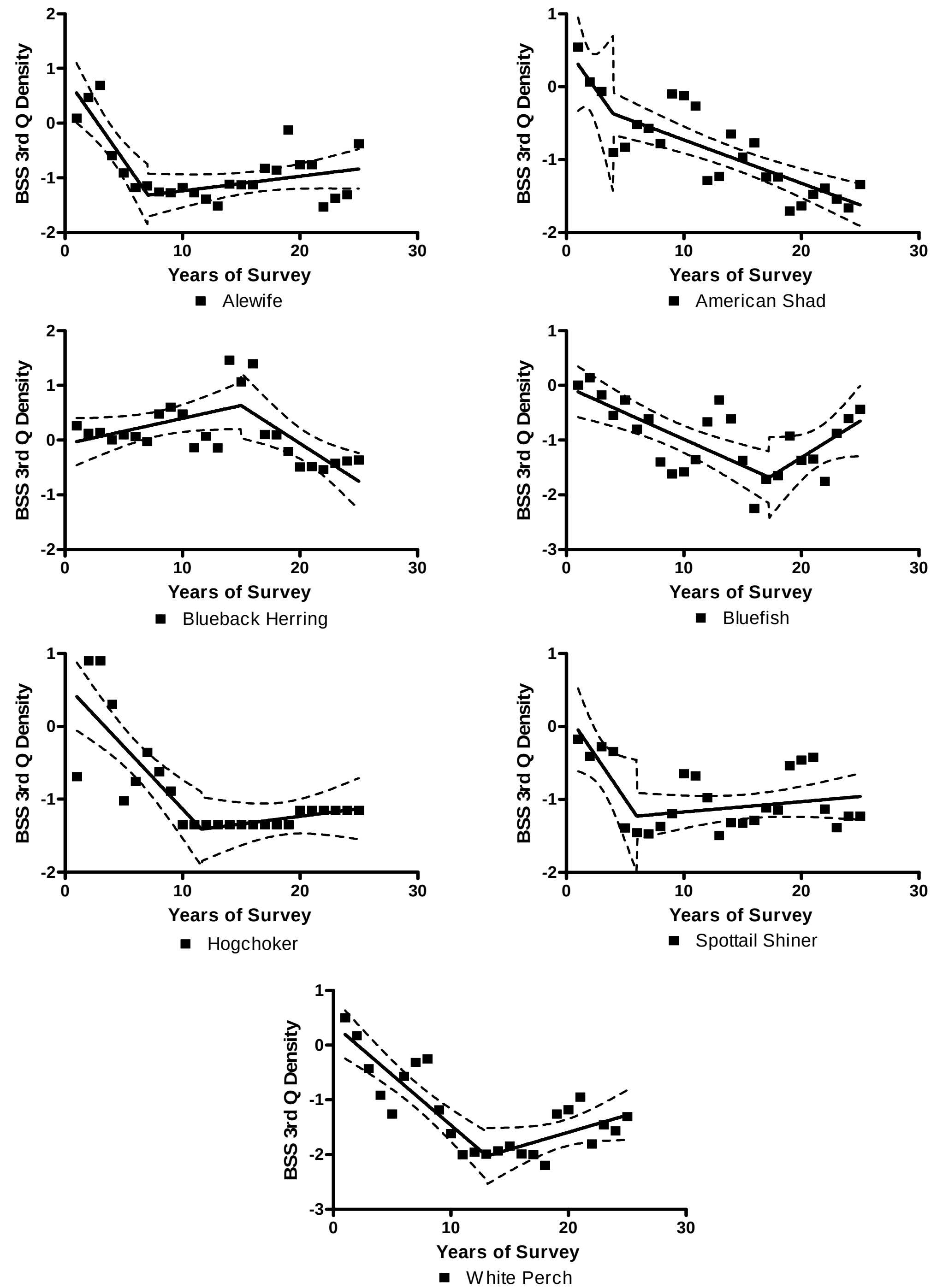


Figure I-7 River Segment 4 population trends based on the BSS standardized density assigned a large level of potential negative impact

Table I-14. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used on LRS Population Trends of YOY Fish Density from River Segment 4

Taxa	Intercept	Slope 1	Join Point	Slope 2
Atlantic Tomcod	0.20	-0.50	1989	0.50

Table I-15 Competing Models Used To Characterize the Standardized River Segment 4 LRS Population Trends of YOY Atlantic Tomcod Density Using a 3-Year Moving Average

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Atlantic Tomcod	0.53	-0.074 ± 0.015	< 0.001	0.49	-0.187 to -0.067	1982	-0.098 to 0.124

Table I-16 River Segment 4 Assessment of the Level of Potential Negative Impact Based on the Standardized LRS Atlantic Tomcod YOY Density Using a 3-Year Moving Average

Species	Best Fit	General Trend	Level of Potential Negative Impact
Atlantic Tomcod	SR	S1 < 0 S2 = 0	4

SR = Segmented Regression.

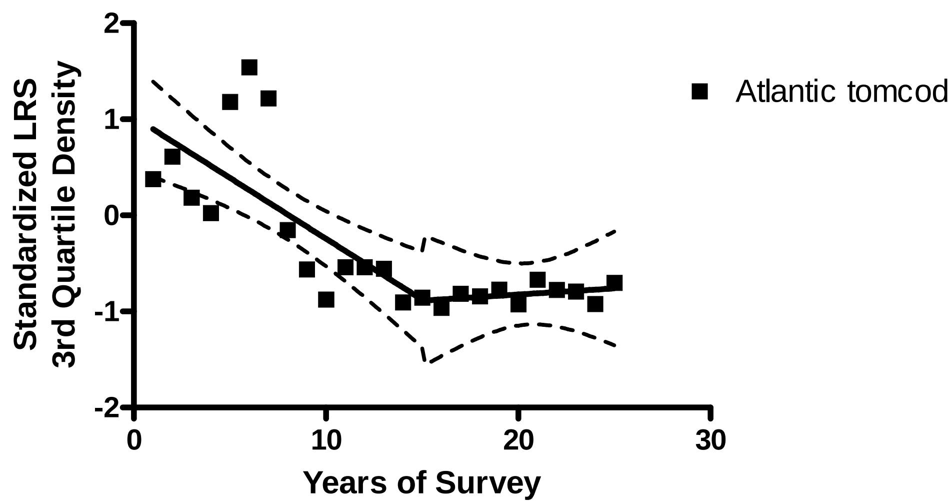
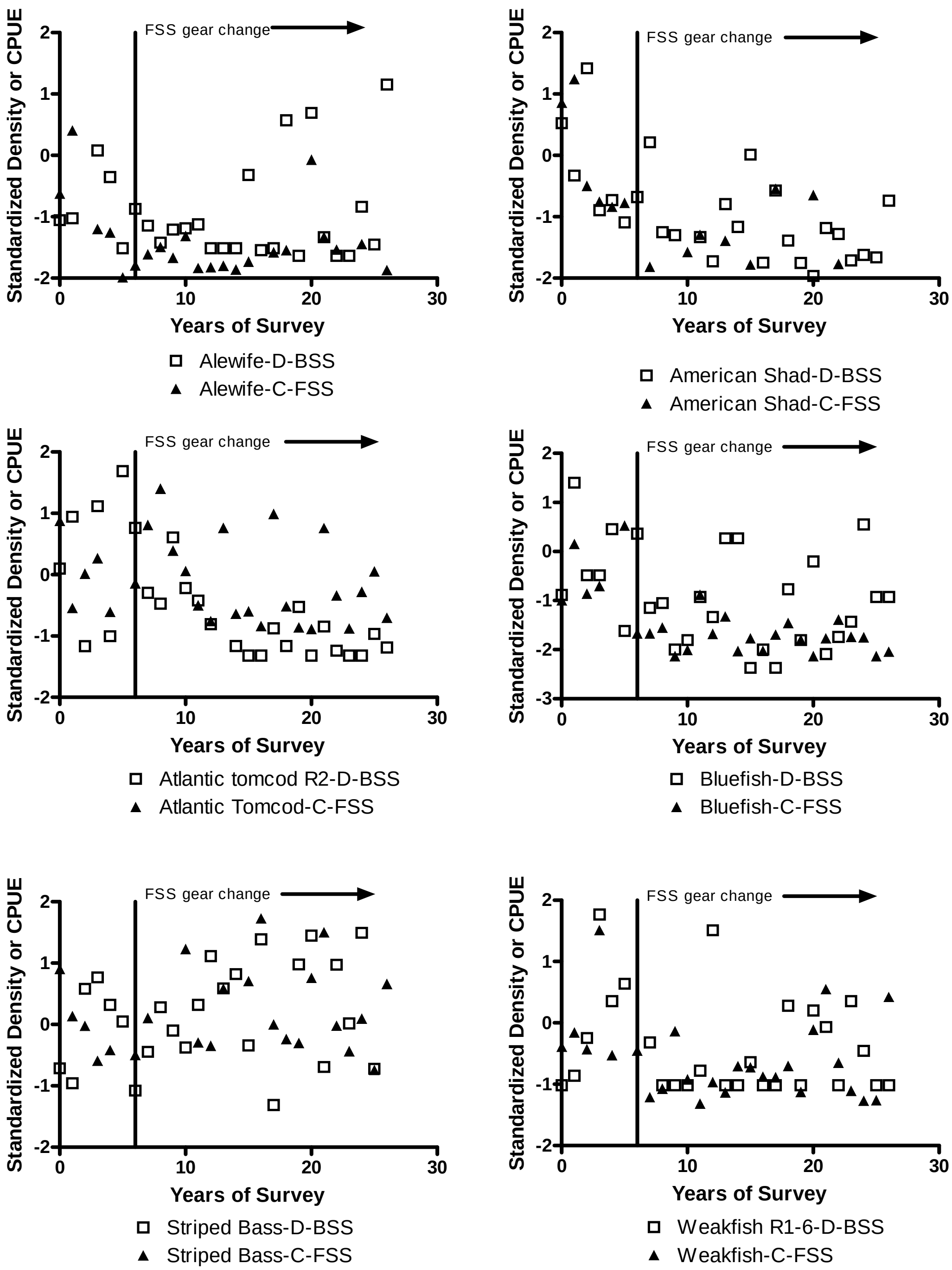


Figure I-8. River Segment 4 population trends based on the LRS standardized density assigned a large level of potential negative impact

A visual and statistical comparison of the river-segment FSS standardized CPUE with the BSS standardized density (Table I-17) suggested that the trends for alewife, American shad, Atlantic tomcod, bluefish, striped bass, and weakfish were not biologically different (Figure I-9). Observations from both surveys overlap and cross over each other. The post-1985 FSS CPUE observations for hogchoker and white perch were greater than the BSS observations and did not show a decline associated with the gear change (Figure I-10). Thus, for these RIS, all of the FSS CPUE data (1979–2005) were used in the regression analysis. The FSS density data for bay anchovy and blueback herring, however, did show a potential gear effect (Figure I-11), and a pre- and post-1985 analysis was conducted.

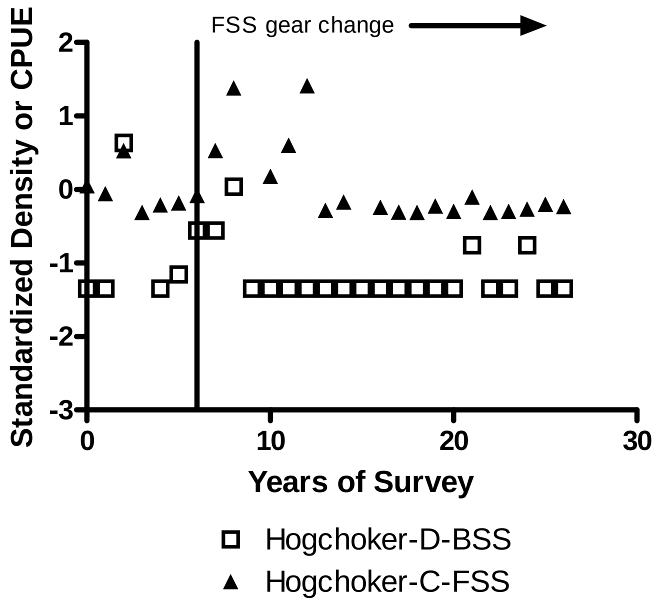
Table I-17. Evaluation of Gear Effect on FSS CPUE Population Trends in River Segment 4

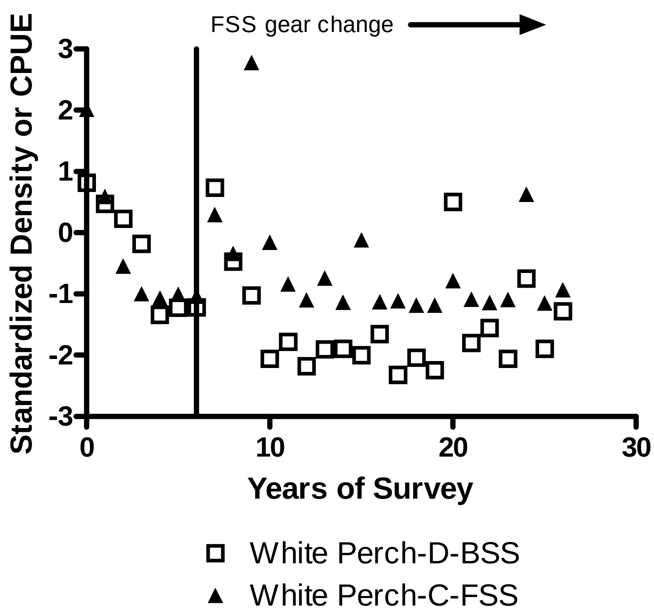
Taxa	Proportion FSS < BSS		Absolute Difference in Proportions	Medan Absolute Difference		Significance of Sign Test	Conclusion
	1979-1984	1985-2005		1979-1984	1985-2005		
Alewife	0.50	0.90	0.40	0.69	0.46	0.808	Not Biol. Different
American Shad	0.33	0.86	0.52	0.32	0.82	0.013	Not Biol. Different
Atlantic Tomcod	0.33	0.24	0.10	1.02	0.64	0.332	Not Biol. Different
Bay Anchovy	0.50	1.00	0.50	1.07	2.21	< 0.001	Separate Analysis
Blueback Herring	0.67	0.95	0.29	0.61	1.25	< 0.001	Separate Analysis
Bluefish	0.67	0.71	0.05	0.81	0.53	0.332	Not Biol. Different
Hogchoker	0.33	0.00	0.33	1.22	1.11	< 0.001	FSS > BSS
Striped Bass	0.50	0.52	0.02	1.23	1.28	0.004	Not Biol. Different
Weakfish	0.50	0.62	0.12	0.66	0.36	0.668	Not Biol. Different
White Perch	0.33	0.10	0.24	0.52	0.94	0.013	FSS > BSS



Note: All data were used in WOE analysis; R2 = River Segment 2 and R1-6 = River Segments 1-6.

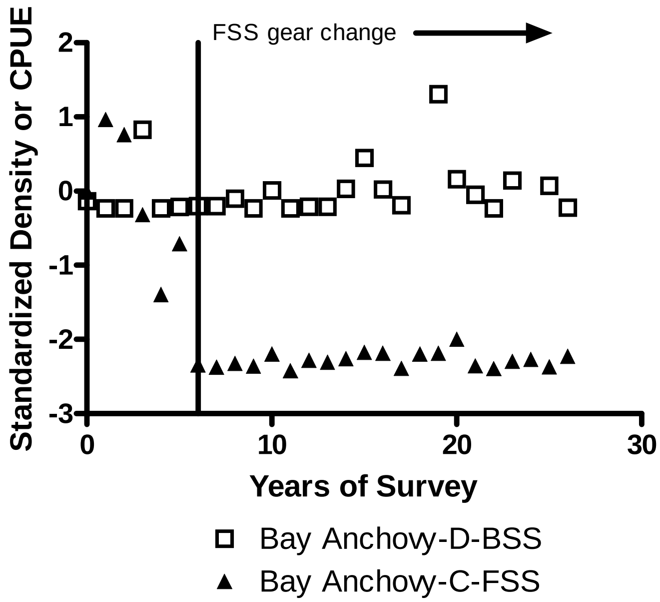
Figure I-9. River Segment 4 population trends based on the FSS standardized CPUE (C) and BSS density (D) not considered biologically different

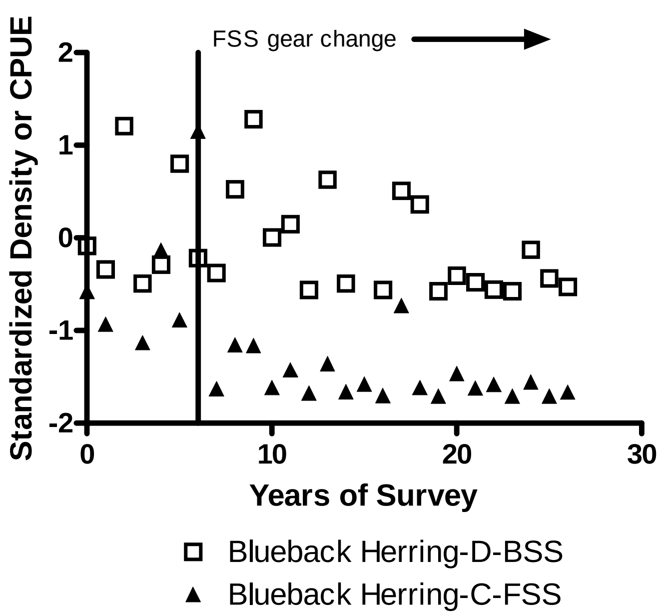




Note: All data were used in WOE analysis.

Figure I-10. River Segment 4 population trends based on the FSS standardized CPUE (C) and BSS density (D) for which the FSS density is greater.





1 Note: Years were analyzed separately for WOE analysis.

2 **Figure I-11. River Segment 4 population trends based on the FSS standardized CPUE (C)**
3 **and BSS density (D) for which the FSS may indicate a gear difference**

The following tables were the intermediate analyses for the assessment of population trends associated with fish CPUE sampled from River Segment 4 (Indian Point). Results of these river-segment trend analyses were compiled in Table H-13 in Section H.1.3 of the SEIS. The data used in this analysis (from Entergy 2007), in order of appearance, were the standardized 75th percentile of the weekly fish CPUE for a given year collected from the FSS (Table I-18, Table I-19, Table I-20, and Figure I-12) and LRS for Atlantic tomcod only (Table I-21, Table I-22 and Table I-23). The Atlantic tomcod population trend observed with the LRS CPUE data was analyzed both before and after the gear change using a 3-year moving average. The data were standardized first and then smoothed.

Table I-18 Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in FSS Population Trends of YOY Fish CPUE from River Segment 4

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife	-0.04	-0.20	1990	0.02
American Shad	0.20	-0.50	1986	0.00
Atlantic Tomcod (All data)	0.40	0.06	1988	0.00
Bay Anchovy (1985-2005)	0.04	-0.50	1990	0.00
Bluefish	0.30	-0.09	1996	-0.01
Hogchoker (All data)	-0.17	0.08	1987	-0.05
Hogchoker (2 values removed)	0.03	0.05	1989	-0.10
Rainbow Smelt	1.00	-0.80	1982	0.00
Striped Bass	-0.08	0.07	1990	0.00
Weakfish (All data)	0.40	-0.08	1990	-0.02
Weakfish (2 values removed)	0.40	-0.08	1990	-0.02
White Perch (All data)	2.00	-1.00	1981	-0.01
White Perch (1 value removed)	1.00	0.00	1982	0.00

Table I-19 Competing Models Used To Characterize the Standardized River Segment 4, FSS Population Trends of YOY Fish CPUE

Species	Linear Regression			Segmented Regression			
	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife	0.92	-0.055 ± 0.023	0.022	0.79	-0.839 to -0.058	1984	-0.058 to 0.060
American Shad	0.76	-0.085 ± 0.019	< 0.001	0.57	-0.717 to -0.159	1985	-0.067 to 0.018
Atlantic Tomcod (All data)	0.95	-0.046 ± 0.024	0.063	0.99	-6.78 to 6.63	1980	-0.102 to 0.012
Atlantic Tomcod (1 value removed)	0.66	-0.028 ± 0.017	0.106	Did Not Converge			
Bay Anchovy 1979–1984	0.80	-0.373 ± 0.191	0.123	Not Fit			
Bay Anchovy 1985–2005	1.00	0.034 ± 0.036	0.360	0.96	-0.022 to 0.248	1999	-0.596 to 0.172
Blueback Herring 1979–1984	1.11	-0.059 ± 0.266	0.835	Not Fit			
Blueback Herring 1985–2005	0.38	-0.022 ± 0.015	0.152	Did Not Converge			
Bluefish	0.84	-0.072 ± 0.021	0.002	0.82	-0.374 to -0.002	1988	-0.106 to 0.061
Hogchoker (All data)	1.00	-0.025 ± 0.025	0.332	0.92	-0.101 to 0.368	1988	-0.184 to 0.000
Hogchoker (2 values removed)	0.47	-0.021 ± 0.012	0.087	0.44	-0.049 to 0.211	1987	-0.097 to -0.008
Rainbow Smelt	0.89	-0.062 ± 0.022	0.009	0.45	-4.95 to -2.33	1980	-0.049 to 0.002
Striped Bass	1.01	-0.013 ± 0.025	0.599	1.00	-0.089 to 0.178	1993	-0.259 to 0.076
White Perch (All data)	0.95	-0.047 ± 0.023	0.055	0.87	-3.97 to 1.12	1981	-0.071 to 0.029
White Perch (1 value removed)	0.72	-0.039 ± 0.018	0.038	0.51	-2.02 to -0.538	1981	-0.037 to 0.026
Weakfish (All data)	0.98	-0.036 ± 0.024	0.152	0.97	-0.282 to 0.045	1991	-0.098 to 0.159
Weakfish (2 values removed)	0.52	-0.003 ± 0.014	0.842	0.50	-0.162 to 0.033	1990	-0.026 to 0.095

Two extreme outliers (both values greater than 3 standard deviations from the mean) were removed from the FSS hogchoker CPUE regression analysis because of their influence on the regression (Tables I-19 and I-20). One extreme outlier (value greater than 3 standard deviations from the mean) was removed from the FSS Atlantic tomcod CPUE regression analysis, and one extreme outlier (value greater than 2 standard deviations from the mean) was removed from the FSS white perch CPUE regression analysis. These extreme outliers had a great influence on the regression results. One value (not an extreme outlier) and one extreme outlier (greater than 3 standard deviations from the mean) were removed from the FSS weakfish CPUE regression analysis because of the influence these data had on the regression results. The results of the regression models with the observations removed were more conservative and were used for the trend analysis.

Table I-20 River Segment 4 Assessment of the Level of Potential Negative Impact Based on the Standardized FSS CPUE

Species	Best Fit	General Trend	Level of Potential Negative Impact
Alewife	SR	S1 < 0 S2 = 0	4
American Shad	SR	S1 < 0 S2 = 0	4
Atlantic Tomcod (All data)	LR	S = 0	1
Atlantic Tomcod (1 value removed)	LR	S = 0	1
Bay Anchovy 1979–1984	LR	S = 0	1
Bay Anchovy 1985–2005	SR	S1 = 0 S2 = 0	
Blueback Herring 1979–1984	LR	S = 0	1
Blueback Herring 1985–2005	LR	S = 0	
Bluefish	SR	S1 < 0 S2 = 0	4
Hogchoker (All data)	SR	S1 = 0 S2 = 0	1
Hogchoker (2 values removed)	SR	S1 = 0 S2 < 0	4
Rainbow Smelt	SR	S1 < 0 S2 = 0	4
Striped Bass	SR	S1 = 0 S2 = 0	1
Weakfish (All data)	SR	S1 = 0 S2 = 0	1
Weakfish (2 values removed)	SR	S1 = 0 S2 = 0	1
White Perch (All data)	SR	S1 = 0 S2 = 0	1
White Perch (1 value removed)	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.

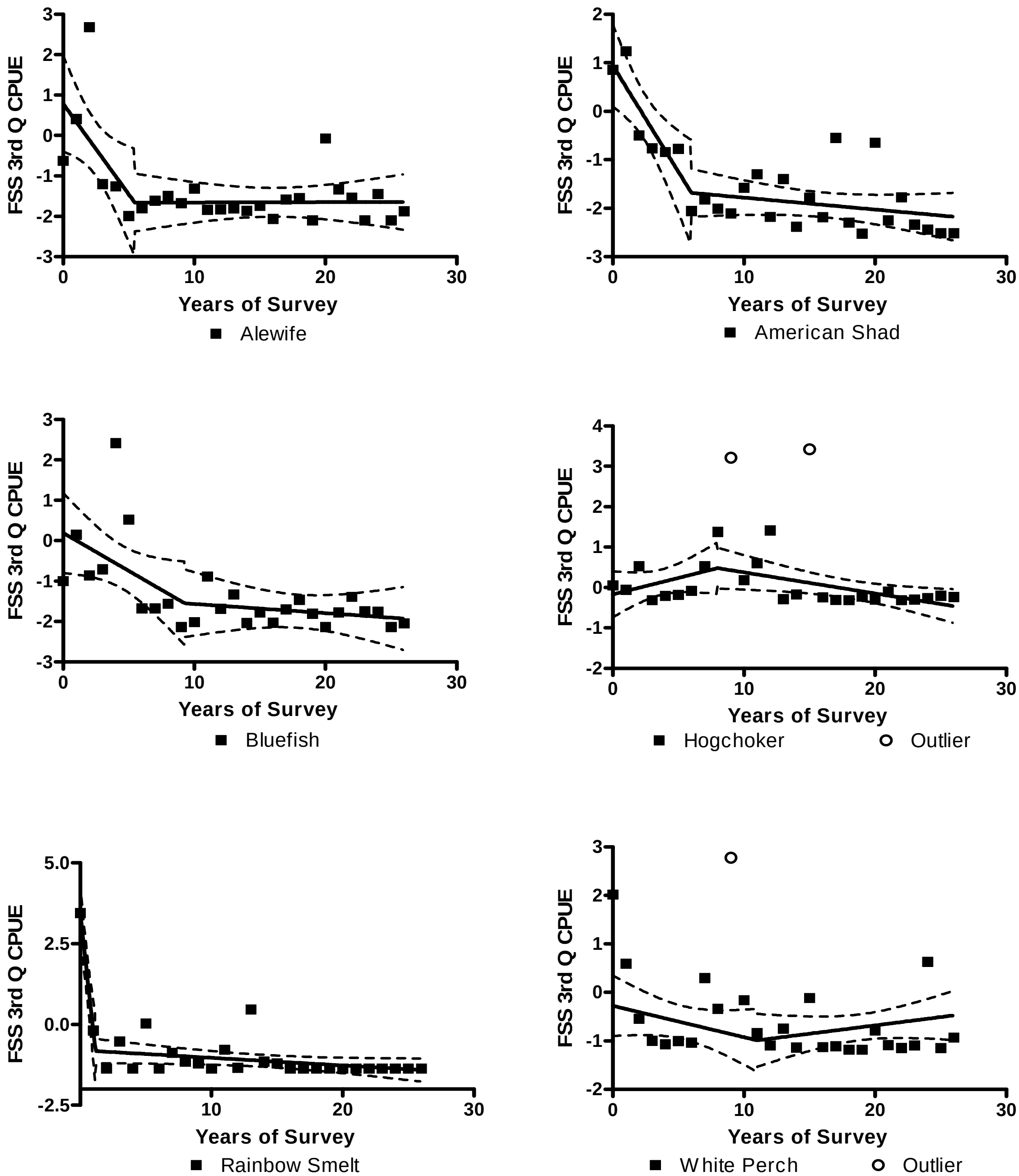


Figure I-12 River Segment 4 population trends based on the FSS standardized CPUE assigned a large level of potential negative impact

Table I-21. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used on LRS Population Trends of YOY Fish CPUE from River Segment 4

Taxa	Intercept	Slope 1	Join Point	Slope 2
Atlantic Tomcod (1985-2005)	0.30	-0.02	1999	0.10

Table I-22. Competing Models Used To Characterize the Standardized River Segment 4 LRS Population Trends of YOY Atlantic Tomcod CPUE Using a 3-Year Moving Average

Species	Linear Regression			Segmented Regression			
	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Atlantic Tomcod (1979-1984)	0.31	0.494 ± 0.074	0.003	Not Fit			
Atlantic Tomcod (1985-2005)	0.57	-0.069 ± 0.022	0.006	0.28	-0.873 to -0.338	1989	-0.031 to 0.034

Table I-23. River Segment 4 Assessment of the Level of Potential Negative Impact Based on the Standardized LRS Atlantic Tomcod YOY CPUE Using a 3-Year Moving Average

Species	Best Fit	General Trend	Level of Potential Negative Impact
Atlantic Tomcod (1979-1984)	LR	S > 0	4
Atlantic Tomcod (1985-2005)	SR	S1 < 0 S2 = 0	

LR = Linear Regression; SR = Segmented Regression.

The results of the two measurement metrics—density (estimated number of RIS per given volume of water provided by the applicant) and CPUE (number of RIS captured by the sampler for a given volume of water derived by the NRC staff) were combined for the assessment of population impacts potentially associated with the IP2 and IP3 cooling systems. Table I-25 presents the numeric results compiled from Tables I-8, I-10, I-12, I-14, and I-16 above and used to derive Table H-14 in Section H.3 in the SEIS Appendices.

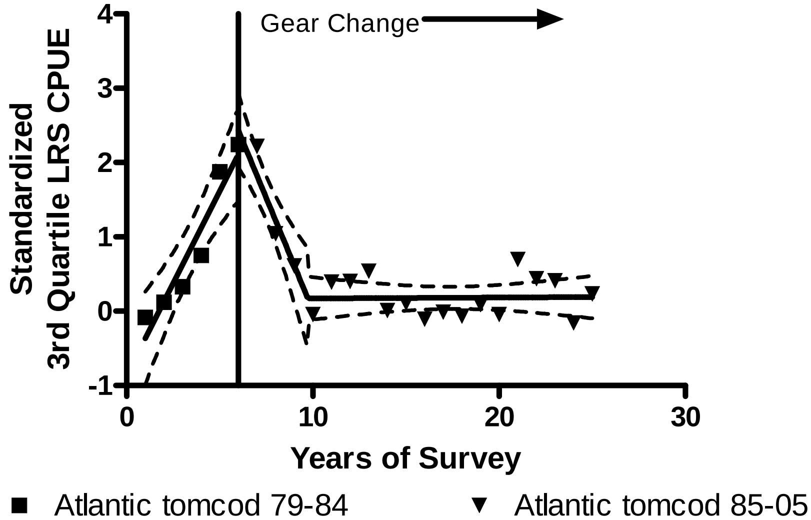


Figure I-13. River Segment 4 population trends based on the LRS standardized CPUE assigned a large level of potential negative impact

Table I-24. Assessment of Population Impacts for IP2 and IP3 River Segment 4

Species	Density			CPUE		River-Segment Assessment
	FSS	BSS	LRS	FSS	LRS	
Alewife	4	4	N/A[a]	4	N/A	4.0
American Shad	4	4	N/A	4	N/A	4.0
Atlantic Menhaden	N/A	N/A	N/A	N/A	N/A	Unknown
Atlantic Sturgeon	N/A	N/A	N/A	N/A	N/A	Unknown
Atlantic Tomcod	4	N/A	4	1	4	3.3
Bay Anchovy	4	1	N/A	1	N/A	2.0
Blueback Herring	4	4	N/A	1	N/A	3.0
Bluefish	1	4	N/A	4	N/A	3.0
Gizzard Shad	N/A	N/A	N/A	N/A	N/A	Unknown
Hogchoker	4	4	N/A	4	N/A	4.0
Rainbow Smelt	1	N/A	N/A	4	N/A	2.5
Shortnose Sturgeon	N/A	N/A	N/A	N/A	N/A	Unknown
Spottail Shiner	N/A	4	N/A	N/A	N/A	4.0
Striped Bass	1	1	N/A	1	N/A	1.0
Weakfish	4	N/A	N/A	1	N/A	2.5
White Catfish	1	N/A	N/A	N/A	N/A	1.0
White Perch	1	4	N/A	4	N/A	3.0
Blue Crab	N/A	N/A	N/A	N/A	N/A	Unknown

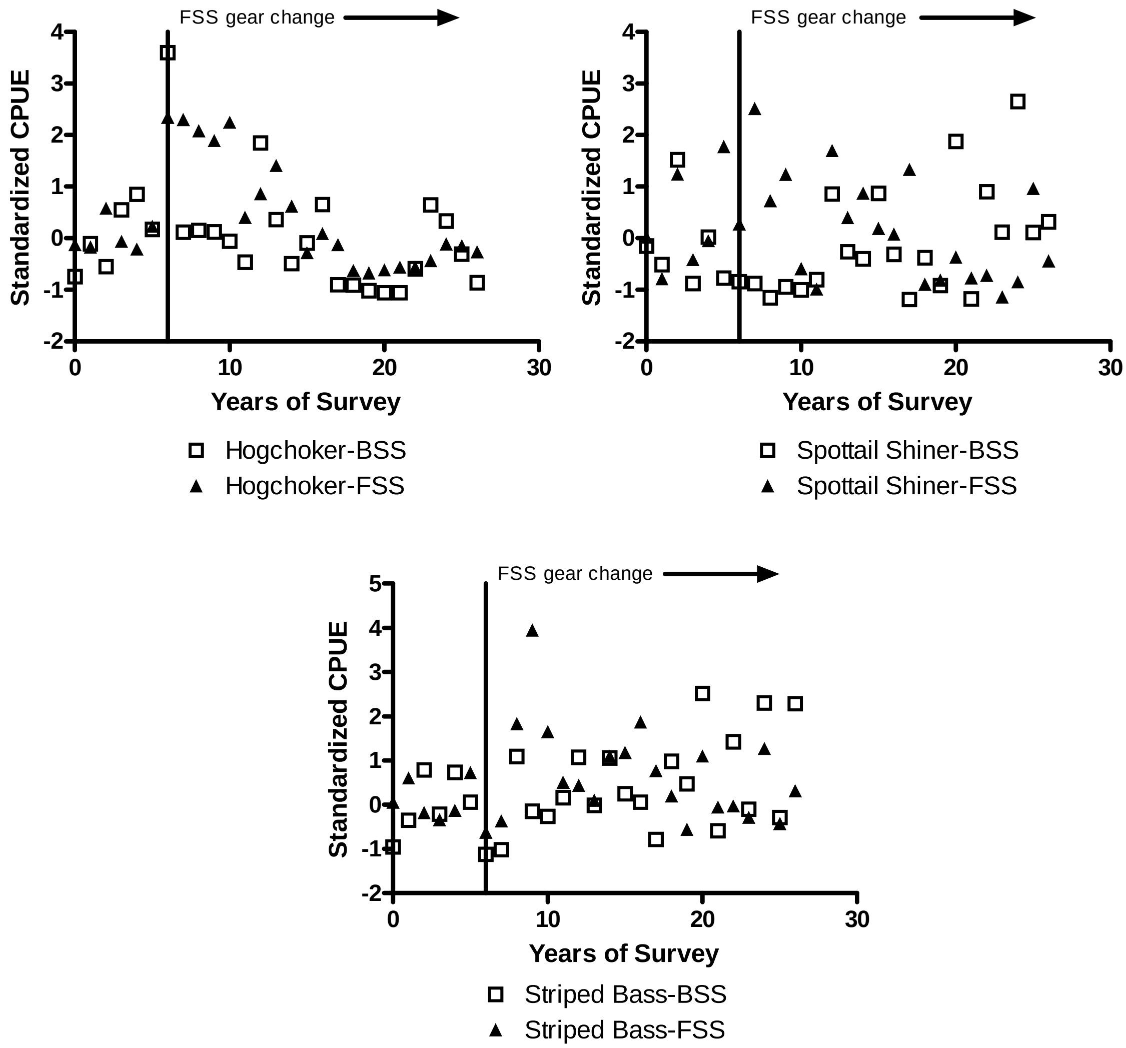
(a) N/A: not applicable; YOY not present in samples

Lower Hudson River

A visual and statistical comparison of the riverwide FSS standardized CPUE with the BSS standardized CPUE (Table I-25) suggested that the trends were not biologically different for hogchoker, spottail shiner, and striped bass (Figure I-14). Observations from both surveys overlap and cross over each other. The post-1985 FSS observations for Atlantic tomcod and white perch were greater than the BSS observations and did not show a decline associated with the gear change (Figure I-15). For these RIS, all of the FSS data (1979–2005) were used in the regression analysis. The FSS density data for alewife, American shad, bay anchovy, blueback herring, and bluefish, however, did show a potential gear effect (Figure I-16), and a pre- and post-1985 analysis was conducted.

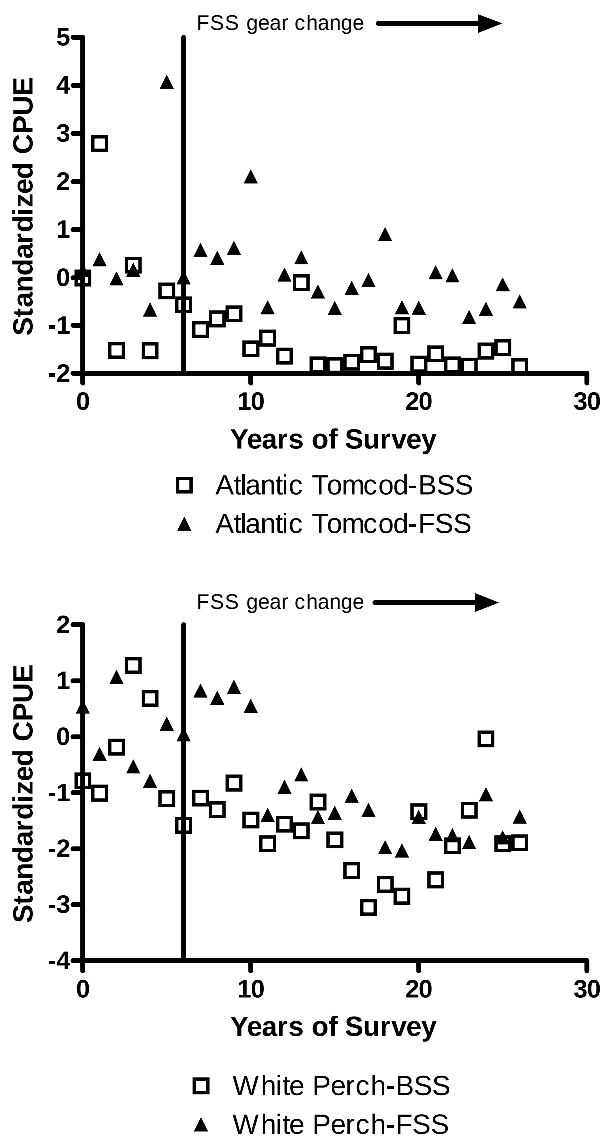
Table I-25. Evaluation of Gear Effect on FSS CPUE Riverwide Population Trends

Taxa	Proportion FSS < BSS		Absolute Difference in Proportions	Medan Absolute Difference		Significance of Sign Test	Conclusion
	1979-1984	1985-2005		1979-1984	1985-2005		
Alewife	0.67	1.00	0.33	0.68	1.47	< 0.001	Separate Analysis
American Shad	0.33	1.00	0.67	1.17	1.60	< 0.001	Separate Analysis
Atlantic Tomcod	0.33	0.00	0.33	1.18	1.36	< 0.001	FSS > BSS
Bay Anchovy	0.50	1.00	0.50	1.04	0.78	< 0.001	Separate Analysis
Blueback Herring	0.50	1.00	0.50	0.86	0.66	< 0.001	Separate Analysis
Bluefish	0.33	1.00	0.67	0.89	1.28	< 0.001	Separate Analysis
Hogchoker	0.50	0.29	0.21	0.61	0.78	< 0.001	Not Biol. Different
Spottail Shiner	0.50	0.38	0.12	0.28	0.85	0.013	Not Biol. Different
Striped Bass	0.50	0.43	0.07	0.91	0.79	0.039	Not Biol. Different
White Perch	0.33	0.19	0.14	1.33	0.81	0.039	FSS > BSS



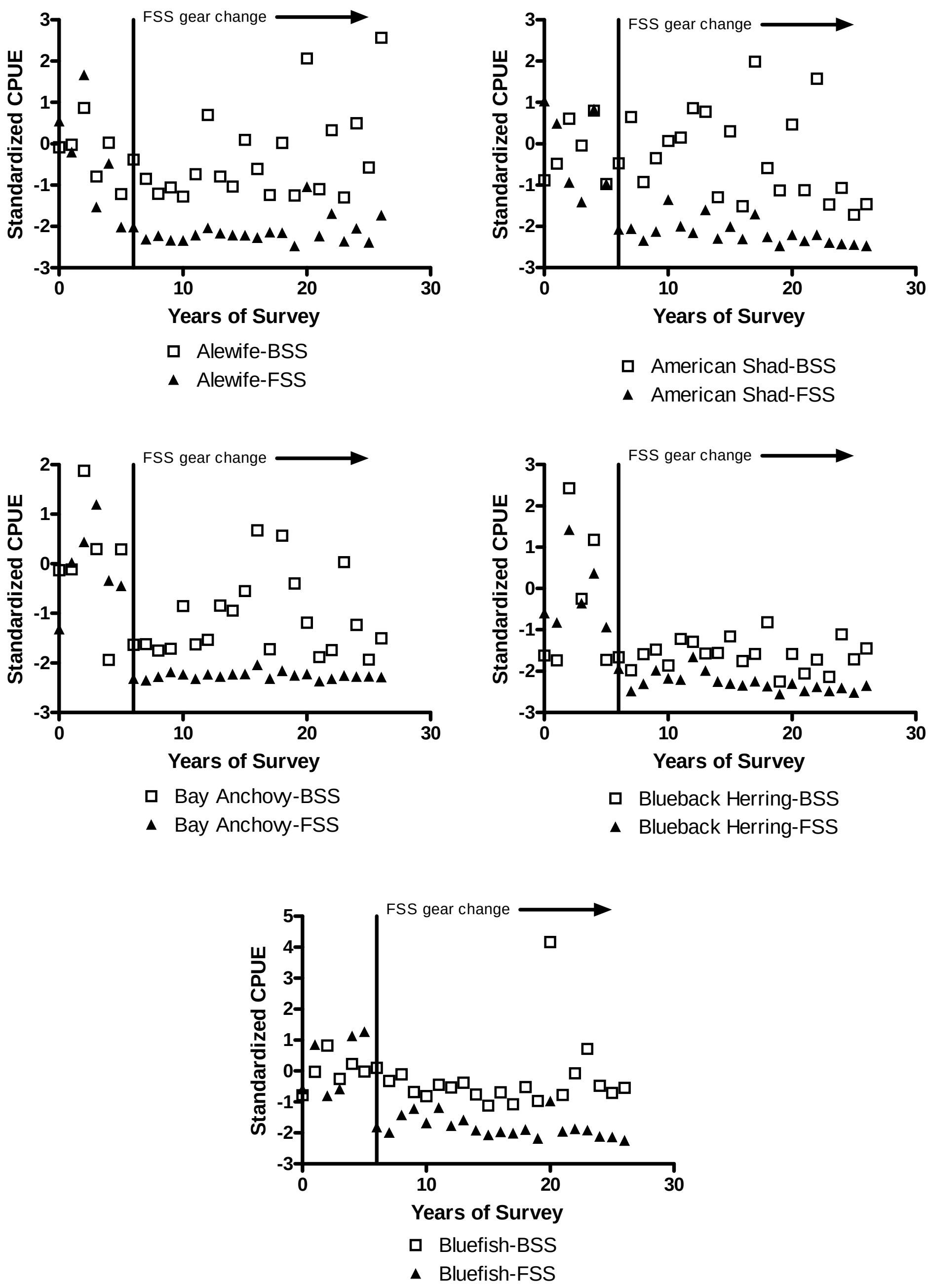
Note**:** All data were used in WOE analysis.

Figure I-14. Riverwide population trends based on the FSS and BSS standardized CPUE not considered biologically different



Note: All data were used in WOE analysis.

Figure I-15. Riverwide population trends based on the FSS and BSS standardized CPUE for which the FSS density is greater



Note: Years were analyzed separately for WOE analysis.

Figure I-16. Riverwide population trends based on the FSS and BSS standardized CPUE for which the FSS may indicate a gear difference

The following tables are the intermediate analyses for the riverwide assessment of population trends associated with annual fish CPUE and the abundance index. Results of these riverwide trend analyses are compiled in Table H-15 in Section H.1.3 of the SEIS Appendices. The data used in this analysis, in order of appearance, were the standardized annual fish CPUE for a given year collected from the FSS (Table I-26, Table I-2718, Table I-28, and Figure I-17), BSS (Table I-29, Table I-30, Table I-31, and Figure I-18), LRS for Atlantic tomcod only (Table I-32, Table I-33 and Table I-34), and the annual fish abundance index (Table I-35, Table I-36, Table I-37, and Figure I-19).

One extreme outlier (value greater than 4 standard deviation away from the mean) was removed from the Atlantic tomcod FSS CPUE regression analysis (Tables I-26, I-27, and I-28) and one from the bluefish BSS CPUE regression analysis (Tables I-29, I-30, and I-31). One extreme outlier (value greater than 4 standard deviations away from the mean) was removed from the abundance index for the bluefish regression analysis (Table I-35, Tables I-36, and I-27). One extreme outlier was also removed from the abundance index for both the rainbow smelt (value greater than 5 standard deviations away from the mean) regression analysis and the white catfish (value greater than 2 standard deviations away from the mean) regression analysis, because of the influence these data had on the regression results. The results of the regression models with the observations removed were more conservative and were used for the trend analysis.

Table I-26. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in FSS CPUE Riverwide Population Trends of YOY Fish

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife (1985-2005)	-0.50	0.30	1989	-0.03
American Shad (1985-2005)	-0.50	0.30	1989	-0.03
Atlantic Tomcod (All data)	0.10	0.00	1991	-0.10
Atlantic Tomcod (1 value removed)	0.10	0.01	1991	-0.01
Bay Anchovy (1985-2005)	-0.50	0.30	1989	-0.03
Blueback Herring (1985-2005)	-0.50	0.30	1989	-0.03
Bluefish (1985-2005)	-0.50	0.30	1989	-0.03
Hogchoker	-0.50	0.30	1987	-0.10
Spottail Shiner	0.00	0.00	1984	0.00
Striped Bass	-0.10	0.10	1989	-0.06

Table I-27 Competing Models Used To Characterize the Standardized Riverwide FSS Population Trends of YOY Fish CPUE

Species	Linear Regression			Segmented Regression			
	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife 1979–1984	0.83	-0.357 ± 0.199	0.148	Not Fit			
Alewife 1985–2005	0.99	0.043 ± 0.036	0.238	1.00	-2.44e-006 to 2.44e+006	1986	-0.028 to 0.139
American Shad 1979–1984	0.98	-0.254 ± 0.235	0.340	Not Fit			
American Shad 1985–2005	0.87	-0.085 ± 0.032	0.015	0.82	-0.293 to 0.805	1989	-0.226 to -0.038
Atlantic Tomcod (All data)	0.95	-0.046 ± 0.023	0.059	0.93	-0.335 to 0.774	1984	-0.146 to -0.009
Atlantic Tomcod (1 value removed)	0.61	-0.028 ± 0.015	0.083	0.60	-0.089 to 0.183	1989	-0.124 to -0.002
Bay Anchovy 1979–1984	1.08	0.135 ± 0.259	0.629	Not Fit			
Bay Anchovy 1985–2005	1.03	-0.002 ± 0.037	0.962	0.99	-0.520 to 1.74	1988	-0.152 to 0.053
Blueback Herring 1979-1984	1.12	0.004 ± 0.267	0.990	Not Fit			
Blueback Herring 1985-2005	0.84	-0.092 ± 0.030	0.007	0.83	-0.272 to 0.382	1991	-0.256 to -0.023
Bluefish 1979–1984	0.92	0.305 ± 0.219	0.236	Not Fit			
Bluefish 1985–2005	0.92	-0.073 ± 0.033	0.039	0.90	-0.874 to 1.44	1988	-0.195 to -0.010
Hogchoker	0.92	-0.055 ± 0.023	0.022	0.65	0.114 to 0.526	1986	-0.198 to -0.086
Spottail Shiner	0.96	-0.043 ± 0.024	0.083	0.91	-0.186 to 0.719	1984	-0.152 to -0.015
Striped Bass	1.02	-0.003 ± 0.025	0.902	0.93	-0.084 to 0.389	1988	-0.164 to 0.023
White Perch	0.65	-0.097 ± 0.016	< 0.001	Did Not Converge			

Table I-28 Riverwide Assessment of the Level of Potential Negative Impact Based on the Standardized FSS CPUE

Species	Best Fit	General Trend	Final Decision
Alewife 1979–1984	LR	S = 0	1
Alewife 1985–2005	LR	S = 0	
American Shad 1979–1984	LR	S = 0	4
American Shad 1985–2005	SR	S1 = 0 S2 < 0	
Atlantic Tomcod (All data)	SR	S1 = 0 S2 < 0	4
Atlantic Tomcod (1 value removed)	SR	S1 = 0 S2 < 0	4
Bay Anchovy 1979–1984	LR	S = 0	1
Bay Anchovy 1985–2005	SR	S1 = 0 S2 = 0	
Blueback Herring 1979–1984	LR	S = 0	4
Blueback Herring 1985–2005	SR	S1 = 0 S2 < 0	
Bluefish 1979–1984	LR	S = 0	4
Bluefish 1985–2005	SR	S1 = 0 S2 < 0	
Hogchoker	SR	S1 > 0 S2 < 0	4
Spottail Shiner	SR	S1 = 0 S2 < 0	4
Striped Bass	SR	S1 = 0 S2 = 0	1
White Perch	LR	S < 0	4

LR = Linear Regression; SR = Segmented Regression.

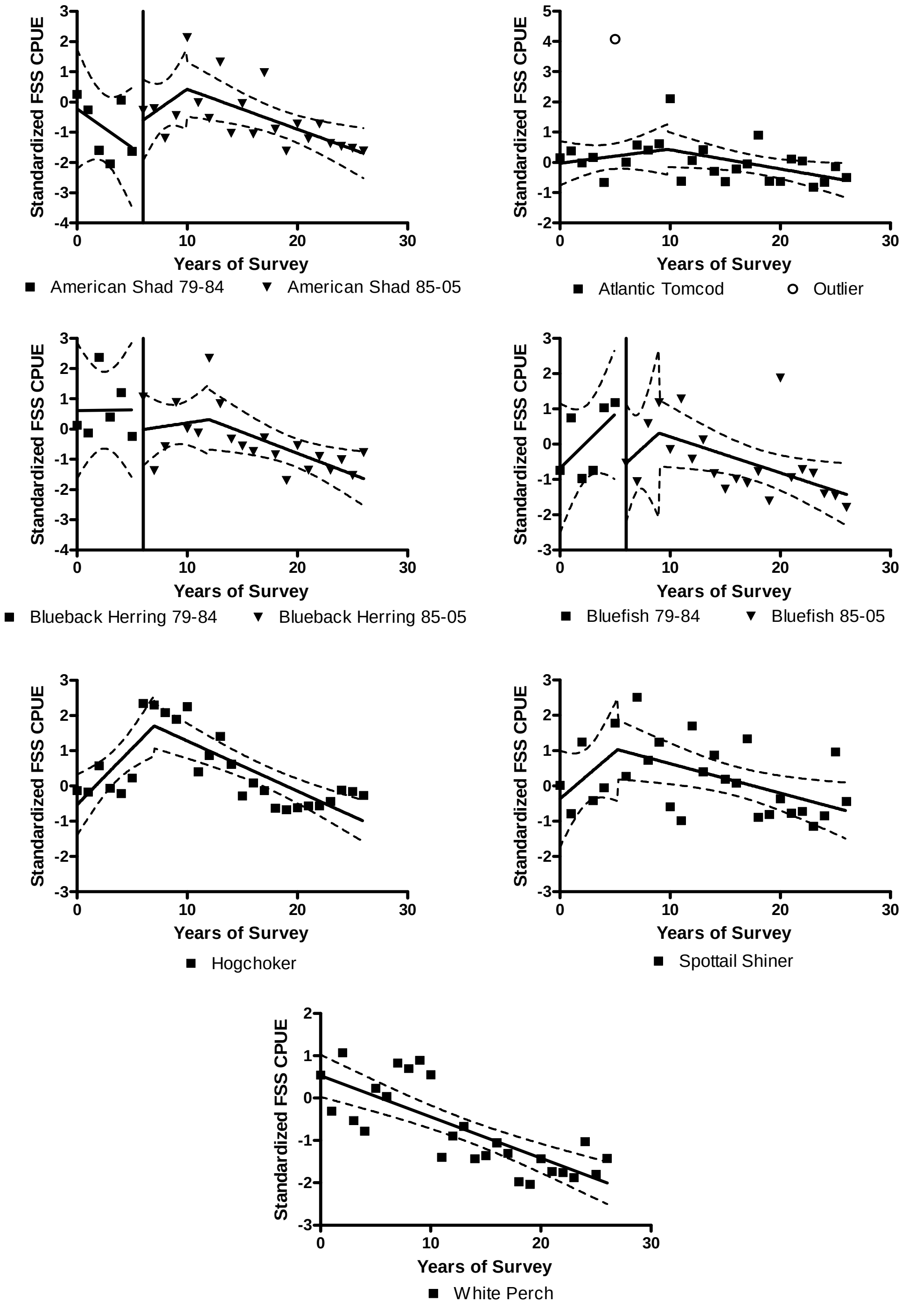


Figure I-17. Riverwide population trend based on the FSS standardized CPUE assigned a large level of potential negative impact

Table I-29. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in BSS CPUE Riverwide Population Trends of YOY Fish

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife	0.50	-0.02	1991	0.00
American Shad	14.00	0.02	1990	-0.05
Atlantic Tomcod	0.05	-0.03	1993	0.00
Bay Anchovy	4.00	-2.00	1986	0.10
Blueback Herring	11.00	0.37	1992	-1.30
Bluefish (All data)	0.30	-0.02	1989	0.03
Bluefish (1 value removed)	0.30	-0.02	1989	0.03
Hogchoker	1.50	0.23	1990	-0.24
Rainbow Smelt	0.16	-0.03	1984	0.00
Spottail Shiner	9.20	-0.50	1988	0.36
Striped Bass	5.20	0.10	1988	0.32
Weakfish	0.00	0.01	1983	0.00
White Catfish	0.10	-0.01	1984	0.00
White Perch	16.90	-0.60	1990	-0.04

Table I-30 Competing Models Used To Characterize the Standardized Riverwide BSS Population Trends of YOY Fish CPUE

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife	0.996	0.027 ± 0.025	0.281	0.944	-0.417 to 0.087	1987	-0.001 to 0.177
American Shad	0.991	-0.030 ± 0.025	0.235	0.981	-0.103 to 0.198	1992	-0.240 to 0.029
Atlantic Tomcod	0.802	-0.078 ± 0.020	0.001	0.787	-0.232 to -0.038	1993	-0.135 to 0.137
Bay Anchovy	0.971	-0.038 ± 0.024	0.123	0.927	-0.631 to 0.094	1986	-0.063 to 0.085
Blueback Herring	0.937	-0.050 ± 0.023	0.042	0.940	-0.429 to 0.091	1987	-0.101 to 0.075
Bluefish (All data)	1.02	0.001 ± 0.025	0.976	1.04	-0.189 to 0.097	1993	-0.101 to 0.218
Bluefish (1 value removed)	0.478	-0.019 ± 0.012	0.121	0.439	-0.103 to -0.013	1995	-0.038 to 0.165
Hogchoker	0.969	-0.039 ± 0.024	0.113	0.913	-0.212 to 0.983	1983	-0.141 to -0.014
Rainbow Smelt	0.875	-0.065 ± 0.022	0.006	0.327	-1.54 to -0.939	1982	-0.022 to 0.021
Spottail Shiner	0.965	0.041 ± 0.024	0.101	0.928	-0.448 to 0.145	1987	0.012 to 0.172
Striped Bass	0.908	0.057 ± 0.022	0.017	0.941	-0.347 to 0.373	1986	-0.010 to 0.147
Weakfish	1.01	-0.021 ± 0.025	0.407	0.996	-0.514 to 1.33	1982	-0.111 to 0.018
White Catfish	0.642	-0.098 ± 0.016	< 0.001	0.668	-2.02 to 1.89	1980	-0.138 to -0.061
White Perch	0.859	-0.068 ± 0.021	0.004	0.737	-0.208 to -0.070	1997	-0.036 to 0.358

Table I-31 Riverwide Assessment of the Level of Potential Negative Impact Based on the BSS CPUE

Species	Best Fit	General Trend	Final Decision
Alewife	SR	S1 = 0 S2 = 0	1
American Shad	SR	S1 = 0 S2 = 0	1
Atlantic Tomcod	SR	S1 < 0 S2 = 0	4
Bay Anchovy	SR	S1 = 0 S2 = 0	1
Blueback Herring	LR	S < 0	4
Bluefish (All data)	LR	S = 0	1
Bluefish (1 value removed)	SR	S1 < 0 S2 = 0	4
Hogchoker	SR	S1 = 0 S2 < 0	4
Rainbow Smelt	SR	S1 < 0 S2 = 0	4
Spottail Shiner	SR	S1 = 0 S2 > 0	1
Striped Bass	LR	S > 0	1
Weakfish	SR	S1 = 0 S2 = 0	1
White Catfish	LR	S < 0	4
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.

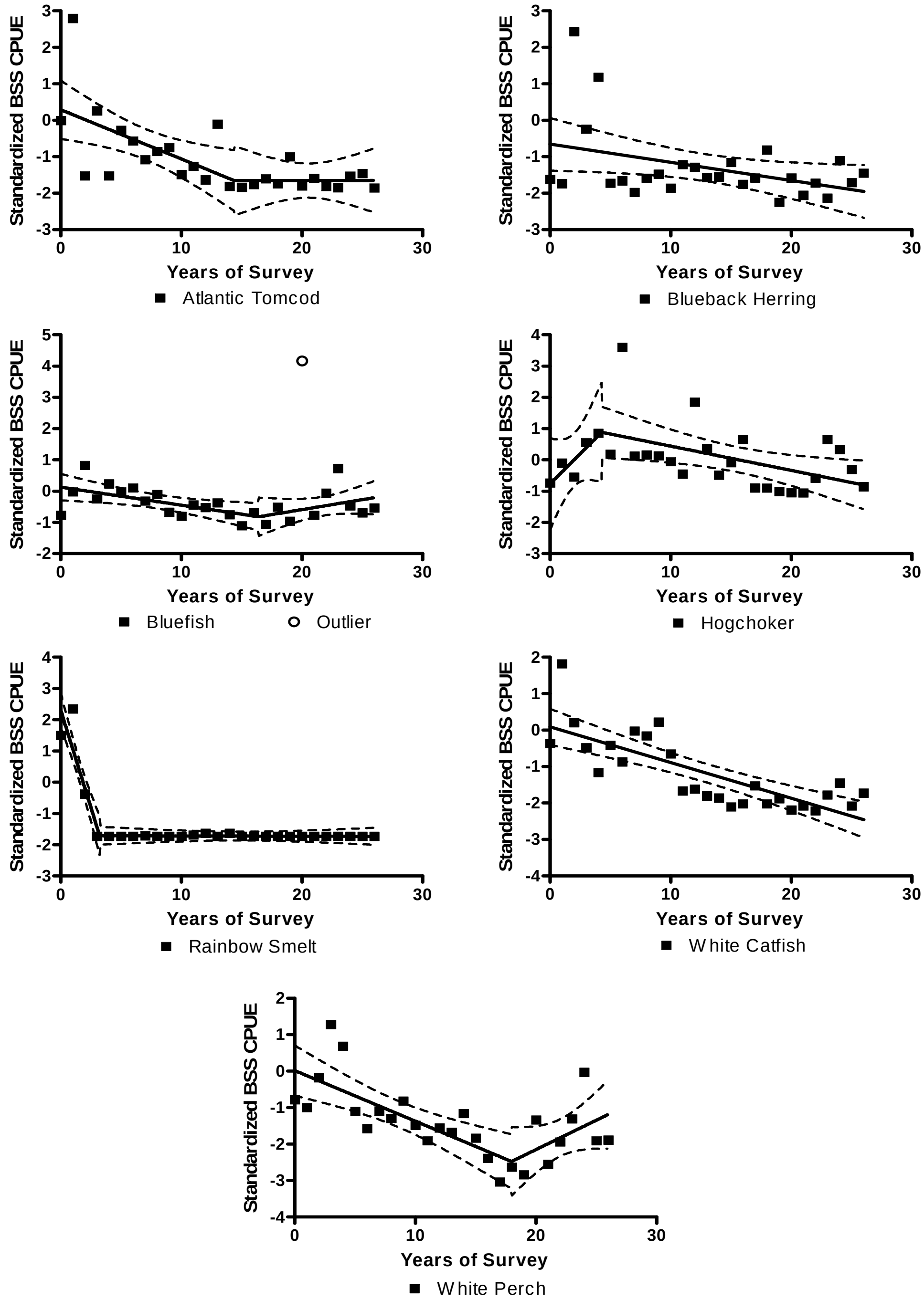


Figure I-18. Riverwide population trends based on the BSS standardized CPUE assigned a large level of potential negative impact

Table I-32. Initial Values for the Nonlinear Fit of the Segmented Regression Model Used on Riverwide LRS Population Trend of YOY Atlantic Tomcod CPUE

Taxa	Intercept	Slope 1	Join Point	Slope 2
Atlantic Tomcod	1.00	-0.20	1989	0.30

Table I-33 Competing Models Used To Characterize the Standardized Riverwide LRS Population Trend of YOY Atlantic Tomcod CPUE

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Atlantic Tomcod	1.02	-0.006 ± 0.025	0.826	0.96	-2.38 to 0.439	1980	-0.037 to 0.081

Table I-34 Riverwide Assessment of the Level of Potential Negative Impact Based on the Standardized LRS CPUE of Atlantic Tomcod

Species	Best Fit	General Trend	Final Decision
Atlantic Tomcod	SR	S1 = 0 S2 = 0	1

SR = Segmented Regression.

Table I-35. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in Riverwide YOY Abundance Index Trends

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife	0.1	-0.1	14	0.01
American Shad	-0.3	0.02	11	-0.5
Atlantic Tomcod	0.1	0.01	12	-0.01
Bay Anchovy	-0.1	0.1	14	-0.1
Blueback Herring	-0.3	0.4	13	-0.1
Bluefish (All data)	0.3	-0.02	10	0.03
Bluefish (1 value removed)	0.3	-0.02	10	0.03
Hogchoker	-0.4	0.2	11	-0.1
Rainbow Smelt (1 value removed)	0.3	0.1	11	-0.1
Spottail Shiner	-0.1	-0.03	14	0.5
Striped Bass	-0.1	0.08	15	0.25
Weakfish	-0.1	-0.02	15	-0.04
White Catfish	-1.00	0.00	20	0.00
White Perch	0.2	-0.06	12	0.18

Table I-36 Competing Models Used To Characterize the Standardized Riverwide YOY Abundance Index Trends

Species	Linear Regression			Segmented Regression			
	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife	1.00	-0.024 ± 0.025	0.334	1.03	-0.199 to 0.075	1993	-0.150 to 0.195
American Shad	0.92	-0.053 ± 0.023	0.028	0.93	-0.151 to 0.209	1989	-0.199 to 0.010
Atlantic Tomcod	0.97	-0.039 ± 0.024	0.112	0.85	-0.051 to 0.323	1989	-0.223 to -0.036
Bay Anchovy	0.95	-0.045 ± 0.024	0.067	0.89	-0.128 to 0.323	1988	-0.195 to -0.016
Blueback Herring	0.98	-0.036 ± 0.024	0.152	0.90	-0.077 to 0.380	1988	-0.200 to -0.020
Bluefish (All data)	1.00	0.023 ± 0.025	0.355	1.03	-0.274 to 0.195	1989	-0.053 to 0.158
Bluefish (1 value removed)	0.38	0.003 ± 0.009	0.775	0.36	-0.074 to 0.015	1994	-0.014 to 0.111
Hogchoker	0.99	-0.029 ± 0.025	0.244	0.96	-0.143 to 0.349	1988	-0.179 to 0.015
Rainbow Smelt (All data)	1.02	-0.008 ± 0.025	0.759	Did Not Converge			
Rainbow Smelt (1 value removed)	0.27	-0.008 ± 0.007	0.253	0.26	-0.022 to 0.059	1992	-0.072 to 0.008
Spottail Shiner	0.97	0.038 ± 0.024	0.125	0.96	-0.164 to 0.100	1993	-0.025 to 0.270
Striped Bass	0.95	0.045 ± 0.024	0.067	0.97	-0.081 to 0.114	1996	-0.126 to 0.369
Weakfish	0.90	-0.059 ± 0.022	0.013	0.85	-0.312 to 0.701	1984	-0.154 to -0.029
White Catfish (All data)	0.85	-0.069 ± 0.021	0.003	Did Not Converge			
White Catfish (1 value removed)	0.50	-0.062 ± 0.012	< 0.001	0.49	-0.169 to -0.030	1992	-0.100 to 0.051
White Perch	0.96	-0.041 ± 0.024	0.096	0.80	-0.286 to -0.068	1993	-0.007 to 0.237

Table I-37 Riverwide Assessment of the Level of Potential Negative Impact Based in the Abundance Index

Species	Best Fit	General Trend	Final Decision
Alewife	LR	S = 0	1
American Shad	LR	S < 0	4
Atlantic Tomcod	SR	S1 = 0 S2 < 0	4
Bay Anchovy	SR	S1 = 0 S2 < 0	4
Blueback Herring	SR	S1 = 0 S2 < 0	4
Bluefish (All data)	LR	S = 0	1
Bluefish (1 value removed)	SR	S1 = 0 S2 = 0	1
Hogchoker	SR	S1 = 0 S2 = 0	1
Rainbow Smelt (All data)	LR	S = 0	1
Rainbow Smelt (1 value removed)	SR	S1 = 0 S2 = 0	1
Spottail Shiner	SR	S1 = 0 S2 = 0	1
Striped Bass	LR	S = 0	1
Weakfish	SR	S1 = 0 S2 < 0	4
White Catfish (All data)	LR	S < 0	4
White Catfish (1 value removed)	SR	S1 < 0 S2 = 0	4
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.

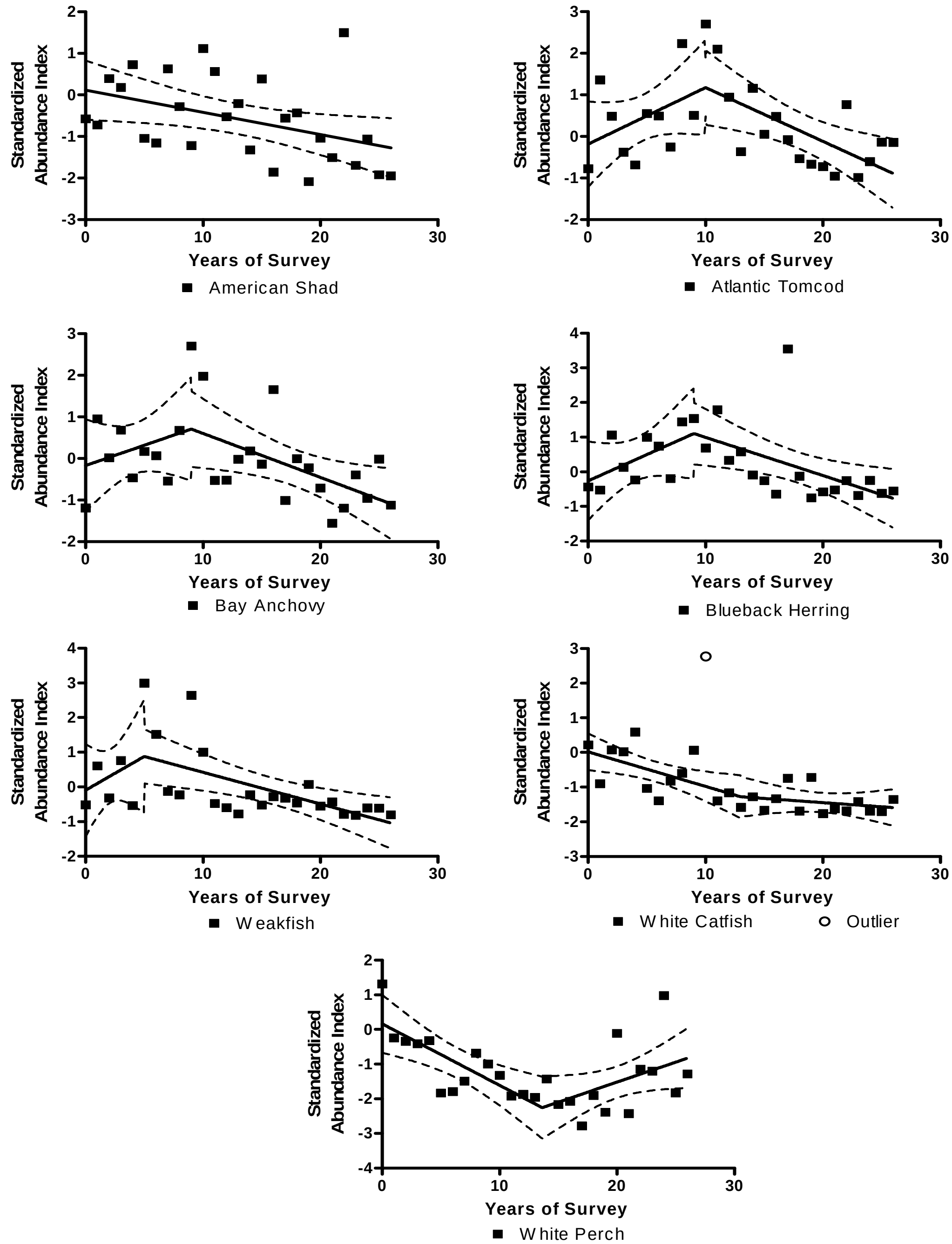


Figure I-19. Riverwide population trends based on the abundance index assigned a large level of potential negative impact

The results of the two measurement metrics—CPUE (number of RIS captured by the sampler for a given volume of water derived by the NRC staff) and the abundance index provided by the applicant—were combined for the assessment of riverwide population impacts. Table I-38 presents the numeric results compiled from Tables I-28, I-31, I-34, and I-37 above and used to derive Table H-14 in Section H.3 in the SEIS Appendices.

Table I-38 Assessment of Riverwide Population Impacts

Species	CPUE			Abundance Index	Riverwide Assessment
	FSS	BSS	LRS		
Alewife	1	1	N/A	1	1.0
American Shad	4	1	N/A	4	3.0
Atlantic Menhaden	N/A	N/A	N/A	N/A	Unknown
Atlantic Sturgeon	N/A	N/A	N/A	N/A	Unknown
Atlantic Tomcod	4	4	1	4	3.3
Bay Anchovy	1	1	N/A	4	2.0
Blueback Herring	4	4	N/A	4	4.0
Bluefish	4	4	N/A	1	3.0
Gizzard Shad	N/A	N/A	N/A	N/A	Unknown
Hogchoker	4	4	N/A	1	3.0
Rainbow Smelt	N/A	4	N/A	1	2.5
Shortnose Sturgeon	N/A	N/A	N/A	N/A	Unknown
Spottail Shiner	4	1	N/A	1	2.0
Striped Bass	1	1	N/A	1	1.0
Weakfish	N/A	1	N/A	4	2.5
White Catfish	N/A	4	N/A	4	4.0
White Perch	4	4	N/A	4	4.0
Blue Crab	N/A	N/A	N/A	N/A	Unknown

I.2.2. Analysis of Strength of Connection

To determine whether the operation of the IP2 and IP3 cooling systems has the potential to influence RIS populations near the facilities or within the lower Hudson River, the NRC staff conducted a strength-of-connection analysis. Measurements used for this analysis include monitoring data at IP2 and IP3 from 1975 to 1990 that provide information on impingement and entrainment rates for RIS and River Segment 4 (Indian Point) population-density data from the LRS, FSS and BSS.

For this analysis, the strength of connection was determined from the uncertainty associated with estimating the difference in the RIS YOY population abundance with and without losses from impingement and entrainment associated with IP2 and IP3 cooling systems. A Monte Carlo simulation (n = 1000) was conducted to estimate the first and third quartiles of the modeled relative cumulative difference in the population abundance achieved over a specified number of years with and without removal of eggs, larvae, and juveniles from entrainment and impingement. A simple exponential model was used to estimate the annual juvenile population abundance (N_t) as follows:

$$N_t = N_0 e^{rt} + (\delta N_0 e^{rt})\varepsilon_t \qquad (1)$$

where t = 1 to 20 or 27 years;

N_0 = the initial juvenile population abundance set to either 1000 or $1\mathrm{x}10^8$;

r = the population growth rate estimated from the slope from the linear model of standardized YOY River Segment 4 (Indian Point) FSS or BSS density data (1979-2005);

δ = the level of variability in the density data which was estimated as the sum of the CV of the annual 75th percentiles from the weekly catch density and the error mean square from the linear regression; and

ε_t = an independent Normal (0,1) random variable.

Two different values for the starting population parameter N_0 and the extent of the number of years simulated (20 or 27) were used to assess their impact on the simulation results. The number of simulation runs (1000) should be large enough such that these two parameters will not affect the results.

Equation (1) was used to model annual abundance of YOY RIS with the removal of eggs, larvae, and juveniles from entrainment and impingement implicit in the parameters N_0 and r. Annual abundance of YOY RIS without losses of eggs, larvae, and juveniles from entrainment and impingement was estimated using the same model form but with N_0 and r replaced with

$$N_0^* = N_0(1 + EMR) \quad \text{and} \quad r^* = r_{UCL}(1 - IMR)/\max(1,CV) \qquad (2)$$

where *EMR* and *IMR* are conditional mortality rates for entrainment and impingement; r_{UCL} is the upper 95 percent confidence limit of the linear slope; and CV is the coefficient of variation of the annual 75th percentiles from the weekly catch density. The growth rate is divided by the CV in the density data to provide an alternative growth rate closer to zero for negative values of r and a slightly larger growth rate for positive values of r with the amount of increase dependent on the magnitude of the variability. The divisor is set to 1 (allowing a maximum increase in growth rate) when the CV is less than 1. The parameter *EMR* for each RIS was estimated from entrainment and River Segment 4 field data supplied by the applicant (Entergy 2007b). The parameter *IMR* for each RIS was estimated from published conditional impingement mortality rates (CIMR; CHGEC 1999). Estimates for *EMR* assume 100 percent mortality while the *IMR* assumes partial survival.

The parameter *EMR* was estimated as the ratio of the number entrained to the sum of the standing crop of eggs, larvae, and juveniles in River Segment 4 (Indian Point) estimated from the LRS, FSS, and BSS 1981 and 1983-1987 data. All three surveys were used because entrainment of juveniles was proportionally greater during July and August than during May and June which was when the majority of the sampling for the LRS took place (Table I-39 and Figure 17a). Estimation of the number entrained and the river segment standing crop were based on the calculations presented in Table I-40.

The number of RIS by life stage (i = eggs, yolk sac larvae, post-yolk sac larvae, juvenile, and undetermined) entrained (E_{ijk}) was calculated weekly (k = 2-35) for each year (j = 1981, 1983-1987) as

$$E_{ijk} = \overline{d_{ijk}}\,(V_{IP2} + V_{IP3})(60 \times 24 \times 7 \times 1000) \qquad (3)$$

where $\overline{d_{ijk}}$ is the input mean weekly density entrained (pounds/m^3) for a given RIS (Table I-40) along with the associated volume of water withdrawn (1000 m^3/min) at IP2 and IP3 (V_{IP2} and VIP3, respectively). Seasonal numbers of RIS entrained were calculated by summing over life stages and weeks. Season 1 (January - March) was only sampled in 1986, thus, the number of fish entrained during that season was added to the totals for all other years.

The estimate of the River Segment 4 standing crop of each life stage was based on the combined standing crop estimates from the LRS, FSS, and BSS (Tables I-40). The LRS and FSS weekly standing crop was estimated as the weekly density of fish caught times the Indian Point region river volume (208,336,266 m^3). The BSS weekly standing crop was estimated as the weekly density of fish caught times the Indian Point region shore zone surface area (4,147,000 m^2) divided by the area of a seine sample (450 m^2). The total number of RIS at risk from entrainment or impingement was calculated as the sum of those RIS entrained (or impinged) and the RIS caught in the river. The annual standing crop of eggs, larvae, and juveniles estimated in the vicinity of IP2 and IP3 based on the LRS, FSS, and BSS is presented in Table I-41. The estimated number of each RIS entrained for the SOC analysis was calculated from the mean density entrained (1981 and 1983-1987) at IP2 and IP3 (Table I-42). The estimated *EMR* values can be compared to the riverwide CMRs (CHGEC 1999; Table I-43).

Impingement mortality for YOY RIS is greatest in July through December (Table I-44), however, impingement data from 1981 through 1990 was not available by life stage. Thus, the parameter *IMR* was estimated as the maximum plant specific cumulative CIMR (1984-1990; CHGEC 1999) for an annual cohort from the juvenile life stage through the last age of impingement vulnerability (Table I-45). The minimum value of *IMR* was set at 0.0005. The CIMR values are based on the estimated number impinged and the Ristroph screen 8-hr mortality rate reported by Fletcher (1990).

The relative cumulative difference in the population abundance achieved over a specified number of years between models with and without the effects of entrainment and impingement was estimated as the sum of the annual differences divided by N_0 (1000 or 10^8) and the number of years evaluated (20 or 27). One realization of the simulation using t = 27, N_0 = 1000, and the white perch parameters (Table I-46) highlights the annual difference achieved in the YOY population abundance with and without entrainment and impingement effects (Figure I-121). The distribution of the relative cumulative difference in the population abundance achieved from all 1000 simulations using the white perch parameters is presented in Figure I-22. Negative values occur when a single simulation has greater negative annual differences (i.e., greater abundance with the model incorporating entrainment and impingement mortality, shown in black in Figure I-21). If there was no variation in the model (δ = 0), then all differences would be positive. Allowing δ to be greater than 0 incorporates the variation observed in the YOY population and the error in the linear model used to estimate population growth. If the range of the first and third quartiles of the resulting distribution includes zero, then the effect of entrainment and impingement was not large enough to be detected over the variation observed in the population.

Four simulation series were conducted for each RIS using all possible pairs of the parameters t and N_0 (n = 1000 for each). All other model parameter values for a give RIS stayed the same for each simulation series and are presented in Table I-46. The strength of connection was determined to be low if the range of the first and third quartiles of the distribution of the relative cumulative difference in YOY population abundance included zero for any of the simulation series. The strength of connection was determined to be high if both quartiles were positive for all parameter t and N_0 pairs. The latter result occurs when the effect of entrainment and impingement was consistently greater than the variation in the model.

The results and strength of connection conclusions of the Monte Carlo simulations (n = 1000) for each pair of N_0 (1000 and 10^8) and number of years modeled (20 and 27) are presented in Table H-17 in Section H.1.3 of Appendix H and in Table I-47. In general, for a given RIS the difference in the median simulation results for 20 verses 27 years modeled (t) decreased with increasing initial abundance (N_0). For N_0 = 1000 and 1 x 10^8, the median difference between the simulation results with a different number of years modeled was 3 percent across all RIS. For t = 20 and 27 years, the median difference between the results of the simulations with different initial abundance was 2 percent and 1 percent respectively across all RIS. Thus, the number of simulations (n = 1000) was sufficient to conclude a strength of connection.

Table I-39. Percentage of Each Life Stage Entrained by Season and the Contribution of Major Taxa Represented in the Samples. Calculations are based on the 75th percentile over years (1981 and 1983-1987) of each season's number of fish entrained. There was no entrainment sampling in October – December.

Life Stage	Season 1 Jan-Mar	Season 2 Apr-Jun	Season 3 Jul-Sep	75th Percentile over Years
EGG	3%	20%	78%	210,801 x 10^6
Rainbow Smelt	99%	2%	0%	
Bay Anchovy	0%	92%	100%	
White Perch	0%	4%	< 1%	
Alosa species	1%	2%	0%	
YOLK-SAC LARVA	8%	89%	3%	23,140 x 10^6
Atlantic Tomcod	100%	0%	0%	
Herring Family	0%	91%	< 1%	
Bay Anchovy	0%	2%	94%	
Striped Bass	0%	5%	1%	
Hogchoker	0%	0%	3%	
POST YOLK-SAC LARVA	< 1%	52%	48%	618,393 x 10^6
Atlantic Tomcod	100%	< 1%	0%	
Alosa species	0%	37%	< 1%	
Bay Anchovy	0%	11%	58%	
Anchovy Family	0%	2%	39%	
White Perch	0%	12%	1%	
Striped Bass	0%	17%	1%	
Herring Family	0%	20%	< 1%	
JUVENILE	2%	44%	54%	10,989 x 10^6
White Perch	96%	10%	10%	
Atlantic Tomcod	0%	67%	2%	
Weakfish	0%	1%	50%	
Bay Anchovy	0%	1%	17%	
Rainbow Smelt	0%	9%	3%	
Striped Bass	0%	6%	5%	
Anchovy Family	0%	1%	4%	
Alosa species	0%	2%	2%	
White Catfish	4%	< 1%	0%	
Blueback Herring	0%	< 1%	3%	
UNDETERMINED STAGE	10%	77%	13%	4,469 x 10^6
Atlantic Tomcod	100%	< 1%	0%	
Morone species	0%	88%	2%	
Bay Anchovy	0%	9%	83%	
Anchovy Family	0%	0%	10%	
Alosa species	0%	0%	4%	

Survey	Week												
Jan-Mar	1	2	3	4	5	6	7	8	9	10	11	12	13
Apr-Jun	14	15	16	17	18	19	20	21	22	23	24	25	26
LRS-1981													
LRS-1983													
LRS-1984													
LRS-1985 and 1986													
LRS-1987													
BSS-1987													
Jul-Sep	27	28	29	30	31	32	33	34	35	36	37	38	39
LRS-1981													
LRS-1983													
LRS-1984													
LRS-1985 -1987													
BSS-1981													
BSS-1983													
BSS-1984													
BSS-1985 and 1986													
BSS-1987													
FSS-1981													
FSS-1983													
FSS-1984-1986													
FSS-1987													
Oct-Dec	40	41	42	43	44	45	46	47	48	49	50	51	52
BSS-1981													
BSS-1983													
BSS-1984													
BSS-1985 and 1986													
BSS-1987													
FSS-1981													
FSS-1983													
FSS-1984													
FSS-1985													
FSS-1986													
FSS-1987													

Figure I-20. Time Line of River Segment 4 Sampling Programs Used to Estimate EMR (1981 and 1983-1987 Surveys). Shaded cells indicate a sampling event occurs within the given week.

Table I-40. Method for Estimating Taxon-Specific Entrainment Mortality Rate (EMR) Based on River Segment 4 Standing Crop for the Strength of Connection Analysis

<table>
<tr><th colspan="2">Property of Method</th><th>Number Entrained</th><th>River Segment 4 Standing Crop</th></tr>
<tr><td rowspan="2">Input Data</td><td>Variables</td><td>mean density organisms entrained by IP2 and IP3

Volume of cooling water withdrawn by IP2 and IP3 (1000 m^3/min)</td><td>LRS density (by life stage)
FSS density of YOY
BSS density of YOY

River Segment 4 volume (m^3)
River Segment 4 shorezone surface area (m^2)</td></tr>
<tr><td>Frequency</td><td>Per week of sampling</td><td>Per week of sampling</td></tr>
<tr><td rowspan="4">Summary Statistics</td><td>Seasonal (Year specific)</td><td>Sum of weekly estimates of number of organisms entrained by IP2 and IP3</td><td>Sum of weekly standing crop estimates</td></tr>
<tr><td>Annual</td><td>Sum of Season 1, 1986 with each year's totals from Season 2 and Season 3</td><td>Sum of seasonal standing crop estimates for River Segment 4</td></tr>
<tr><td>EMR</td><td colspan="2">$\frac{75^{th}\text{ Percentile Annual Number Entrained}}{75^{th}\text{ Percentile (Annual Number Entrained + Annual Standing Crop)}}$</td></tr>
<tr><td>Units of numerator and denominator of EMR</td><td colspan="2"># of organisms</td></tr>
<tr><td colspan="2">Years of Data</td><td>1981 and 1983-1987</td><td>1981 and 1983-1987</td></tr>
<tr><td colspan="2">Life Stages</td><td>Eggs, Larvae, and Juveniles</td><td>Eggs, Larvae, and Juveniles (YOY)</td></tr>
<tr><td colspan="2">Taxonomic Substitutions</td><td colspan="2">Alewife, Blueback Herring, and unidentified Alosids treated collectively as River Herring

Unidentified Anchovy spp allocated to Bay Anchovy

Unidentified Morone spp allocated proportionally to Striped Bass and White Perch</td></tr>
</table>

Table I-41. Estimated Annual Standing Crop of Eggs, Larvae, and Juvenile RIS Within River Segment 4 (millions of fish)

Taxon	1981	1983	1984	1985	1986	1987
Alewife and Blueback Herring	239,387	1,357,568	1,038,155	78,176	353,533	21,619
American Shad	9,731	2,374	95,443	2,100	3,222	926
Atlantic Menhaden	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Atlantic Sturgeon	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Atlantic Tomcod	200,776	25,139	135,160	401,962	151,134	207,723
Bay Anchovy	2,075,519	1,139,353	1,190,819	1,545,273	497,132	1,885,743
Bluefish	465	1,158	851	200	513	1,348
Gizzard Shad	Unknown	Unknown	Unknown	Unknown	Unknown	3.83
Hogchoker	1,882	587	1,057	1,116	3,521	6,384
Rainbow Smelt	1,341	841	16,111	992	46,771	21,926
Shortnose Sturgeon	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Spottail Shiner	5.81	0.103	0.0161	215	0.0387	0.0166
Striped Bass	1,336,073	625,737	627,731	79,755	405,668	291,361
Weakfish	1,473	3,547	15,306	3,495	1,245	985
White Catfish	Unknown	0.0018	27.3	215	Unknown	31.9
White Perch	794,963	913,526	437,750	91,594	757,411	68,591

Table I-42. Annual Estimated Number of RIS Entrained at IP2 and IP3 (millions of fish)

Taxa	1981	1983	1984	1985	1986	1987
Alewife and Blueback Herring	20,159	119,801	181,006	954	186	44.6
American Shad	350	359	18,175	26.0	242	9.27
Atlantic Menhaden	0	0	0	0	0	0
Atlantic Sturgeon	0	0	0	0	0	0
Atlantic Tomcod	4,231	2,951	8,557	12,737	4,925	3,714
Bay Anchovy	1,241,061	352,177	467,558	344,483	182,493	236,713
Bluefish	0	0	3.88	19.7	0	0
Gizzard Shad	0	0	0	0	0	0
Hogchoker	3,188	2,168	961	745	585	185
Rainbow Smelt	6,089	6,090	7,146	6,126	10,952	6,857
Shortnose Sturgeon	0	0	0	0	0	0
Spottail Shiner	0	9.13	3.93	0	0	0
Striped Bass	85,626	43,256	49,716	20,495	78,666	33,076
Weakfish	3,130	4,154	9,485	2,062	631	102
White Catfish	7.23	7.23	10.8	7.23	10.5	7.23
White Perch	48,743	68,418	29,734	11,137	71,501	8,297
All fish taxa	1,446,376	795,342	888,363	403,092	463,644	288,208

Table I-43. Estimate of the River Segment 4 Entrainment Mortality Rate (EMR) and the 95 Percent Confidence Limits for the Riverwide Entrainment CMR (1974-1997)

Taxa	75th Percentile Annual Number Entrained (number x 10^9)	75th Percentile of Number at Risk (number x 10^9)	EMR	Riverwide CMR for Entrainment at IP2 and IP3	
				Lower 95 percent Confidence Limit	Upper 95 percent Confidence Limit
Alewife and Blueback Herring	94.9	1003	0.095	0.00747	0.0324
American Shad	0.357	8.43	0.042	0	0.016696
Atlantic Menhaden	0	NA	NA	Not Modeled	
Atlantic Sturgeon	0	NA	NA	Not Modeled	
Atlantic Tomcod	7.65	210	0.036	0.152	0.234
Bay Anchovy	439	2064	0.213	0.0925	0.140
Bluefish	0.00291	1.08	0.003	Not Modeled	
Gizzard Shad	0	NA	NA	Not Modeled	
Hogchoker	1.87	4.83	0.386	Not Modeled	
Rainbow Smelt	7.07	27.4	0.258	Not Modeled	
Shortnose Sturgeon	0	NA	NA	Not Modeled	
Spottail Shiner	0.00295	0.00838	0.352	0.0802	0.104
Striped Bass	71.4	675	0.106	0.181	0.276
Weakfish	3.90	7.17	0.544	Not Modeled	
White Catfish	0.00965	0.0848	0.114	Not Modeled	
White Perch	63.5	840	0.076	0.0568	0.108

Table I-44. Percentage of Each Life Stage Impinged by Season and the Contribution of Major Taxa Represented in the Samples. Note, because only two years had life stage information available (1979 and 1980), calculation of the 75th percentile was based on the weighted average of the ranked observations, (i.e., y = 0.25*X(1) + 0.75*X(2) where X(i) is the ranked observation in increasing order).

Life Stage	Season 1 Jan-Mar	Season 2 Apr-Jun	Season 3 Jul-Sep	Season 4 Oct-Dec	75th Percentile over Years
Young-of-Year	0%	9%	43%	48%	$3,214 \times 10^3$
Atlantic Tomcod	0%	98%	60%	1%	
White Perch	0%	0%	16%	72%	
American Shad	0%	0%	6%	1%	
Blueback Herring	0%	0%	3%	24%	
Weakfish	0%	0%	5%	< 1%	
Yearling	82%	17%	1%	1%	$3,747 \times 10^3$
White Perch	95%	94%	60%	93%	
Striped Bass	4%	1%	5%	1%	
Atlantic Tomcod	1%	< 1%	14%	1%	
Alewife	< 1%	< 1%	12%	1%	
Blueback Herring	< 1%	1%	9%	3%	
Older	19%	19%	53%	9%	$1,320 \times 10^3$
White Perch	83%	41%	3%	5%	
Bay Anchovy	< 1%	15%	85%	40%	
Rainbow Smelt	10%	18%	1%	12%	
Hogchoker	< 1%	20%	6%	16%	
Alosa species	< 1%	< 1%	< 1%	16%	

Table I-45. Cumulative Conditional Impingement Mortality Rate Estimated by Year Class for Indian Point[1] Used to Estimate the Taxon-Specific Impingement Mortality Rate (IMR) for the Strength of Connection Analysis. Note, these estimates include a correction for partial survival.

RIS	1984	1985	1986	1987	1988	1989	1990	Maximum = IMR
Alewife	NA	0.002	0.002	0.001	0.001	0.001	NA	0.002
American Shad	NA	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005
Atlantic Tomcod	NA	NA	0.008	0.030	0.005	0.003	0.004	0.030
Bay Anchovy	NA	0.002	0.004	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.004
Blueback Herring	NA	0.003	0.004	0.002	0.001	0.001	NA	0.004
Bluefish	NA	NA	NA	NA	NA	NA	NA	0.0005
Hogchoker	NA	NA	NA	NA	NA	NA	NA	0.0005
Rainbow Smelt	NA	NA	NA	NA	NA	NA	NA	0.0005
Spottail Shiner	NA	0.002	0.001	0.007	< 0.0005	0.001	< 0.0005	0.007
Striped Bass	0.008	0.003	0.005	0.005	< 0.0005	< 0.0005	0.001	0.008
Weakfish	NA	NA	NA	NA	NA	NA	NA	0.0005
White Catfish	NA	NA	NA	NA	NA	NA	NA	0.0005
White Perch	NA	0.026	0.032	0.012	0.011	0.014	0.007	0.032

[1] CHGEC (1999) Appendix VI.
NA = Not available.

Table I-46. Parameter Values Used in the Monte Carlo Simulation

RIS	Survey Used	Linear Slope (*r*)	Upper 95% Confidence Limit of the Slope	Error Mean Square from Regression	CV of Density Data (19 79-1990)	*EMR*	*IMR*
Alewife	BSS	-0.030	-0.014	0.570	1.245	0.095	0.0020
American Shad	BSS	-0.069	-0.059	0.350	0.744	0.042	0.0005
Atlantic Tomcod	FSS	-0.040	-0.026	0.490	1.035	0.036	0.0300
Bay Anchovy	FSS	-0.075	-0.061	0.505	0.598	0.213	0.0040
Blueback Herring	BSS	-0.024	-0.009	0.530	1.488	0.095	0.0040
Bluefish	BSS	-0.038	-0.022	0.580	0.692	0.003	0.0005
Hogchoker	FSS	-0.034	-0.018	0.580	1.679	0.386	0.0005
Rainbow Smelt	FSS	0.012	0.041	0.576	1.452	0.258	0.0005
Spottail Shiner	BSS	-0.017	-0.005	0.430	1.293	0.352	0.0070
Striped Bass	BSS	0.040	0.052	0.420	0.528	0.106	0.0080
Weakfish	FSS	-0.047	-0.031	0.560	1.085	0.544	0.0005
White Catfish	FSS	0.007	0.010	0.100	3.520	0.114	0.0005
White Perch	BSS	-0.062	-0.045	0.610	0.848	0.076	0.0320

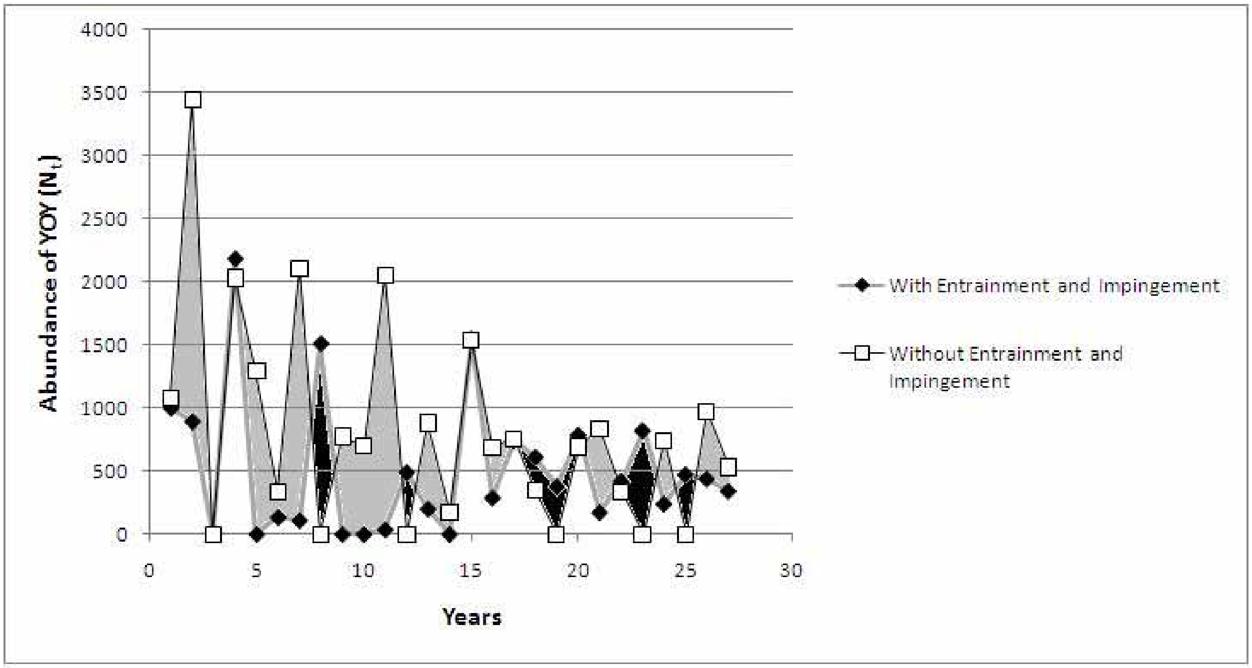


Figure I-21. One Realization of the Monte Carlo Simulation using Parameter Estimates for White Perch. Gray and black shading represents positive and negative annual differences in abundance between the two models.

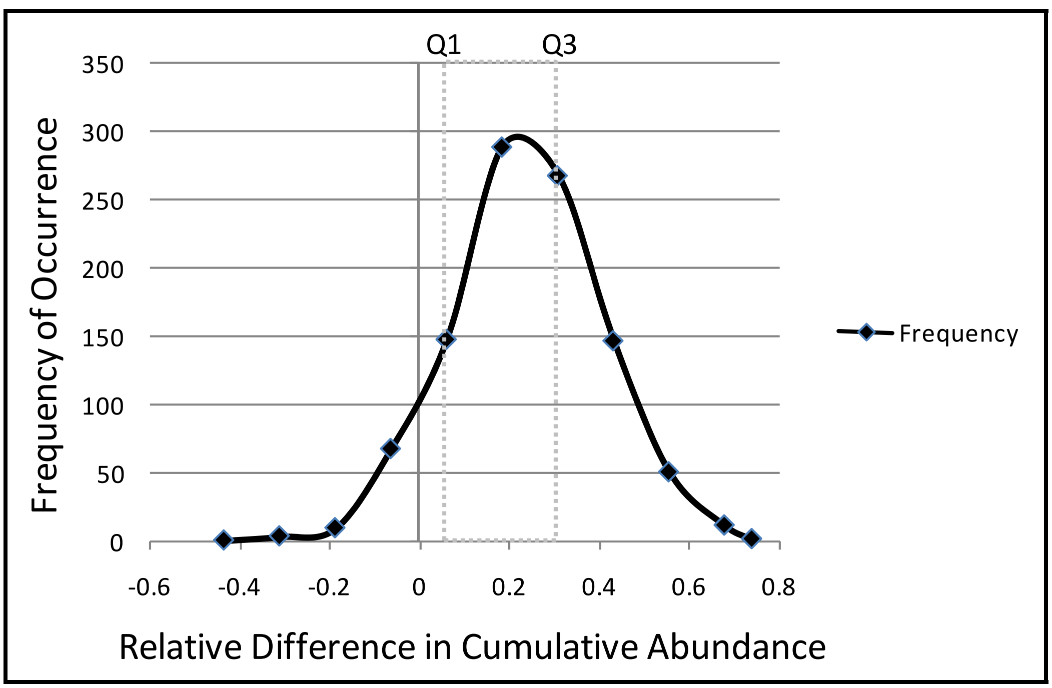


Figure I-22. Distribution of the Relative Difference in Cumulative Abundance from the Monte Carlo Simulation (n = 1000) using Parameter Estimates for White Perch. The first and third quartiles (Q1 and Q3) of the distribution are indicated with dashed lines.

Table I-47. Quartiles of the Relative Difference in Cumulative Abundance and Conclusions for the Strength-of-Connection From the Monte Carlo Simulation

Taxa	Number of Years	N_0 = 1000			$N_0 = 1 \times 10^8$			Strength of Connection Conclusion
		Median	Q1	Q3	Median	Q1	Q3	
Alewife	20	0.33	0.11	0.59	0.32	0.06	0.55	High
	27	0.36	0.15	0.56	0.33	0.14	0.53	
American Shad	20	0.07	-0.04	0.18	0.09	-0.02	0.20	Low
	27	0.08	-0.01	0.16	0.08	0.00	0.16	
Atlantic Tomcod	20	0.14	-0.04	0.32	0.17	-0.01	0.38	Low
	27	0.18	0.04	0.32	0.18	0.02	0.33	
Bay Anchovy	20	0.21	0.09	0.32	0.20	0.08	0.31	High
	27	0.18	0.10	0.26	0.18	0.10	0.27	
Blueback Herring	20	0.30	0.02	0.60	0.28	0.02	0.60	High
	27	0.43	0.16	0.67	0.40	0.14	0.64	
Bluefish	20	0.13	-0.04	0.29	0.14	-0.03	0.30	Low
	27	0.14	0.02	0.29	0.16	0.01	0.30	
Hogchoker	20	0.71	0.39	1.05	0.74	0.41	1.10	High
	27	0.81	0.53	1.10	0.77	0.46	1.06	
Rainbow Smelt	20	0.77	0.33	1.25	0.81	0.35	1.34	High
	27	0.93	0.52	1.38	1.03	0.63	1.46	
Spottail Shiner	20	0.59	0.33	0.88	0.58	0.23	0.90	High
	27	0.61	0.36	0.88	0.62	0.35	0.87	
Striped Bass	20	0.45	0.09	0.76	0.45	0.12	0.78	High
	27	0.62	0.27	1.02	0.66	0.31	1.01	
Weakfish	20	0.62	0.39	0.87	0.66	0.42	0.90	High
	27	0.63	0.43	0.84	0.64	0.43	0.83	
White Catfish	20	0.19	-0.36	0.76	0.05	-0.46	0.66	Low
	27	0.09	-0.41	0.58	0.09	-0.43	0.58	
White Perch	20	0.16	0.01	0.32	0.20	0.04	0.35	High
	27	0.18	0.06	0.31	0.20	0.07	0.31	

I.3 Cumulative Impacts on Aquatic Resources

<u>Zebra Mussels</u>

For this analysis, the 75th percentile of the weekly FSS and BSS density and CPUE data from Region 12 (Albany) were used to evaluate the population trend LOE for impacts associated with a zebra mussel invasion. Data for white perch, blueback herring, alewife, American shad, white catfish, spottail shiner, and striped bass were used in the analysis because all have high densities of YOY within this region. The data were standardized based on the first 5-year mean and the standard deviation of all annual results (1979 - 2005). Only weeks 27 to 43 were used in the analysis for the FSS and weeks 22 to 43 for the BSS survey, so that most years contained observations from the months of July through October and June through October for each survey, respectively. Effects associated with changes in gear types for the FSS (1985) were also considered.

Simple linear regression and segmented regression with a single join point were fit to the annual measure of abundance for each RIS, as described in Section H.3. The model with the smallest MSE was chosen as the better fit to the data. If the best-fit model was the simple linear regression and the slope was statistically significantly less than 0 ($\alpha = 0.05$), a negative population trend was considered detected. If the slope was not significantly different from 0, then a population trend was not considered detected. If the best-fit model was the segmented regression and either slope, S_1 or S_2, was statistically significantly less than 0 ($\alpha = 0.05$), then a negative population trend was considered detected. If both slopes S_1 and S_2 were not significantly different from 0 ($\alpha = 0.05$), then the trend was not considered detected.

Data collected between 1985 and 2005 are not temporally disconnected from the 1991 invasion of zebra mussels. However, because of earlier impacts, there is a potential that fish populations stabilized pre-1985 to a lower abundance level. If changes in gear types have affected the observed population response, only data post-1985 were used. For this analysis, data were standardized with the average of 1985 to 1989 and the standard deviation of all data between 1985 and 2005. This analysis was used only when the observed response from all data was biologically different from the BSS population density trend and had a decline associated with the gear change.

A visual and statistical comparison of the river-segment FSS standardized density with the BSS standardized density (Table I-48) suggested that the trends for blueback herring, striped bass, and white perch were not biologically different (Figure I-23). Observations from both surveys overlap and cross over each other. The post-1985 FSS observations for spottail shiner (proportion FSS < BSS = 0.14; p = 0.013) were generally greater than the BSS observations and did not show a decline associated with the gear change relative to the BSS (Figure I-23). Thus, for these RIS, all of the FSS data (1979–2005) were used in the regression analysis. The FSS density data for alewife and American shad, however, did show a potential gear effect (Figure I-24), and a post-1985 analysis was conducted.

Table I-48. Evaluation of Gear Effect on FSS River Segment 12 Population Density Trends

Taxa	Proportion FSS < BSS		Absolute Difference in Proportions	Medan Absolute Difference		Significance of Sign Test	Conclusion
	1979-1984	1985-2005		1979-1984	1985-2005		
Alewife	0.40	1.00	0.60	1.11	1.19	< 0.001	Separate Analysis
American Shad	0.60	0.90	0.30	0.89	0.94	0.095	Separate Analysis
Blueback Herring	0.40	0.71	0.31	1.36	0.57	0.192	Not Biol. Different
Spottail Shiner	0.40	0.14	0.26	0.67	0.78	0.013	FSS > BSS
Striped Bass	0.40	0.29	0.11	0.56	0.57	0.332	Not Biol. Different
White Perch	0.40	0.95	0.55	0.86	0.44	< 0.001	Not Biol. Different

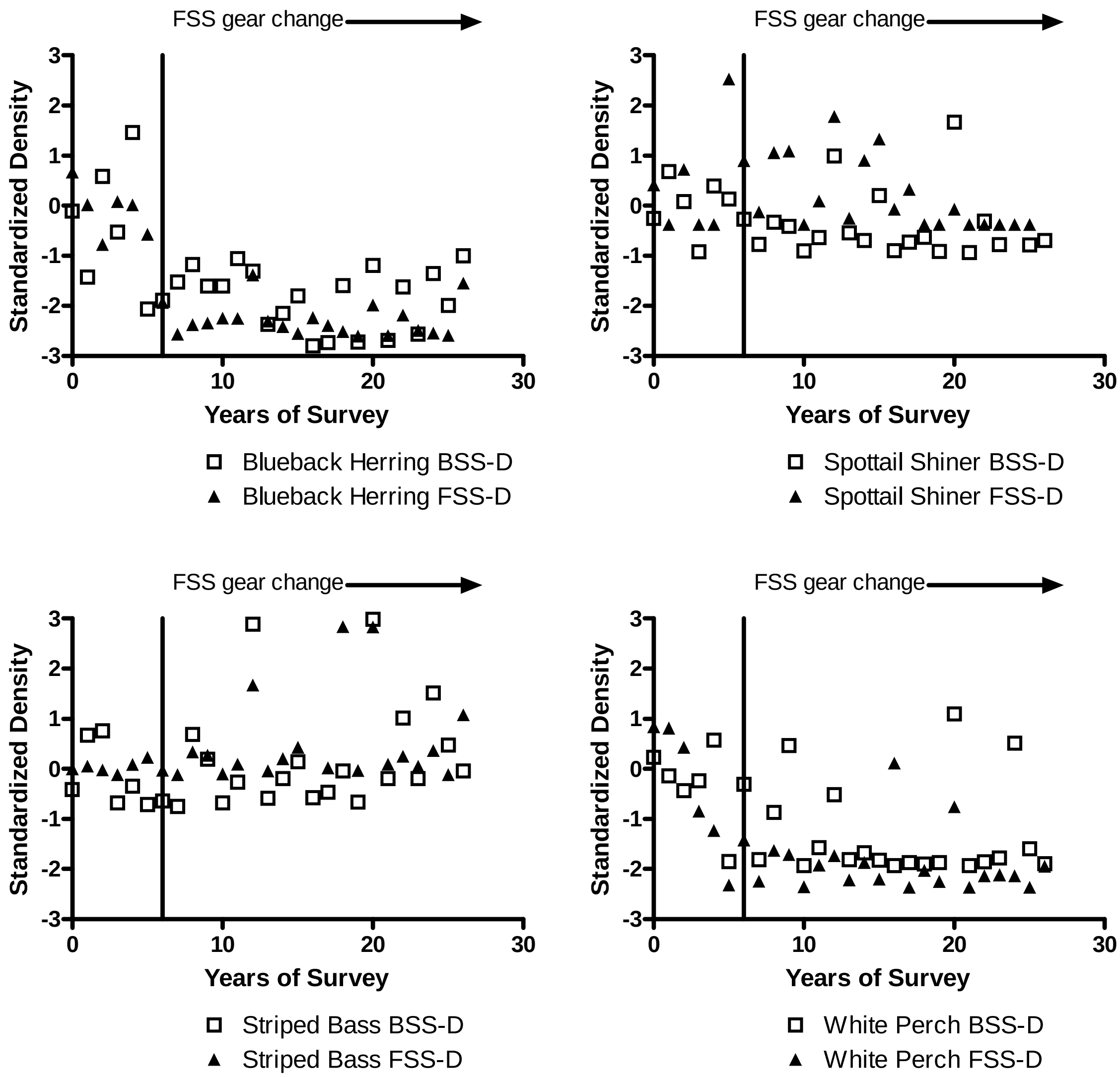


Figure I-23. River Segment 12 population trends based on the BSS and FSS standardized density (D) not considered to be affected by the gear change

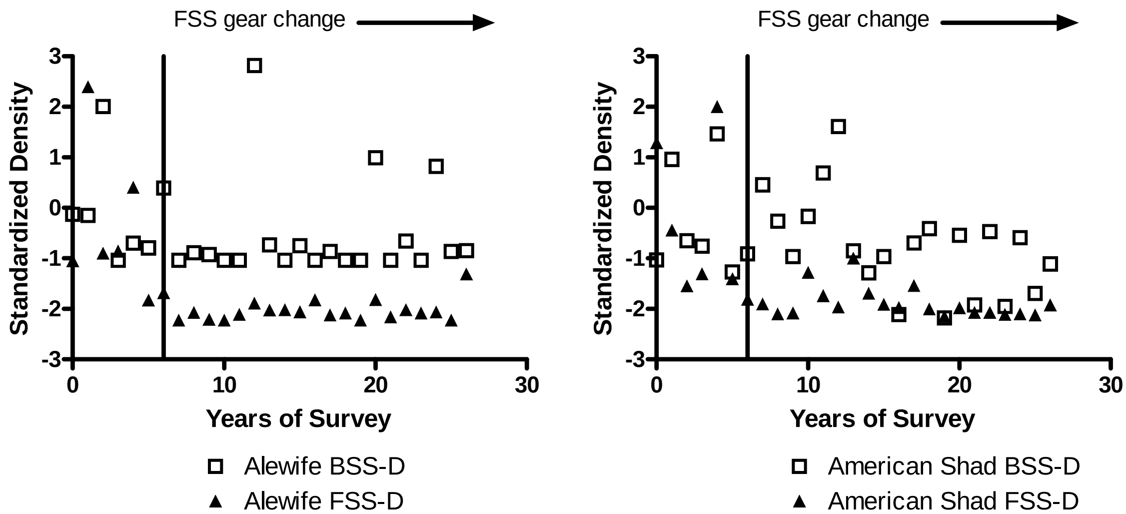


Figure I-24. River Segment 12 population trends based on the BSS and FSS standardized density (D) for which the FSS may indicate a gear difference

The following tables are the intermediate analyses for the assessment of population trends associated with fish density sampled from River Segment 12 (Albany). Results of these river-segment trend analyses are compiled in Table H-19 in Section H.2 of the Appendix H. The data used in this analysis, in order of appearance, were the standardized 75th percentile of the weekly fish density for a given year collected from the FSS (Table I-49, Table I-50, Table I-51, and Figure I-25) and BSS (Table I-52, Table I-53, Table I-54, and Figure I-26).

Two extreme outliers (values greater than 2 standard deviations away from the mean) were removed from the FSS spottail shiner density regression analysis (Tables I-50 and I-51). Three extreme outliers were also removed from the FSS striped bass density (values greater than 2 standard deviations away from the mean) regression analysis and one extreme outlier from the FSS white catfish density (value greater than 2 standard deviations away from the mean) regression analysis because of the influence these data had on the regression results. The results of the regression models with the observations removed were more conservative and were used for the trend analysis.

One extreme outlier (value greater than 2 standard deviations away from the mean) was removed from the BSS alewife density regression analysis (Tables I-53 and I-54). One value was also removed from the BSS American shad density (value greater than 1.6 standard deviations away from the mean) regression analysis, as well as one extreme outlier from the BSS spottail shiner density (value greater than 3 standard deviations away from the mean) regression analysis and two extreme outliers from the BSS striped bass density (values greater than 2 standard deviations away from the mean) regression analysis because of the influence these data had on the regression results. The results of the regression models with the observations removed were more conservative and were used for the trend analysis.

Table I-49. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in FSS Population Trends of YOY Fish Density from River Segment 12

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife (1985-2005)	0.0	0.0	1994	-0.1
American Shad (1985-2005)	0.0	0.0	1994	-0.1
Blueback Herring (All data)	0.5	-0.08	1990	-0.02
Spottail Shiner (2 values removed)	0.0	0.3	1991	-0.3
Striped Bass (3 values removed)	-0.08	0.07	1990	0.0
White Catfish (1 value removed)	-0.2	0.08	1986	0.1
White Perch (All data)	0.4	0.0	1982	0.0

Table I-50. Competing Models Used To Characterize the Standardized River Segment 12 (Albany) Fall Juvenile Survey Population Trends of YOY Fish Density

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife (1985–2005)	1.01	0.031 ± 0.036	0.409	0.95	-5.66 to 2.00	1986	-0.028 to 0.139
American Shad (1985–2005)	0.95	-0.059 ± 0.034	0.102	0.90	-0.216 to 0.475	1992	-0.271 to -0.0001
Blueback Herring	0.73	-0.088 ± 0.018	< 0.001	0.44	-0.520 to -0.238	1987	-0.042 to 0.034
Spottail Shiner (All data)	1.02	-0.007 ± 0.025	0.777	1.05	-0.553 to 0.695	1984	-0.095 to 0.059
Spottail Shiner (2 outliers removed)	0.65	-0.025 ± 0.017	0.158	0.59	-0.041 to 0.160	1991	-0.188 to -0.010
Striped Bass (All data)	0.975	0.037 ± 0.024	0.139	0.94	0.004 to 0.155	1999	-0.568 to 0.171
Striped Bass (3 outliers removed)	0.40	0.012 ± 0.010	0.253	0.42	-1.20 to 1.30	1980	-0.014 to 0.037
White Catfish (All data)	0.982	-0.034 ± 0.024	0.171	1.00	-0.118 to 0.123	1994	-0.283 to 0.096
White Catfish (1 outlier removed)	0.88	-0.022 ± 0.022	0.327	0.92	-1.15e+006 to 1.15e+006	1979	-0.070 to 0.026
White Perch	0.84	-0.071 ± 0.021	0.002	0.58	-0.972 to -0.212	1984	-0.049 to 0.031

Table I-51. River Segment 12 (Albany) Assessment of the Level of Potential Negative Impact Based on the Standardized FSS Density

Species	Best Fit	General Trend	Level of Potential Negative Impact
Alewife	SR	S1 = 0 S2 = 0	1
American Shad	SR	S1 = 0 S2 < 0	4
Blueback Herring	SR	S1 < 0 S2 = 0	4
Spottail Shiner (All data)	LR	S = 0	1
Spottail Shiner (2 outliers removed)	SR	S1 = 0 S2 < 0	4
Striped Bass (All data)	SR	S1 > 0 S2 = 0	1
Striped Bass (3 outliers removed)	LR	S = 0	1
White Catfish (All data)	LR	S = 0	1
White Catfish (1 outlier removed)	LR	S = 0	1
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.

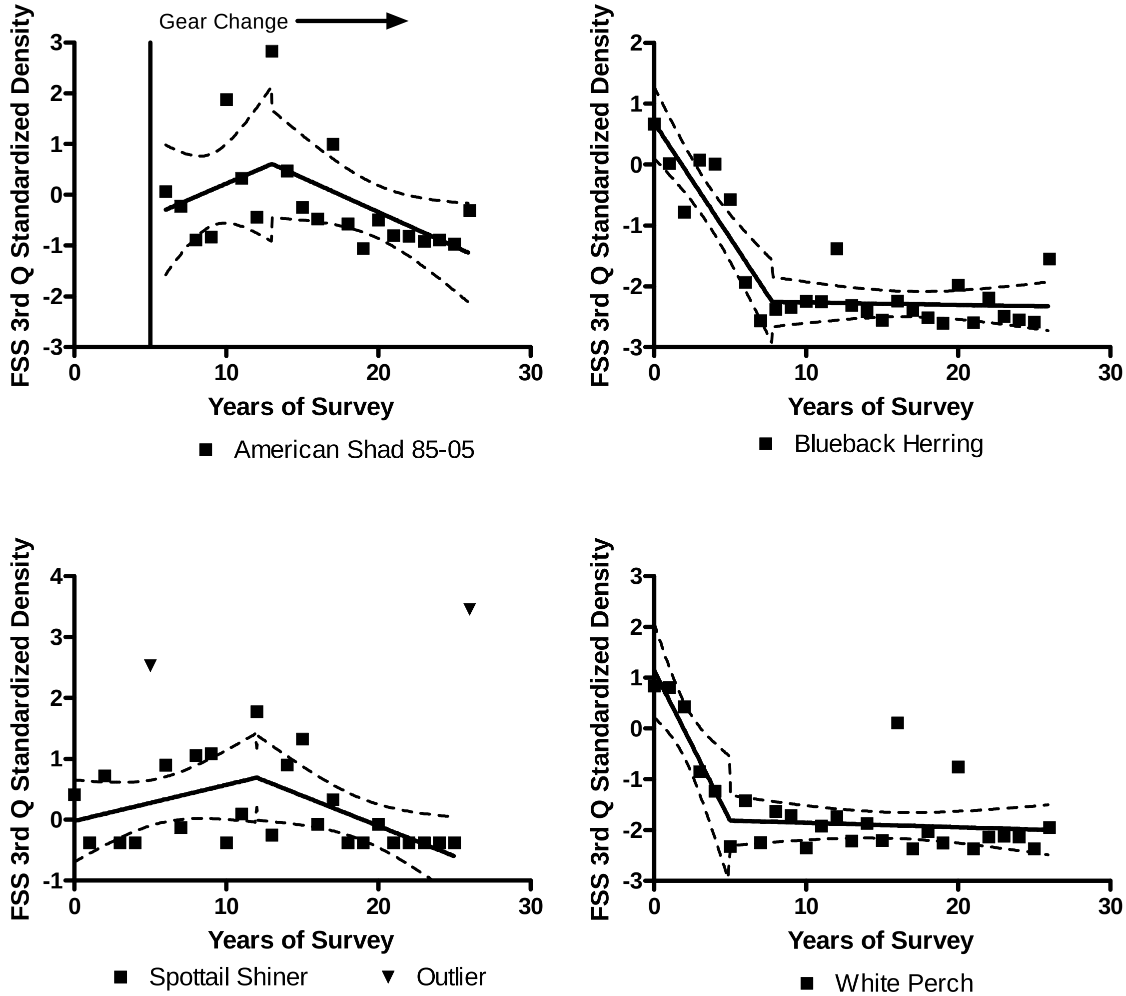


Figure I-25. River Segment 12 (Albany) population trends based on the FSS standardized density assigned a large level of potential negative impact

Table I-52. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used in BSS Population Trends of YOY Fish Density from River Segment 12

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife (1 value removed)	-0.04	-0.20	1990	0.020
Blueback Herring (All data)	0.50	0.07	1990	-0.080
Spottail Shiner (1 value removed)	1.25	-0.80	1982	0.000
Striped Bass (2 values removed)	0.18	-0.04	1984	0.040
White Perch (All data)	0.30	-0.12	1991	-0.050

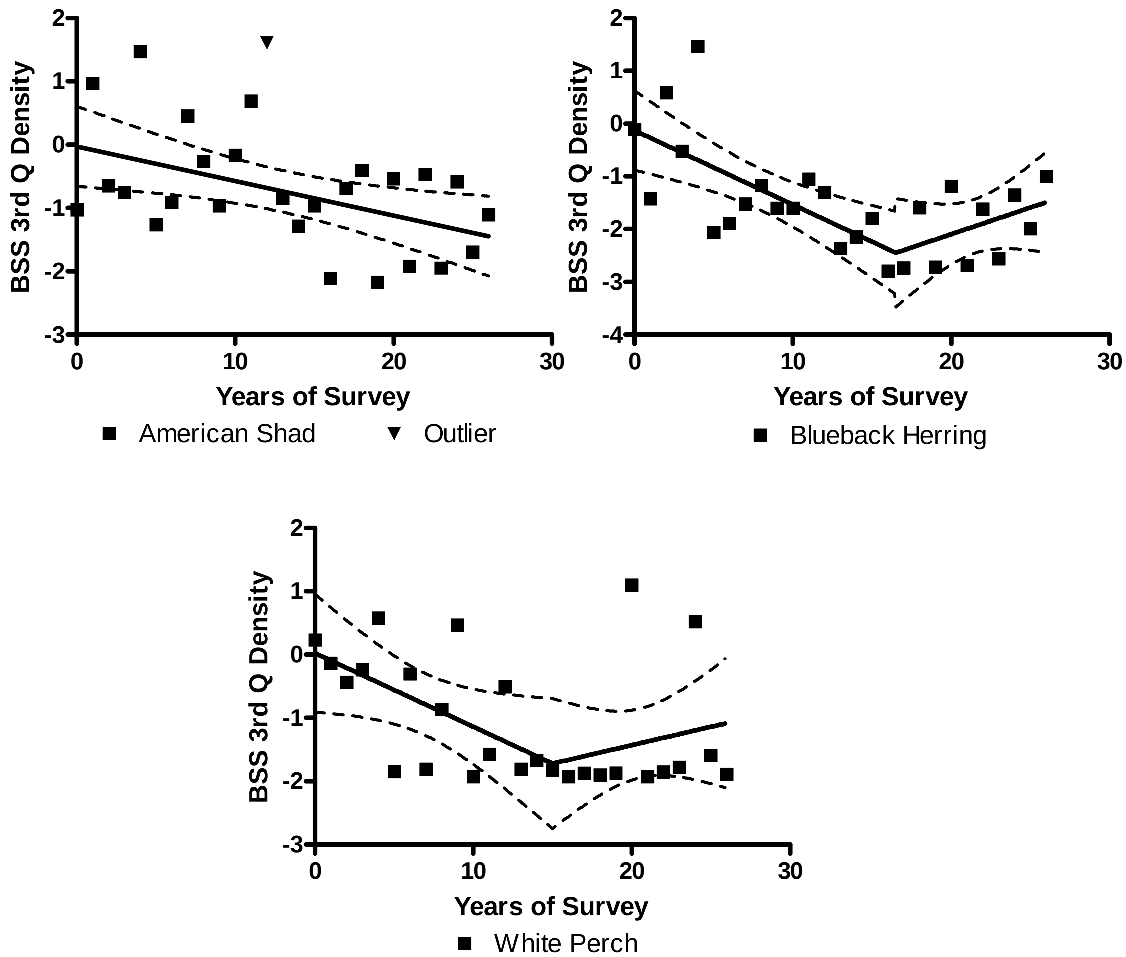
Table I-53. Competing Models Used To Characterize the Standardized River Segment 12 (Albany) Beach Seine Survey Population Trends of YOY Fish Density

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife (All data)	1.01	-0.020 ± 0.025	0.440	1.03	-0.877 to 0.472	1984	-0.073 to 0.071
Alewife (1 outlier removed)	0.78	-0.018 ± 0.019	0.373	0.74	-0.310 to 0.027	1989	-0.039 to 0.120
American Shad (All data)	0.91	-0.056 ± 0.023	0.020	Did Not Converge			
American Shad (1 value removed)	0.81	-0.055 ± 0.020	0.012	Did Not Converge			
Blueback Herring	0.87	-0.066 ± 0.022	0.005	0.78	-0.221 to -0.060	1996	-0.078 to 0.279
Spottail Shiner (All data)	1.02	0.007 ± 0.025	0.769	1.05	-1.23 to 0.765	1982	-0.050 to 0.087
Spottail Shiner (1 outlier removed)	0.66	-0.021 ± 0.017	0.232	0.68	-1.06 to 0.704	1982	-0.059 to 0.032
Striped Bass (All data)	0.99	0.030 ± 0.025	0.226	1.02	-0.787 to 0.544	1984	-0.024 to 0.117
Striped Bass (2 outliers removed)	0.61	0.020 ± 0.015	0.211	0.59	-0.483 to 0.148	1984	-0.003 to 0.088
White Perch	0.94	-0.048 ± 0.023	0.048	0.92	-0.229 to -0.003	1994	-0.100 to 0.216

Table I-54. River Segment 12 (Albany) Assessment of the Level of Potential Negative Impact Based on the Standardized BSS Density

Species	Best Fit	General Trend	Level of Potential Negative Impact
Alewife (All data)	LR	S = 0	1
Alewife (1 value removed)	SR	S1 = 0 S2 = 0	1
American Shad (All data)	LR	S < 0	4
American Shad (1 value removed)	LR	S < 0	4
Blueback Herring	SR	S1 < 0 S2 = 0	4
Spottail Shiner (All data)	LR	S = 0	1
Spottail Shiner (1 value removed)	LR	S = 0	1
Striped Bass (All data)	LR	S = 0	1
Striped Bass (2 value removed)	SR	S1 = 0 S2 = 0	1
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.



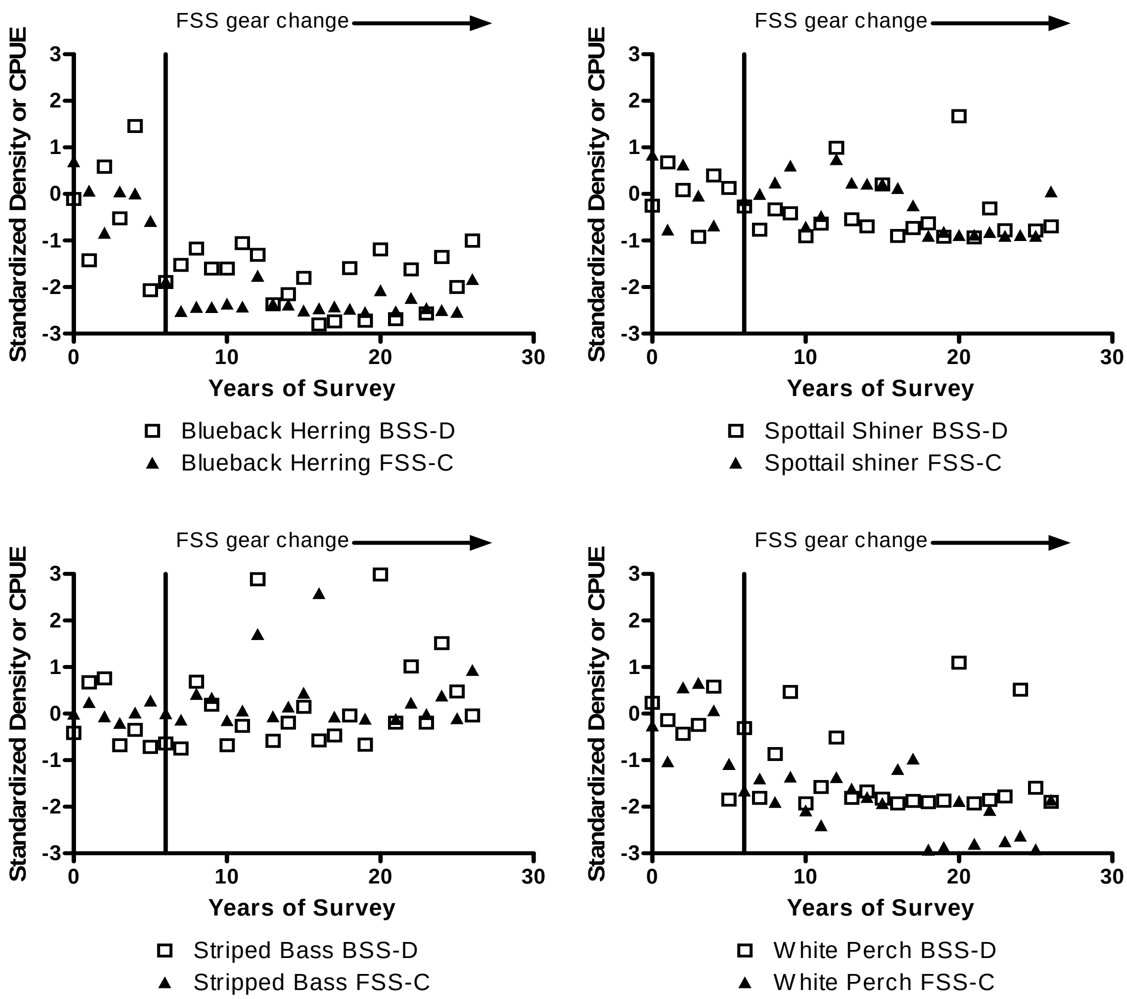
Note: Design Restricted

Figure I-26. River Segment 12 (Albany) population trends based on the BSS standardized density assigned a large level of potential negative impact

A visual and statistical comparison of the river-segment FSS standardized CPUE with the BSS standardized density (Table I-55) suggested that the trends were not biologically different for blueback herring, spottail shiner, striped bass, and white perch (Figure I-27). Observations from both surveys overlap and cross over each other. Thus, for these RIS, all of the FSS data (1979–2005) were used in the regression analysis. The FSS CPUE data for alewife and American shad, however, did show a potential gear effect (Figure I-28), and a post-1985 analysis was conducted.

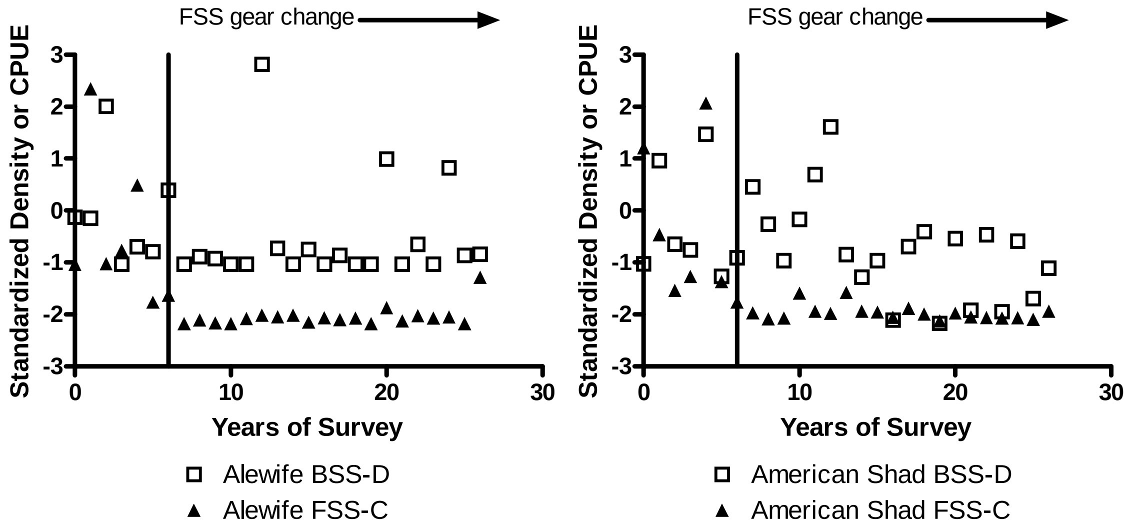
Table I-55. Evaluation of Gear Effect on FSS CPUE Trends for River Segment 12

Taxa	Proportion FSS < BSS		Absolute Difference in Proportions	Medan Absolute Difference		Significance of Sign Test	Conclusion
	1979-1984	1985-2005		1979-1984	1985-2005		
Alewife	0.50	1.00	0.50	1.08	1.22	< 0.001	Separate Analysis
American Shad	0.67	0.90	0.24	0.74	1.11	0.01	Separate Analysis
Blueback Herring	0.33	0.67	0.33	1.44	0.62	0.33	Not Biol. Different
Spottail Shiner	0.33	0.33	0.00	1.09	0.49	0.67	Not Biol. Different
Striped Bass	0.33	0.24	0.10	0.45	0.53	0.33	Not Biol. Different
White Perch	0.50	0.76	0.26	0.83	0.87	0.09	Not Biol. Different



Note: All data were used in WOE analysis.

Figure I-27. River Segment 12 population trends based on the FSS standardized CPUE (C) and BSS density (D) not considered biologically different



Note: Post-1985 data were analyzed for WOE analysis.

Figure I-28. River Segment 12 population trends based on the FSS standardized CPUE (C) and BSS density (D) for which the FSS may indicate a gear difference

The following tables are the intermediate analyses for the assessment of population trends associated with fish CPUE sampled from River Segment 12 (Albany). Results of these river-segment trend analyses are compiled in Table H-19 in Section H.2 of Appendix H. The data used in this analysis were the standardized 75th percentile of the weekly fish CPUE for a given year collected from the FSS (Table I-56, Table I-57, Table I-58, and Figure I-27.).

One extreme outlier (value greater than 3 standard deviations away from the mean) was removed from the FSS spottail shiner CPUE regression analysis (Tables I-56 and I-57), and one extreme outlier was removed from the FSS white catfish CPUE (value greater than 2 standard deviations away from the mean) regression analysis because of the influence these data had on the regression results. The results of the regression models with the observations removed were more conservative and were used for the trend analysis.

Table I-56. Initial Values for the Nonlinear Fit of the Segmented Regression Models Used on FSS CPUE Trends for YOY Fish from River Segment 12

Taxa	Intercept	Slope 1	Join Point	Slope 2
Alewife (1985-2005)	0.00	0.00	1994	-0.10
American Shad (1985-2005)	0.00	0.00	1994	-0.09
Blueback Herring (All data)	0.50	-0.08	1990	-0.02
Spottail Shiner (1 value removed)	1.25	-0.08	1982	0.00
Striped Bass (All data)	-0.08	0.07	1990	0.00
White Catfish (1 value removed)	0.40	0.06	1988	0.00
White Perch (All data)	0.30	0.00	1982	0.00

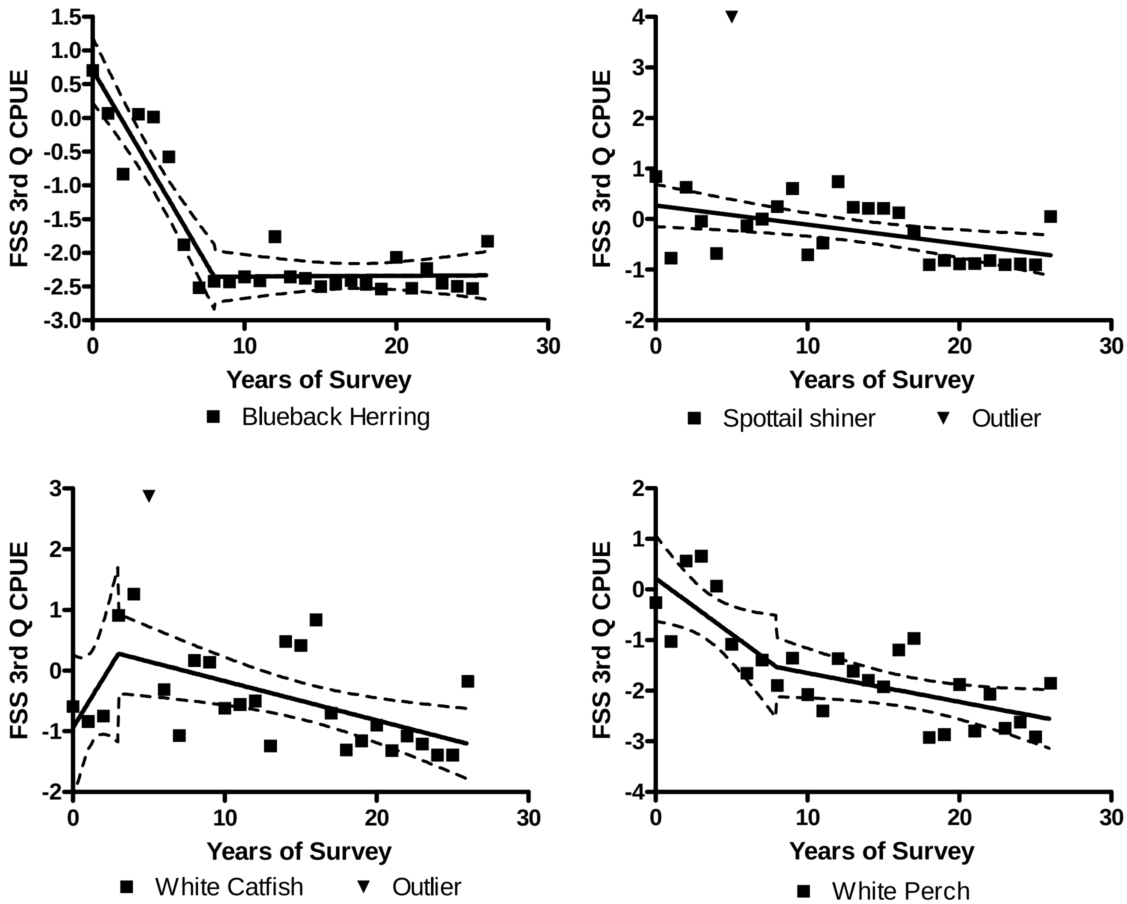
Table I-57 Competing Models Used To Characterize the Standardized River Segment 12 (Albany) Fall Juvenile Survey Population Trends of YOY Fish CPUE

	Linear Regression			Segmented Regression			
Species	MSE	Slope	p-value	MSE	95 percent CI Slope 1	Join Point	95 percent CI Slope 2
Alewife (1985–2005)	1.00	0.033 ± 0.036	0.371	0.96	-0.185 to 0.083	1999	-0.108 to 0.656
American Shad (1985–2005)	0.94	-0.066 ± 0.034	0.064	0.96	-0.342 to 0.385	1992	-0.247 to 0.046
Blueback Herring	0.72	-0.089 ± 0.018	< 0.001	0.38	-0.484 to -0.282	1987	-0.035 to 0.037
Spottail Shiner (All data)	0.91	-0.057 ± 0.023	0.018	Did Not Converge			
Spottail Shiner (1 outlier removed)	0.52	-0.038 ± 0.013	0.008	0.53	-2.89 to 2.14	1980	-0.066 to -0.002
Striped Bass	0.98	0.034 ± 0.024	0.168	0.95	-0.010 to 0.162	1997	-0.415 to 0.180
White Catfish (All data)	0.91	-0.056 ± 0.023	0.020	Did Not Converge			
White Catfish (1 outlier removed)	0.72	-0.042 ± 0.018	0.031	0.68	-0.325 to 1.14	1982	-0.111 to -0.018
White Perch	0.67	-0.095 ± 0.017	< 0.001	0.64	-0.391 to -0.052	1987	-0.116 to 0.003

Table I-58. River Segment 12 (Albany) Assessment of the Level of Potential Negative Impact Based on the Standardized FSS CPUE

Species	Best Fit	General Trend	Level of Potential Negative Impact
Alewife	SR	S1 = 0 S2 = 0	1
American Shad	LR	S = 0	1
Blueback Herring	SR	S1 < 0 S2 = 0	4
Spottail Shiner (All data)	LR	S < 0	4
Spottail Shiner (1 outlier removed)	LR	S < 0	4
Striped Bass	SR	S1 = 0 S2 = 0	1
White Catfish (All data)	LR	S < 0	4
White Catfish (1 outlier removed)	SR	S1 = 0 S2 < 0	4
White Perch	SR	S1 < 0 S2 = 0	4

LR = Linear Regression; SR = Segmented Regression.



Note: Design Restricted.

Figure I-29. River Segment 12 (Albany) population trends based on the FSS standardized CPUE assigned a large level of potential negative impact

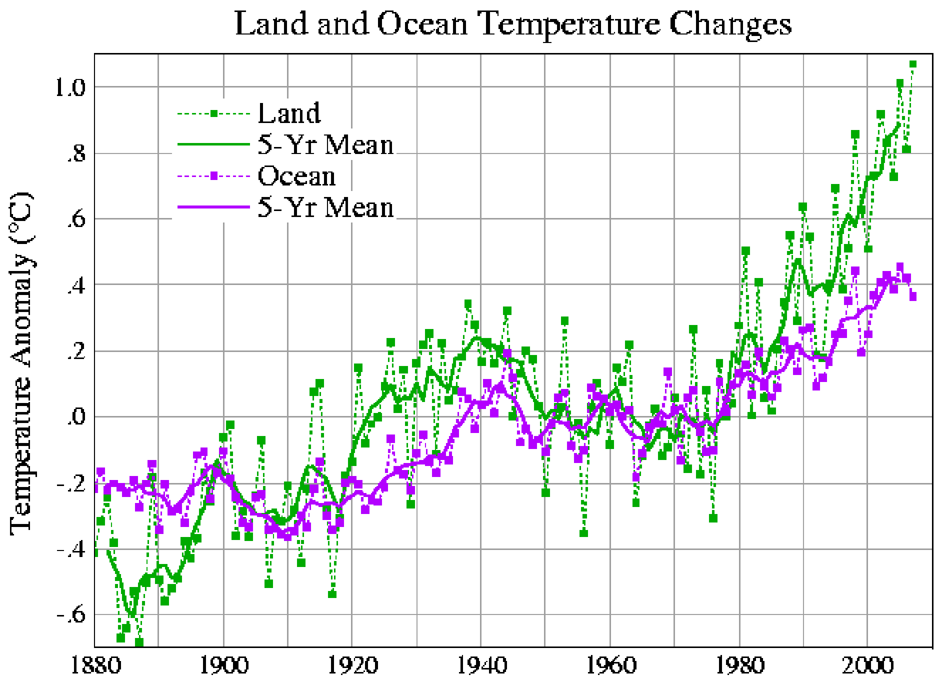
The WOE analysis for River Segment 12, Albany, for all population trend data post-1991 is presented in Table I-59. This table is a compilation of Tables I-51, I-54, and I-58 and was used to derive Table H-21 in Section H.2 in the Appendix H of this SEIS.

Table I-59. River Segment 12 (Albany) Assessment of the Level of Potential Negative Impact Following Zebra Mussel Invasion in 1991 Based on the Standardized FSS and BSS Density and FSS CPUE

Species	Trend Post-1991	Level of Potential Negative Impact Post- 1991
FSS Density		
Alewife	S2 = 0	1
American Shad	S2 < 0	4
Blueback Herring	S2 = 0	1
Spottail Shiner	S2 < 0	4
Striped Bass	S = 0	1
White Catfish	S = 0	1
White Perch	S2 = 0	1
BSS Density		
Alewife	S2 = 0	1
American Shad	S < 0	4
Blueback Herring	S2 = 0	1
Spottail Shiner	S = 0	1
Striped Bass	S2 = 0	1
White Perch	S2 = 0	1
FSS CPUE		
Alewife	S2 = 0	1
American Shad	S = 0	1
Blueback Herring	S2 = 0	1
Spottail Shiner	S < 0	4
Striped Bass	S2 = 0	1
White Catfish	S2 < 0	4
White Perch	S2 = 0	1

Water Quality and Temperature

Both water quality and water temperature can act to shift RIS densities into adjacent river segments based on specific life stage needs. Water quality changes have been occurring over the past decade (Section 2.2.5 of the SEIS), and water temperatures have been increasing over the last 100 years (Figure I-31). An analysis of RIS distributional change within the Hudson River was conducted by comparing the first and last 5-year mean densities from the survey that was most efficient at catching a given RIS. Striped bass (Figure I-32), alewife (Figure I-33), spottail shiner (Figure I-34), hogchoker (Figure I-35), and white perch (Figure I-36) all appear to have shifted slightly upriver, while the bay anchovy has shifted slightly downriver (Figure I-37). All other RIS that could be evaluated (American shad, Atlantic tomcod, blueback herring, bluefish, and weakfish) did not show a change in their distributions. It is not possible from these data to determine what might have influenced these shifts.



Source: Hansen et al. 2006.

Figure I-31. Historical trend in global land and ocean temperature

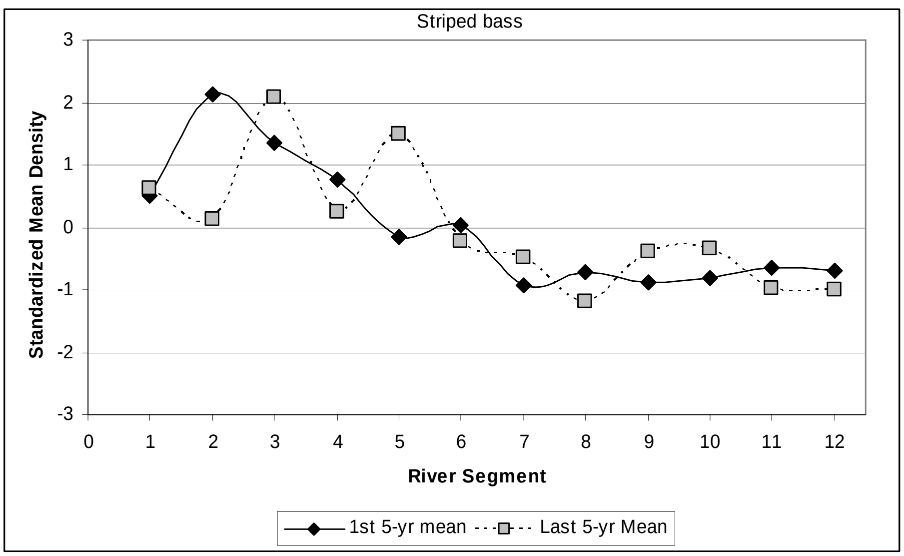


Figure I-32. Relative density of YOY striped bass from the BSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

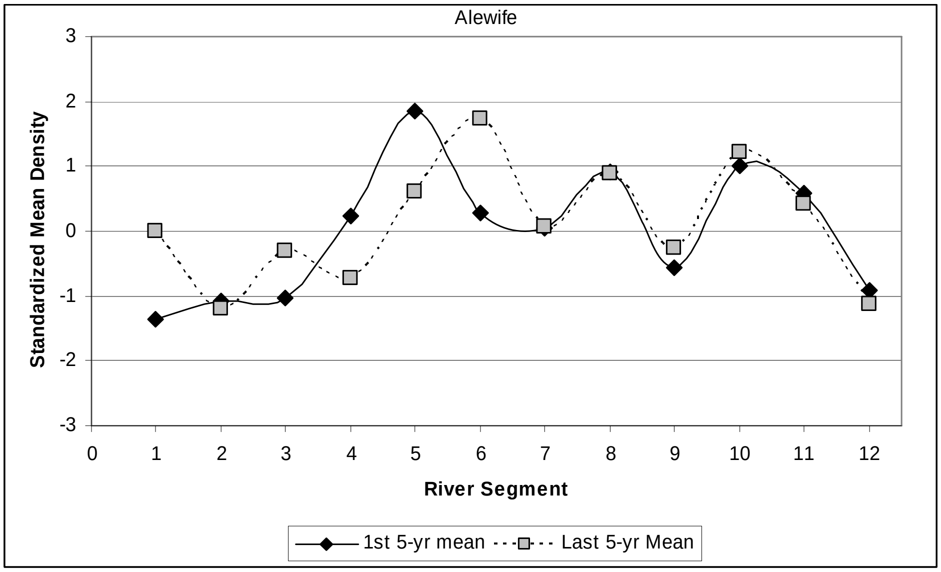


Figure I-33. Relative density of YOY alewife from the BSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

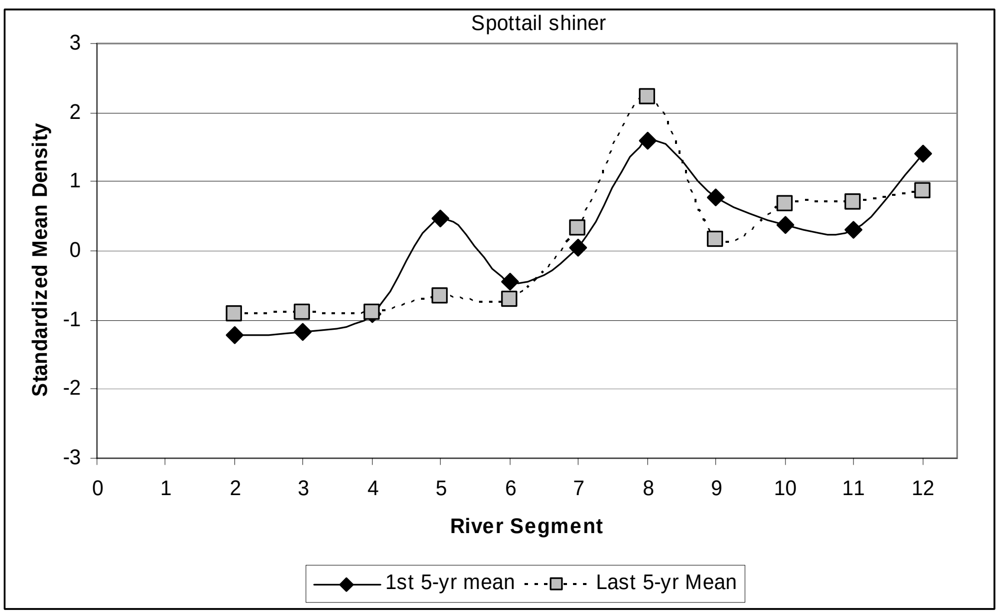


Figure I-34. Relative density of YOY spottail shiner from the BSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

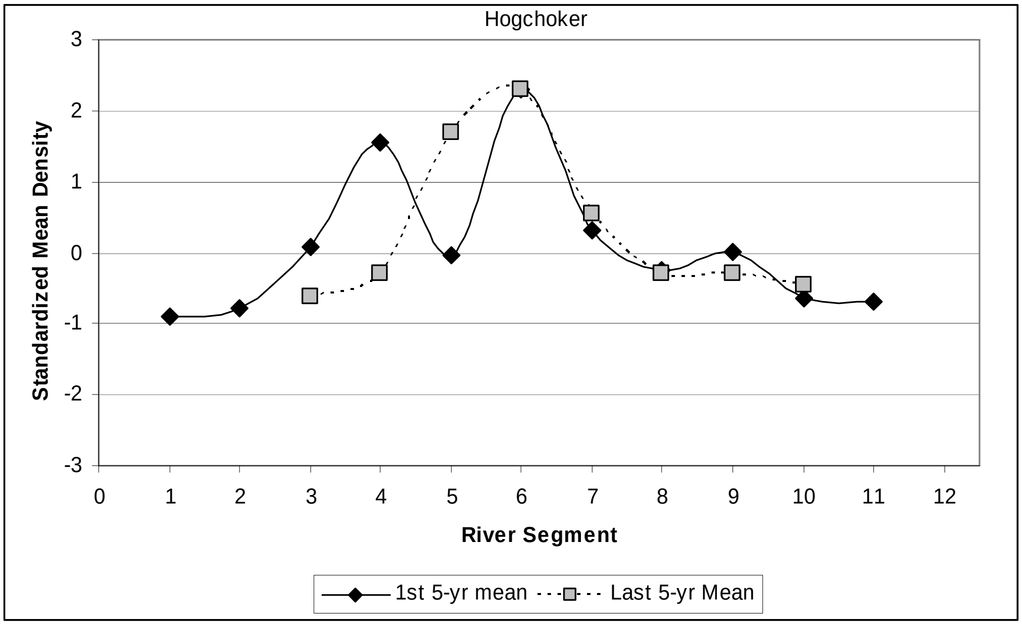


Figure I-35. Relative density of YOY hogchoker from the FSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

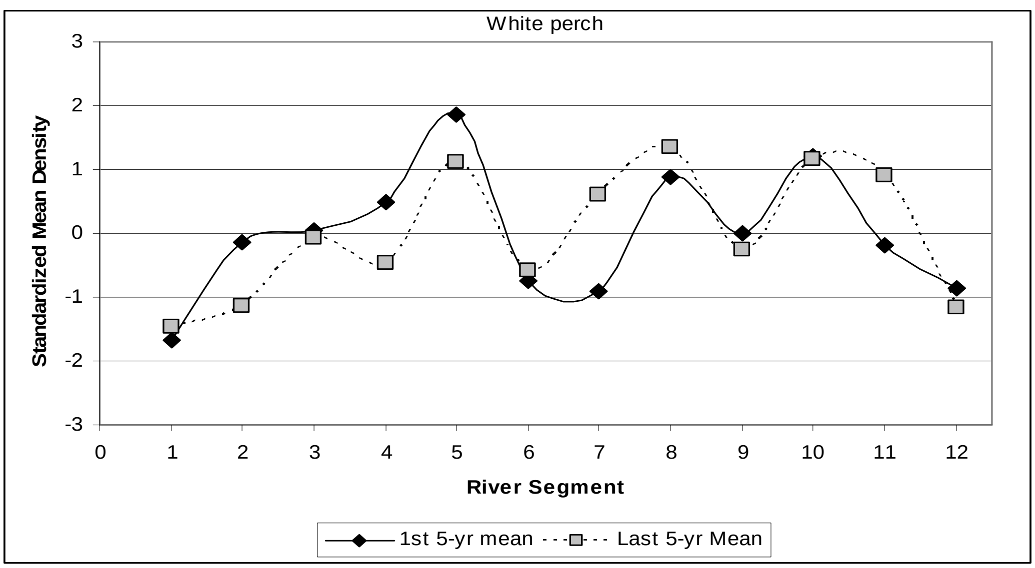


Figure I-36. Relative density of YOY white perch from the BSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

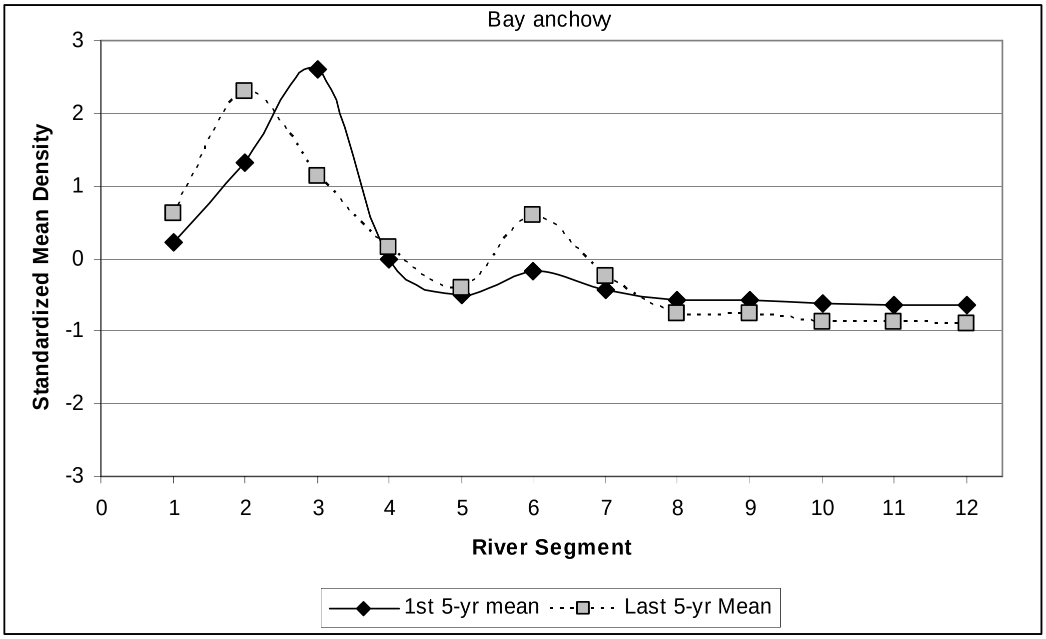


Figure I-37. Relative density of YOY bay anchovy from the FSS 1979–1983 and 2001–2005; data within each river segment of the Hudson River

I.4 References

Applied Science Associates (ASA). 1999. *1996 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. December 1999. ADAMS Accession No. ML083420045.

Applied Science Associates (ASA). 2001a. *1997 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; Niagara Mohawk Power Corporation; and Southern Energy New York. January 2001. ADAMS Accession No. ML083420045.

ASA Analysis and Communication (ASA). 2001b. *1998 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Central Hudson Gas and Electric Corporation; Dynegy Roseton LLC; Entergy Indian Point 3 LLC; Mirant Bowline LLC; New York Power Authority; and Niagara Mohawk Power Corporation. July 2001.

ASA Analysis and Communication (ASA). 2002. *1999 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. August 2002. ADAMS Accession No. ML083420076.

ASA Analysis and Communication (ASA). 2003. *2000 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. June 2003. ADAMS Accession No. ML083420089.

ASA Analysis and Communication (ASA). 2004a. *2001 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. April 2004.

ASA Analysis and Communication (ASA). 2004b. *2002 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. October 2004.

ASA Analysis and Communication (ASA). 2005. *2003 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. February 2005.

ASA Analysis and Communication (ASA). 2006. *2004 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. January 2006. ADAMS Accession No. ML083420103.

ASA Analysis and Communication (ASA). 2007. *2005 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Dynegy Roseton L.L.C.; Entergy Nuclear Indian Point 2 L.L.C.; Entergy Nuclear Indian Point 3 L.L.C.; and Mirant Bowline L.L.C. January 2007. ADAMS Accession No. ML073331067.

Battelle. 1983. *1980 and 1981 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. December 15, 1983. ADAMS Accession No. ML083420045.

Cochran, W.G. 1997. *Sampling Techniques*, John Wiley & Sons, New York, New York.

Consolidated Edison Company of New York, Inc. (Con Edison). Undated a. *1993 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). Undated b. *1994 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). Undated c. *1995 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). 1980. Hudson River Ecological Study in the Area of Indian Point 1979 Annual Report. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). 1983. Hudson River Ecological Study in the Area of Indian Point 1982 Annual Report. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). 1984. Hudson River Ecological Study in the Area of Indian Point 1981 Annual Report. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison) and New York Power Authority. 1984. Hudson River Ecological Study in the Area of Indian Point 1983 Annual Report. Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison) and New York Power Authority. 1986. Hudson River Ecological Study in the Area of Indian Point 1985 Annual Report. Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison) and New York Power Authority. 1987. Hudson River Ecological Study in the Area of Indian Point 1986 Annual Report. Prepared by Normandeau Associates, Inc. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison) and New York Power Authority. 1988. Hudson River Ecological Study in the Area of Indian Point 1987 Annual Report. Prepared by EA Science and Technology. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison) and New York Power Authority. 1991. Hudson River Ecological Study in the Area of Indian Point 1990 Annual Report. Prepared by EA Science and Technology. ADAMS Accession No. ML083420045.

Consolidated Edison Company of New York, Inc. (Con Edison). 1996. *1992 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. April 1996. ADAMS Accession No. ML083420045.

EA Engineering, Science, and Technology (EA). 1988. *1987 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. July 1988. ADAMS Accession No. ML083420045.

EA Engineering, Science, and Technology (EA). 1990. *1988 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. August 1990. ADAMS Accession No. ML083420045.

EA Engineering, Science, and Technology (EA). 1991. *1989 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. March 1991. ADAMS Accession No. ML083420045.

EA Engineering, Science, and Technology (EA). 1991. *1990 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. October 1991. ADAMS Accession No. ML083420045.

EA Engineering, Science, and Technology (EA). 1995. *1995 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. ADAMS Accession No. ML083420045.

Entergy Nuclear Operations, Inc. (Entergy). 2007. *Applicant's Environment Report, Operating License Renewal Stage.* (*Appendix E of* Indian Point*, Units 2 and 3, License Renewal Application*). April 23, 2007. (Agencywide Documents Access and Management System) ADAMS Accession No. ML071210530.

Entergy Nuclear Operations, Inc. (Entergy). 2007b. Letter from F.R. Dacimo, Vide President, Entergy Nuclear Operations, Inc. to Document Control Desk, U.S. Nuclear Regulatory Commission. Subject: Entergy Nuclear Operations, Inc., Indian Point Nuclear Generating Unit

Nos. 2 & 3; Docket Nos. 50-247 and 50-286; Supplement to License Renewal Application (LRA) – Environmental Report References. ADAMS Nos. ML080080205, ML0800080209, ML080080214, ML0800802161, ML0800080291, ML080080298, ML080080306, and ML080080313.

Hansen J., M. Sato, R. Ruedy, K. Lo, D.W. Lea, and M. Medina-Elizade. 2006. "Global Temperature Change." PNAS 103: 14288–14293. Accessed at http://pubs.giss.nasa.gov/docs/2006/2006_Hansen_etal_1.pdf on April 21, 2008.

Lawler, Matusky & Skelly Engineers (LMS). 1989. *1986 and 1987 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; and Central Hudson Gas and Electric Corporation. June 1989. ADAMS Accession No. ML083420045.

Lawler, Matusky & Skelly Engineers (LMS). 1991. *1990 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. January 1991. ADAMS Accession No. ML083420045.

Lawler, Matusky & Skelly Engineers (LMS). 1996. *1991 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. January 1996. ADAMS Accession No. ML083420045.

Martin Marietta Environmental Systems (MMES). 1986. *1984 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. May 1986. ADAMS Accession No. ML083420045.

New York Power Authority (NYPA). 1986. "Size Selectivity and Relative Catch Efficiency of a 3-m Beam Trawl and a 1-m^2 Epibenthic Sled for Sampling Young of the Year Striped Bass and Other Fishes in the Hudson River Estuary." Prepared by Normandeau Associates, Inc. January 1986. (HR Library #7180). ADAMS Accession No. ML083360641.

Normandeau Associates, Inc. (Normandeau). 1985a. *1982 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. February 1985. ADAMS Accession No. ML083420045.

Normandeau Associates, Inc. (Normandeau). 1985b. *1983 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. April 1985. ADAMS Accession No. ML083420045.

Normandeau Associates, Inc. (Normandeau). 1986. *1985 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New

York Power Authority; and Niagara Mohawk Power Corporation. September 1986. ADAMS Accession No. ML083420045.

Normandeau Associates, Inc. (Normandeau). 1987. *1986 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. August 1987. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1977. *1974 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; and Central Hudson Gas and Electric Corporation. May 1977. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1978. *1975 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; and Power Authority of the State of New York. June 1978. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1979. *1976 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; and Power Authority of the State of New York. May 1979. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1980. *1977 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; and Power Authority of the State of New York. July 1980. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1980. *1978 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; and Power Authority of the State of New York. September 1980. ADAMS Accession No. ML083420045.

Texas Instruments Inc. (TI). 1981. *1979 Year Class Report for the Multiplant Impact Study of the Hudson River Estuary*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; and Power Authority of the State of New York. March 1981. ADAMS Accession No. ML083420045.

Versar, Inc. (Versar). 1987. *1985 Year Class Report for the Hudson River Estuary Monitoring Program*. Prepared for Consolidated Edison Company of New York, Inc.; Orange and Rockland Utilities, Inc.; Central Hudson Gas and Electric Corporation; New York Power Authority; and Niagara Mohawk Power Corporation. October 1987. ADAMS Accession No. ML083420045.

NRC FORM 335 (9-2004) NRCMD 3.7 — U.S. NUCLEAR REGULATORY COMMISSION	1. REPORT NUMBER (Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)
BIBLIOGRAPHIC DATA SHEET *(See instructions on the reverse)*	NUREG-1437, Suplement 38, Vol. 3

2. TITLE AND SUBTITLE

Generic Environmental Impact Statement for License Renewal of Nuclear Plants
Supplement 38
Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3
Final Report
Public Comments, Continued; Appendices

3. DATE REPORT PUBLISHED

MONTH	YEAR
December	2010

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

See Appendix B of this Report

6. TYPE OF REPORT

Technical

7. PERIOD COVERED *(Inclusive Dates)*

8. PERFORMING ORGANIZATION - NAME AND ADDRESS *(If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)*

Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

Same as 8 above

10. SUPPLEMENTARY NOTES

Docket Nos. 05000247 and 05000286, TAC Nos. MD5411 and MD5412

11. ABSTRACT *(200 words or less)*

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by Entergy Nuclear Operations, Inc. (Entergy), Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC (all applicants will be jointly referred to as Entergy) to renew the operating licenses for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3) for an additional 20 years under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." This SEIS includes the NRC staff's analysis which considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the NRC staff's recommendation regarding the proposed action.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewals for IP2 and IP3 are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS, (2) the environmental report and other information submitted by Entergy, (3) consultation with other Federal, State, Tribal, and local agencies, (4) the NRC staff's own independent review, and (5) the NRC staff's consideration of public comments received during the scoping process and in response to the draft SEIS.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

Indian Point Nuclear Generating Unit Numbers 2 and 3
IP2
IP3
IPEC
Supplement to the Generic Environmental Impact Statement
FSEIS
National Environmental Policy Act
NEPA
License Renewal
GEIS
NUREG-1437, Supplement 38

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

(This Page) unclassified

(This Report) unclassified

15. NUMBER OF PAGES

16. PRICE

Printed on recycled paper

Federal Recycling Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS

MEDIA
MAIL

NUREG-1437, Supplement 38, Vol. 3
Final

Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Regarding Indian Point Nuclear Generating Unit Nos. 2 and 3

December 2010