Annual Radioactive Effluent Release Report

2008

Oyster Creek Nuclear Generating Station

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2008 through December 31, 2008

EXELON GENERATION COMPANY, LLC

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219 (Oyster Creek Generating Station)

DOCKET NO. 72-15 (Independent Spent Fuel Storage Facility)

Submitted to
The United States Nuclear Regulatory Commission
Pursuant to
Renewed Facility Operating License DPR-16

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EXECUTIVE SUMMARY

Effluents are strictly monitored to ensure that radioactivity released to the environment is as low as reasonably achievable and does not exceed regulatory limits. Effluent control includes the operation of monitoring systems, in-plant and environmental sampling and analyses programs, quality assurance programs for effluent and environmental programs, and procedures covering all aspects of effluent and environmental monitoring.

Both radiological environmental and effluent monitoring indicate that the operation of Oyster Creek Nuclear Generating Station (OCNGS) does not result in significant radiation exposure of people or the environment surrounding OCNGS and is well below the applicable levels set by the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA).

There were no liquid radioactive effluent releases above ODCM LLDs during 2008. Therefore there was no dose due to radiological liquid releases. Utilizing gaseous effluent data, the maximum hypothetical dose to any individual in the south east sector of the plant (sector of predominant wind direction) was calculated using a mathematical model, which is based on the methods defined by the U.S. Nuclear Regulatory Commission. These methods accurately determine the types and quantities of radioactive materials being released to the environment.

The maximum hypothetical calculated organ dose (thyroid) from iodines and particulates to any individual due to gaseous effluents was 3.58E-3 mRem (0.00358 mRem), which was approximately 0.024 percent of the annual limit. The maximum hypothetical calculated whole body dose to any individual due to gaseous effluents was 4.22E-4 mRem (0.000422 mRem), which was 0.000084 percent of the annual limit.

The total maximum hypothetical organ dose (thyroid) received by any individual from gaseous effluents from OCNGS for the reporting period due to all radiological effluents is 3.58E-3 mRem (0.00358 mRem). This value is more than 83,000 times lower than the dose the average individual in the Oyster Creek area received from background radiation, including that from radon during the same time period. The background radiation dose averages approximately 300 mRem per year in the Central New Jersey area, which includes approximately 200 mRem/year from naturally occurring radon gas and100 mRem from background radiation.

The Independent Spent Fuel Storage Installation (ISFSI) is a closed system and the only exposure would be due to direct radiation. This includes iodines, particulates and noble gases. Based on offsite TLD readings, dose due to direct radiation from the ISFSI was less than 1mRem for 2008. Because it is a sealed unit, no radioactive material was released.

Additionally, comparison of environmental sampling results to iodine and particulate gaseous effluents released, showed no radioactivity attributable to the operation of OCNGS. Both elevated and ground-level release paths were considered in this review,

with total iodines released of 1.58 mCi and total particulates with half-lives greater than 8 days released of 0.339 mCi (1 mCi is one/one-thousandth of a Ci.).

Joint Frequency Tables of meteorological data, per Pasquill Category, as well as for all stability classes, are included. All data was collected from the on-site Meteorological Facility. Data recoveries for the 380-foot data and the 33-foot data were 97.9 percent and 97.8 percent, respectively. The UFSAR commits to Regulatory Guide (RG) 1.23 for Meteorological Facility data recovery. RG 1.23 requires data recovery of at least 90% on an annual basis.

1. Introduction

In accordance with the reporting requirements of Technical Specification 3.6.E.1 applicable during the reporting period, this report summarizes the effluent release data for Oyster Creek Generating Station for the period January 1, 2008 through December 31, 2008. This submittal complies with the format described in Regulatory Guide 1.21, "Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water Cooled Nuclear Power Plants", Revision 1, June, 1974.

Meteorological data was reported in the format specified in Regulatory Guide 1.23, Revision 1, "Meteorological Monitoring Programs For Nuclear Power Plants".

All vendor results were received and included in the report calculations. Therefore the 2008 report is complete.

2. Supplemental Information

A. Regulatory Limits

	Limit	Units	Receptor	ODCM and 10 CFR 50, Appendix I Design Objective Limits
1. Noble Gases:				
a.	≤ 500	mrem/Yr	Total Body	ODCM Control 3.11.2.1
	≤ 3000	mrem/Yr	Skin	
b.	≤ 10	mRad	Air Gamma	Quarterly air dose limits
	≤ 20	mRad	Air Beta	ODCM Control 3.11.2.2
c.	≤ 20	mRad	Air Gamma	Yearly air dose limits
	≤ 40	mRad	Air Beta	ODCM Control 3.11.2.2
d.	≤ 10	mrem	Total Body (Gamma)	10 CFR 50, Appendix I, Section
	≤ 30	mrem	Skin (Beta)	II.B.2(b)
2. Iodines, Tritium, Particulates with Half Life > 8 days:				
a.	≤ 1500	mrem/Yr	Any Organ	ODCM Control 3.11.2.1
b.	≤ 7.5	mrem	Any Organ	Quarterly dose limits ODCM Control 3.11.2.3
c.	≤ 15	mrem	Any Organ	Yearly dose limits ODCM Control 3.11.2.3
3. Liquid Effluents				
a.	Concentration 10 CFR 20, Appendix B, Table 2 Col. 2			ODCM Control 3.11.1.1
b.	≤ 1.5	mrem	Total Body	Quarterly dose limits
	≤ 5	mrem	Any Organ	ODCM Control 3.11.1.2
c.	≤ 3	mrem	Total Body	Yearly dose limits
	≤ 10	mrem	Any Organ	ODCM Control 3.11.1.2

B. Effluent Concentration Limits:

Gaseous dose rates rather than effluent concentrations are used to calculate permissible release rates for gaseous releases. The maximum permissible dose rates for gaseous releases are defined in ODCM Controls 3.11.2.2. and 3.11.2.2.

The Effluent Concentration Limit (ECL) specified in 10 CFR 20, Appendix B, Table 2, Column 2 for identified nuclides, were used to calculate permissible release rates and concentrations for liquid release per the Oyster Creek Offsite Dose Calculation Manual Control 3.11.1.1. The total activity concentration at the Route 9 bridge for all dissolved or entrained gases was limited to $\leq$ 2E-04 µCi/mL.

C. Average Energy ($\bar{E}$):

The Oyster Creek ODCM limits the instantaeneous dose equivalent rates due to the release of noble gases to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin. The average beta and gamma energies ($\bar{E}$) of the radionuclide mixture in releases of fission and activation gases as described in Regulatory Guide 1.21, "Measuring, Evaluation, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," may be used to calculate doses in lieu of more sophisticated software. The Oyster Creek radioactive effluent program employs the methodologies presented in U.S. NRC Regulatory Guide 1.109 "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, October 1978. Therefore, average energies are not applicable to Oyster Creek.

D. Measurements and Approximations of Total Radioactivity:

1. Fission and Activation Gases

The method used for Gamma Isotopic Analysis is the Canberra Gamma Spectroscopy System with a gas Marinelli beaker. Airborne effluent gaseous activity was continuously monitored and recorded in accordance with ODCM Table 4.11.2.1.2-1. Additional grab samples were taken from the stack RAGEMS sample point and ground-level release sample points and analyzed at least monthly to determine the isotopic mixture of noble gas activity released for the month. The data from the noble gas radiation monitor were analyzed to report net noble gas effluent activity. If activity was found in the grab isotopic analysis, the isotopic mixture for the Noble Gas Monitor was determined from that isotopic mixture.

2. Particulates and Iodines

The method used for Gamma Isotopic Analysis is the Canberra Gamma Spectroscopy System with a particulate filter (47 mm) and/or charcoal cartridge, respectively. Particulate and iodine activity was continuously sampled and analyzed in accordance with ODCM Table 4.11.2.1.2-1. Charcoal and particulate samples are taken from the stack RAGEMS sample point and ground-level release sample points and analyzed at least weekly to determine the total activity released from the plant based on the highest vent flow rates recorded for the sampling period.

3. Liquid Effluents

During 2008, there were no radiological liquid releases. Since there were no liquid discharges in 2008, there was no dose attributable to liquid effluents.

4. Tritium in Gaseous Effluents:

Air from stack effluents was passed through a desiccant column and distilled to remove the tritiated water collected. An aliquot of the water from the distillate was analyzed using a liquid scintillation counter.

5. Composite Samples and Lower Limit of Detection (LLD)

Particulate air samples were composited monthly and analyzed for gross alpha, Sr-89 and Sr-90. These composites are submitted to an offsite vendor laboratory for analysis.

6. Estimated Total Error Present

Procedure CY-AA-170-2100, Estimated Errors of Effluent Measurements, provides the methodology to obtain an overall estimate of the error associated with radioactive effluents.

E. Abnormal Releases: There were no abnormal releases during 2008.

F. Revisions to the ODCM

Revision 3 of CY-OC-70-301, Offsite Dose Calculation Manual was approved during April, 2009. A complete copy along with a summary of changes is included in the mailing:

- Changes to REMP sample locations.
- Change the reporting level of I-131 to 2 pCi/L
- Update X/Q and D/Q factors to average values from the last five years of met data.
- Use of the updated X/Q and D/Q factors in example dose calculations.
- Add a reference for a report from a vendor's hydrogeologic investigation report.
- A complete re-write of Table E-1 describing REMP sample stations.
- Updated maps of the 1-mile, 1 to 5-mile and greater than 5-mile rings showing REMP sample stations.

Radiation Effluent Monitors Out of Service More Than 30 Days

Per ODCM Control 3.11, "Radioactive Liquid Effluent Monitoring Instrumentation" and Table 3.3.3.11-1 Radioactive Gaseous Effluent Monitoring Instrumentation", instrumentation requires:

With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 3.3.3.11-1. Restore the inoperable instrumentation to OPERABLE status within the time specified in the ACTION or explain in the next Annual Radioactive Effluent Release Report why this inoperability was not corrected within the time specified.

The following is a discussion of instrumentation out of service for greater than 30 days:

The Service Water radiation monitor was out of service from 09/25/2008 to 12/31/2008 due to inoperable instrumentation. An investigation revealed that the monitor could not be repaired and that new components had to be manufactured.

G. Changes to the Process Control Plan

Revision 8 of the Process Control Plan (PCP) (RW-AA-100) consisted of numerous relatively minor changes including clarification to a vendor's processing system, changes to general waste processing requirements, the handling of dry activated waste (DAW)burial site requirements, and shipping and inspection requirements.

H. Releases from the Independent Spent Fuel Storage Facility

The Independent Spent Fuel Storage Installation (ISFSI) is a closed system and the only exposure would be due to direct radiation. This includes iodines, particulates, and noble gases. Based on offsite TLD readings, dose due to direct radiation from the ISFSI was less than 1mRem for 2008. Because it is a sealed unit, no radioactive material was released.

Appendix A
Effluent and Waste Disposal Summary

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TABLE A -1 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES PERIOD 2008

A. FISSION AND ACTIVATION GASSES

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total Release	Ci	1.54E0	1.98E0	3.33E0	8.76E-2	25
2. Average Release Rate for Period	uCi/sec	1.96E-1	2.52E-1	4.19E-1	1.10E-2	
3. Dose - Gamma Air Dose	mrad	3.81E-5	3.13E-5	7.83E-5	3.57E-3	
- Beta Air Dose	mrad	1.94E-5	2.85E-5	4.95E-5	4.57E-3	
4. Percent of ODCM Limit - Gamma Air Dose	%	7.62E-4	6.26E-4	1.57E-3	7.14E-2	
- Beta Air Dose	%	1.94E-3	2.85E-4	4.95E-4	4.57E-2	

B. IODINES

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total – I-131	Ci	1.58E-4	2.03E-4	3.13E-5	1.59E-5	25
2. Average Release Rate for Period	uCi/sec	2.03E-5	2.58E-5	3.94E-6	1.60E-7	

C. PARTICULATES

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Particulates with T 1/2 > 8 days	Ci	1.11E-4	1.04E-4	2.61E-5	9.80E-5	25
2. Average Release Rate for Period	uCi/sec	1.42E-5	1.32E-5	3.28E-6	1.23E-5	
3. Gross Alpha Radioactivity	Ci	<LLD	<LLD	<LLD	<LLD	

D. TRITIUM

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total Release	Ci	5.37	5.91	10.1	6.24	25
2. Average Release Rate for Period	UCi/sec	6.38E-1	7.86E-1	1.27E0	7.85E-1	

E. Iodine 131 & 133, Tritium & Particulate

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1. Organ Dose	mrem	8.65E-4	1.33E-3	5.00E-4	1.17E-3
2. Percent of ODCM Limit	%	1.15E-2	1.77E-2	6.67E-3	1.56E-2

* ODCM Limit is for combined Iodine, tritium and particulate only, which is shown in Item E.

TABLE A - 2 GASEOUS EFFLUENTS FOR RELEASE POINT – ELEVATED PERIOD 2008

1. FISSION AND ACTIVATION GASSES

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
KR-85	Ci	<LLD	<LLD	<LLD	<LLD
KR-85M	Ci	<LLD	<LLD	<LLD	<LLD
KR-87	Ci	<LLD	<LLD	<LLD	<LLD
KR-88	Ci	<LLD	<LLD	<LLD	<LLD
XE-131M	Ci	<LLD	<LLD	<LLD	<LLD
XE-133	Ci	<LLD	<LLD	<LLD	<LLD
XE-133M	Ci	<LLD	<LLD	<LLD	<LLD
XE-135	Ci	1.54E0	1.98E0	3.33E0	8.76E2
XE-135M	Ci	<LLD	<LLD	<LLD	<LLD
XE-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	1.54E0	1.98E0	3.33E0	8.76E2

2. IODINES

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
I-131	Ci	1.58E-4	2.03E-4	3.13E-5	1.59E-5
I-133	Ci	5.34E-4	4.25E-4	1.75E-4	2.17E-5
Total for Period	Ci	6.92E-4	6.28E-4	2.06E-4	3.76E-5

3. PARTICULATES (T 1/2 > 8 DAYS)

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
MN-54	Ci	1.51E-5	1.87E-5	<LLD	<LLD
FE-59	Ci	<LLD	<LLD	<LLD	<LLD
CO-58	Ci	<LLD	<LLD	<LLD	<LLD
CO-60	Ci	<LLD	<LLD	<LLD	7.17E-6
ZN-65	Ci	<LLD	<LLD	<LLD	<LLD
SR-89	Ci	9.64E-5	8.51E-5	2.61E-5	6.42E-5
SR-90	Ci	<LLD	<LLD	<LLD	<LLD
ZR-95	Ci	<LLD	<LLD	<LLD	<LLD
NB-95	Ci	<LLD	<LLD	<LLD	<LLD
MO-99	Ci	<LLD	<LLD	<LLD	<LLD
CS-134	Ci	<LLD	<LLD	<LLD	<LLD
CS-137	Ci	<LLD	<LLD	<LLD	<LLD
CE-141	Ci	<LLD	<LLD	<LLD	<LLD
CE-144	Ci	<LLD	<LLD	<LLD	<LLD
BA 140	Ci	<LLD	<LLD	<LLD	2.66E-5
Total for Period	Ci	1.11E-4	1.04E-4	2.61E-5	9.80E-5

TABLE A - 3 GASEOUS EFFLUENTS FOR RELEASE POINT – GROUND LEVEL PERIOD 2008

1. FISSION AND ACTIVATION GASSES

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
AR-41	Ci	<LLD	<LLD	<LLD	<LLD
KR-85M	Ci	<LLD	<LLD	<LLD	<LLD
KR-87	Ci	<LLD	<LLD	<LLD	<LLD
KR-88	Ci	<LLD	<LLD	<LLD	<LLD
XE-133	Ci	<LLD	<LLD	<LLD	<LLD
XE-133M	Ci	<LLD	<LLD	<LLD	<LLD
XE-135	Ci	<LLD	<LLD	<LLD	6.15E1
XE-135M	Ci	<LLD	<LLD	<LLD	<LLD
XE-138	Ci	<LLD	<LLD	<LLD	<LLD
		<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	<LLD	<LLD	6.15E1

2. IODINES

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
I-131	Ci	<LLD	<LLD	<LLD	1.71E5
I-133	Ci	<LLD	<LLD	1.75E4	<LLD
Total for Period	Ci	<LLD	<LLD	1.75E4	1.71E5

3. PARTICULATES (T 1/2 > 8 DAYS)

Nuclide Released	Continuous Mode				
	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4
MN-54	Ci	< LLD	< LLD	< LLD	< LLD
FE-59	Ci	< LLD	< LLD	< LLD	< LLD
CO-58	Ci	< LLD	< LLD	< LLD	< LLD
CO-60	Ci	< LLD	< LLD	< LLD	< LLD
ZN-65	Ci	< LLD	< LLD	< LLD	< LLD
SR-89	Ci	< LLD	< LLD	< LLD	< LLD
SR-90	Ci	< LLD	< LLD	< LLD	< LLD
ZR-95	Ci	< LLD	< LLD	< LLD	< LLD
NB-95	Ci	< LLD	< LLD	< LLD	< LLD
MO-99	Ci	< LLD	< LLD	< LLD	< LLD
CS-134	Ci	< LLD	< LLD	< LLD	< LLD
CS-137	Ci	< LLD	< LLD	< LLD	< LLD
CE-141	Ci	< LLD	< LLD	< LLD	< LLD
CE-144	Ci	< LLD	< LLD	< LLD	< LLD
Total for Period	Ci	< LLD	< LLD	< LLD	< LLD

TABLE A - 4 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
PERIOD 2008

A. FISSION AND ACTIVATION PRODUCTS

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total release (not including tritium, gasses & alpha)	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2. Average diluted concentration during batch discharge for the period	uCi/ml	<LLD	<LLD	<LLD	<LLD	
3. Dose - Whole Body	mrem	N/A	N/A	N/A	N/A	
- Organ	mrem	N/A	N/A	N/A	N/A	
4. % of ODCM Limit - Whole Body Dose*	%	N/A	N/A	N/A	N/A	
- Organ Dose*	%	N/A	N/A	N/A	N/A	

B. TRITIUM

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total Release	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2. Average diluted concentration during batch discharge for the period	uCi/ml	N/A	N/A	N/A	N/A	
3. % of ODCM Limit - ECL	%	N/A	N/A	N/A	N/A	

C. DISSOLVED AND ENTRAINED GASSES

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total release	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2. Average diluted concentration during batch discharge for the period	uCi/ml	N/A	N/A	N/A	N/A	
3. %of ODCM Limit - ECL	%	N/A	N/A	N/A	N/A	

D. GROSS ALPHA RADIOACTIVITY

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
1. Total release	Ci	<LLD	<LLD	<LLD	<LLD	N/A
2. Average diluted concentration during batch discharge for the period	uCi/ml	N/A	N/A	N/A	N/A	

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error %
E. Volume of waste released (prior to dilution)	Liters	N/A	N/A	N/A	N/A	N/A

F. Volume of dilution water used during period	Liters	N/A	N/A	N/A	N/A	N/A

* Percent of limit includes tritium.

Appendix B
Solid Waste and Irradiated Fuel Shipments

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Solid waste shipped offsite for burial or disposal (not irradiated fuel) 1/1/08 – 12/31/08

1. Type of waste

Type of waste	Unit	12 Month Period	Estimated Error %
a. Spent resin, filters sludges, evaporator bottoms, etc	m^3	2.14E1	25%
	Ci	4.54E1	
b. Dry compressible waste, contaminated equipment, etc.	m^3	4.43E2	25%
	Ci	1.94E-1	
c. Irradiated components, control rods, etc.	m^3	1.52E-1	25%
	Ci	2.07E4	
d. Other (Describe)	m^3	1.18E1	25%
Oil Filter Media	Ci	5.65E1	

2. Estimate of Major Nuclide Composition (By Waste Type)

Category A – Spent Resin, Filters, Sludges, Evaporator Bottoms, etc.

Isotope	Waste Class A Curies *	Percent Abundance	Waste Class B Curies *	Percent Abundance	Waste Class C Curies*	Percent Abundance
Co-60	1.46E+00	34.8	1.29E+01	31.4	1.00E+04	48.3
Cs-137	1.26E+00	30.1	1.93E+01	47.0	1.89E-02	9.13E-05
Fe-55	1.03E+00	24.6	5.99E+00	14.6	9.48E+03	45.8
Mn-54	2.15E-01	5.128	1.07E+00	2.60	2.62E+02	1.27
Zn-65	1.01E-01	2.409	2.42E-01	0.589	<LLD	N/A
C-14	6.73E-02	1.605	7.88E-01	1.92	1.46E+00	7.06E-03
Ni-63	2.88E-02	0.687	3.89E-01	0.946	9.43E+02	4.58
Cs-134	1.21E-02	0.289	2.70E-01	0.657	<LLD	N/A
H-3	4.14E-03	0.099	7.27E-02	0.177	7.00E-01	3.38E-03
Sr-90	3.84E-03	0.092	5.91E-02	0.144	5.91E-05	2.86E-7
Ag-110m	3.51E-03	0.084	<LLD	N/A	<LLD	N/A
Ce-144	3.48E-03	0.083	1.62E-02	0.040	1.58E-04	7.64E-07
Pu-241	2.39E-03	0.057	<LLD	N/A	<LLD	N/A
Co-57	5.25E-04	0.013	<LLD	N/A	<LLD	N/A
Totals	4.19		4.11E+01		2.07E+04	

* Activity is estimated

Category B – Dry Compressible Waste, Contaminated Equipment, etc.

Isotope	Waste Class A Curies *	Percent Abundance
Fe-55	9.03E-02	46.53
Co-60	4.34E-02	22.36
Mn-54	2.62E-02	13.50
Cs-137	1.89E-02	9.74
Zn-65	1.25E-02	6.44
Ni-63	8.05E-04	0.41
Co-58	6.22E-04	0.32
Ag-110m	6.04E-04	0.31
Cs-134	2.08E-04	0.11
Ce-144	1.58E-04	0.08
Other	3.83E-04	0.20
Totals	1.94E-01	100.0

* Activity is estimated

Category C – Irradiated components, control rods, etc.

Isotope	Waste Class C Curies *	Percent Abundance
Co-60	1.00E+04	4.83E+01
Fe-55	9.48E+03	4.58E+01
Ni-63	9.43E+02	4.56E+00
Mn-54	2.62E+02	1.27E+00
Ni-59	4.86E+00	2.35E-02
C-14	1.46E+00	1.40E+08
Co-58	1.46E+00	7.06E-03
H-3	7.00E-01	3.38E-03
Nb-94	2.04E-02	9.86E-05
Cs-137	1.89E-02	9.13E-05
Tc-99	1.06E-02	5.12E-05
Ce-144	1.58E-04	7.64E-07
Sr-90	5.91E-05	2.86E-07
Pu-241	3.52E-05	1.70E-07
Am-241	1.04E-06	5.03E-09
Pu-238	9.39E-07	4.54E-09
Cm-243	7.55E-07	3.65E-09
Cm-242	5.71E-07	2.76E-09
Pu-239	3.12E-07	1.51E-09
Totals	2.07E+04	100.0

* Activity is estimated

3. Solid Waste (Disposition)

Number of Shipments	Mode of Transportation	Destination
8	Hitman Transport Co.	Barnwell Waste Management
7	Hitman Transport Co.	Duratek
3	Hitman Transport Co.	Duratek Radwaste Processing, Inc.

A. Irradiated Fuel Shipments (disposition). There were no irradiated fuel shipments.

Appendix C
Radiological Impact to Man

Per ODCM Control 6.2, the Annual Radioactive Effluent Release Report shall include an assessment of the radiation doses to the hypothetically highest exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources. For purposes of this calculation the following assumptions were made:

Gaseous

- Annual average meteorology and actual gaseous effluent releases were used.
- Beta air dose attributed to noble gas releases.
- The sector with the highest x/Q, x/Q depleted and D/Q was the SE sector at Site Boundary 762 meters.
- All significant pathways were assumed to be present
- Occupancy factor was considered 100%.

Liquid
There was no dose due to liquid releases.

A summary of gaseous and liquid radiation doses to members of the public at these locations was as follows:

Effluent	Applicable Organ	Estimated Dose	Age Group	Location		% of Applicable Limit	Limit	Unit
				Distance (meters)	Direction (toward)			
Noble Gas	Gamma - Air Dose	5.25E-03	All	762	SE	2.63E-02	20	mRad
Noble Gas	Beta – Air Dose	3.10E-03	All	762	SE	7.75E-03	40	mRad
Noble Gas	Total Body (Gamma)	3.47E-03	All	762	SE	3.47E-02	10	mrem
Noble Gas	Skin (Beta)	6.40E-03	All	762	SE	2.13E-02	30	mrem
Iodine, Particulate & Tritium	Thyroid	1.03E-02	Infant	762	SE	3.40E-02	30	mrem

Doses calculated were well below all ODCM and 40 CFR Part 190 limits of 25 mrem to a real individual.

The ODCM does not require population doses to be calculated.

The radiation doses to Members of the Public have been estimated using methodology stated in the ODCM. The maximum gaseous dose to members of the public at these locations is based on the following assumptions:

- Actual meteorological data and actual effluent releases were used.
- Beta air dose attributed to noble gas releases.
- Dose is from ground plane and inhalation only. No ingestion dose.
- Adult age group was used for the New Jersey State Police dose.
- The maximum expected occupancy factor is 25% of a working year at all locations.

Notes:

(1) The limit for Gamma Air Dose = 10 mRad/Yr (ref. ODCM 3.11.2.2.)
(2) The limit for Beta Air Dose = 20 mRad/Yr (ref. ODCM 3.11.2.2.)
(3) The limit for Iodine/Particulate/H-3 Organ Dose = 15 mrem/Yr (ref. ODCM 3.11.2.3.)

Appendix D
Meteorological Data

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS A

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	0	11	38	57	14	1	121
NNE	SSW	0	9	31	29	26	6	101
NE	SW	0	12	26	24	7	0	69
ENE	WSW	1	20	55	42	16	5	139
E	W	1	21	54	71	32	26	205
ESE	WNW	0	18	75	74	53	44	264
SE	NW	0	20	60	57	25	15	177
SSE	NNW	1	9	25	36	14	2	87
S	N	1	16	22	5	1	0	45
SSW	NNE	2	11	20	10	6	0	49
SW	NE	3	7	30	40	7	1	88
WSW	ENE	0	15	64	56	12	0	147
W	E	0	20	75	21	17	0	133
WNW	ESE	0	31	63	11	1	0	106
NW	SE	1	15	79	23	0	0	118
NNW	SSE	2	9	59	64	2	0	136
TOTAL		12	244	776	620	233	100	1985

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS B

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	2	3	14	15	0	1	35
NNE	SSW	0	1	5	7	7	5	25
NE	SW	3	5	6	9	3	0	26
ENE	WSW	0	3	6	13	0	1	23
E	W	0	8	8	17	2	4	39
ESE	WNW	0	4	14	8	9	8	43
SE	NW	0	5	5	8	6	2	26
SSE	NNW	2	4	9	5	4	0	24
S	N	1	2	3	2	0	0	8
SSW	NNE	0	2	3	4	0	0	9
SW	NE	2	5	5	8	5	1	26
WSW	ENE	1	2	12	6	1	0	22
W	E	1	6	4	1	3	0	15
WNW	ESE	0	4	2	0	0	0	6
NW	SE	1	5	8	2	0	1	17
NNW	SSE	1	2	13	4	1	0	21
TOTAL		14	61	117	109	41	23	365

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS C

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	1	1	4	10	3	0	19
NNE	SSW	0	1	7	4	8	3	23
NE	SW	0	4	2	4	2	0	12
ENE	WSW	0	1	1	3	1	1	7
E	W	0	0	7	11	2	3	23
ESE	WNW	0	2	7	7	1	1	18
SE	NW	1	4	1	3	3	1	13
SSE	NNW	1	4	6	1	2	0	14
S	N	0	2	2	1	0	0	5
SSW	NNE	0	1	0	1	0	0	2
SW	NE	1	2	3	0	2	1	9
WSW	ENE	0	0	2	1	2	2	7
W	E	0	1	5	3	1	1	11
WNW	ESE	0	1	1	0	1	0	3
NW	SE	1	2	1	0	0	1	5
NNW	SSE	0	4	5	1	0	0	10
TOTAL		5	30	54	50	28	14	181

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS D

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	1	10	39	45	10	17	122
NNE	SSW	4	18	30	57	45	92	246
NE	SW	1	6	15	25	17	7	71
ENE	WSW	3	9	14	21	12	4	63
E	W	0	7	22	35	18	20	102
ESE	WNW	1	5	21	28	34	27	116
SE	NW	3	12	23	27	25	22	112
SSE	NNW	1	12	15	34	18	1	81
S	N	2	16	30	27	3	0	78
SSW	NNE	4	13	31	19	5	0	72
SW	NE	2	11	23	48	44	29	157
WSW	ENE	1	5	33	33	17	24	113
W	E	2	6	14	31	13	11	77
WNW	ESE	2	8	14	12	0	0	36
NW	SE	1	8	22	16	1	6	54
NNW	SSE	1	6	33	14	6	4	64
TOTAL		29	152	379	472	268	264	1564

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS E

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	5	21	42	69	19	24	180
NNE	SSW	5	15	48	127	83	47	325
NE	SW	8	18	19	68	112	20	245
ENE	WSW	5	16	32	49	41	14	157
E	W	10	16	32	57	60	29	204
ESE	WNW	4	12	25	67	96	46	250
SE	NW	2	11	20	55	52	16	156
SSE	NNW	6	7	16	37	28	5	99
S	N	3	9	16	20	9	0	57
SSW	NNE	1	2	16	25	19	11	74
SW	NE	4	5	19	34	12	6	80
WSW	ENE	0	7	13	29	11	13	73
W	E	0	7	15	27	25	17	91
WNW	ESE	1	10	34	10	8	3	66
NW	SE	3	16	18	23	4	3	67
NNW	SSE	3	16	27	28	8	14	96
TOTAL		60	188	392	725	587	268	2220

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS F

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	3	7	12	22	6	1	51
NNE	SSW	4	8	7	12	11	0	42
NE	SW	1	17	15	17	23	13	86
ENE	WSW	5	9	12	24	34	8	92
E	W	0	25	15	29	64	5	138
ESE	WNW	4	17	4	29	35	7	96
SE	NW	1	17	9	25	16	8	76
SSE	NNW	1	2	12	17	19	5	56
S	N	1	7	8	25	15	0	56
SSW	NNE	1	0	9	4	0	0	14
SW	NE	0	1	7	6	0	0	14
WSW	ENE	0	4	8	3	0	0	15
W	E	0	6	6	4	1	0	17
WNW	ESE	1	9	10	1	0	0	21
NW	SE	1	2	3	3	0	0	9
NNW	SSE	0	6	6	4	1	0	17
TOTAL		23	137	143	225	225	47	800

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS G

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	5	7	25	21	4	0	62
NNE	SSW	6	14	37	18	9	0	84
NE	SW	16	31	31	43	16	6	143
ENE	WSW	28	39	36	45	32	11	191
E	W	30	32	29	56	36	5	188
ESE	WNW	19	23	24	49	43	4	162
SE	NW	16	22	38	33	12	0	121
SSE	NNW	13	8	22	44	16	7	110
S	N	3	8	16	46	27	2	102
SSW	NNE	5	14	15	22	10	0	66
SW	NE	2	10	16	20	3	0	51
WSW	ENE	2	5	25	19	1	0	52
W	E	1	14	21	7	1	0	44
WNW	ESE	5	8	13	2	0	0	28
NW	SE	8	11	17	2	1	0	39
NNW	SSE	8	9	23	8	0	0	48
TOTAL		167	255	388	435	211	35	1491

OYSTER CREEK 380 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS ALL

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	17	60	174	239	56	44	590
NNE	SSW	19	66	165	254	189	153	846
NE	SW	29	93	114	190	180	46	652
ENE	WSW	42	97	156	197	136	44	672
E	W	41	109	167	276	214	92	899
ESE	WNW	28	81	170	262	271	137	949
SE	NW	23	91	156	208	139	64	681
SSE	NNW	25	46	105	174	101	20	471
S	N	11	60	97	126	55	2	351
SSW	NNE	13	43	94	85	40	11	286
SW	NE	14	41	103	156	73	38	425
WSW	ENE	4	38	157	147	44	39	429
W	E	4	60	140	94	61	29	388
WNW	ESE	9	71	137	36	10	3	266
NW	SE	16	59	148	69	6	11	309
NNW	SSE	15	52	166	123	18	18	392
TOTAL		310	1067	2249	2636	1593	751	8606

Hours of Missing/Invalid Data: 177

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS A

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	0	16	76	38	0	0	130
NNE	SSW	0	25	33	15	0	0	73
NE	SW	1	35	34	1	0	0	71
ENE	WSW	4	63	65	11	0	0	143
E	W	2	70	104	36	1	0	213
ESE	WNW	0	61	129	48	0	0	238
SE	NW	0	61	92	14	0	0	167
SSE	NNW	4	41	44	7	0	0	96
S	N	3	29	17	0	0	0	49
SSW	NNE	2	25	19	0	0	0	46
SW	NE	3	33	36	0	0	0	72
WSW	ENE	2	43	88	0	0	0	133
W	E	2	62	75	1	0	0	140
WNW	ESE	0	71	56	0	0	0	127
NW	SE	1	66	89	0	0	0	156
NNW	SSE	2	22	102	5	0	0	131
TOTAL		26	723	1059	176	1	0	1985

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS B

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	0	6	24	3	0	0	33
NNE	SSW	1	7	4	7	1	0	20
NE	SW	1	10	15	0	0	0	26
ENE	WSW	2	12	8	1	0	0	23
E	W	2	10	17	5	0	0	34
ESE	WNW	0	16	21	9	0	0	46
SE	NW	3	10	14	1	0	0	28
SSE	NNW	1	12	7	0	0	0	20
S	N	4	4	3	0	0	0	11
SSW	NNE	0	5	3	0	0	0	8
SW	NE	1	11	10	1	0	0	23
WSW	ENE	5	13	6	0	0	0	24
W	E	2	9	4	0	0	0	15
WNW	ESE	2	3	0	0	0	0	5
NW	SE	0	14	7	1	0	0	22
NNW	SSE	4	13	10	0	0	0	27
TOTAL		28	155	153	28	1	0	365

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS C

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	0	5	17	2	0	0	24
NNE	SSW	0	7	4	6	0	0	17
NE	SW	0	6	4	0	0	0	10
ENE	WSW	0	5	3	0	0	0	8
E	W	0	14	8	4	0	0	26
ESE	WNW	0	10	5	1	0	0	16
SE	NW	2	4	5	0	0	0	11
SSE	NNW	1	8	4	0	0	0	13
S	N	2	3	1	0	0	0	6
SSW	NNE	2	1	1	0	0	0	4
SW	NE	0	3	4	0	0	0	7
WSW	ENE	0	3	4	0	0	0	7
W	E	1	6	4	0	0	0	11
WNW	ESE	1	2	1	0	0	0	4
NW	SE	1	2	1	1	0	0	5
NNW	SSE	1	9	2	0	0	0	12
TOTAL		11	88	68	14	0	0	181

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS D

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	9	61	51	22	6	0	149
NNE	SSW	9	45	85	78	5	0	222
NE	SW	11	25	19	5	1	0	61
ENE	WSW	5	33	20	2	0	0	60
E	W	7	47	33	16	0	0	103
ESE	WNW	7	42	52	22	0	0	123
SE	NW	16	49	40	15	1	0	121
SSE	NNW	14	58	25	0	0	0	97
S	N	12	33	11	0	0	0	56
SSW	NNE	9	43	18	0	0	0	70
SW	NE	11	56	65	17	1	0	150
WSW	ENE	9	50	40	11	5	0	115
W	E	3	34	29	4	0	0	70
WNW	ESE	1	24	4	0	0	0	29
NW	SE	4	53	3	5	0	0	65
NNW	SSE	8	48	14	2	1	0	73
TOTAL		135	701	509	199	20	0	1564

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS E

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	43	87	39	17	8	0	194
NNE	SSW	31	129	120	28	0	0	308
NE	SW	46	133	48	3	0	0	230
ENE	WSW	51	109	22	3	0	0	185
E	W	58	117	43	10	0	0	228
ESE	WNW	31	105	81	14	0	0	231
SE	NW	21	90	33	3	0	0	147
SSE	NNW	25	57	20	1	0	0	103
S	N	15	29	3	0	0	0	47
SSW	NNE	14	23	24	10	0	0	71
SW	NE	16	52	9	3	0	0	80
WSW	ENE	16	33	11	6	0	0	66
W	E	10	49	35	1	0	0	95
WNW	ESE	10	26	18	3	0	0	57
NW	SE	15	42	10	1	0	0	68
NNW	SSE	30	42	27	8	0	0	107
TOTAL		432	1123	543	111	8	0	2217

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS F

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	25	13	0	0	0	0	38
NNE	SSW	23	17	1	0	0	0	41
NE	SW	31	63	1	0	0	0	95
ENE	WSW	54	108	1	0	0	0	163
E	W	50	76	0	1	0	0	127
ESE	WNW	36	53	2	0	0	0	91
SE	NW	33	58	3	0	0	0	94
SSE	NNW	18	26	6	0	0	0	50
S	N	10	6	0	0	0	0	16
SSW	NNE	5	3	0	0	0	0	8
SW	NE	5	2	0	0	0	0	7
WSW	ENE	5	1	0	0	0	0	6
W	E	5	10	0	0	0	0	15
WNW	ESE	8	5	0	0	0	0	13
NW	SE	8	3	0	0	0	0	11
NNW	SSE	16	9	0	0	0	0	25
TOTAL		332	453	14	1	0	0	800

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS G

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	23	2	0	0	0	0	25
NNE	SSW	28	8	0	0	0	0	36
NE	SW	89	35	0	0	0	0	124
ENE	WSW	282	152	0	0	0	0	434
E	W	285	81	0	0	0	0	366
ESE	WNW	150	32	0	0	0	0	182
SE	NW	129	57	0	0	0	0	186
SSE	NNW	42	26	0	0	0	0	68
S	N	11	3	0	0	0	0	14
SSW	NNE	5	0	0	0	0	0	5
SW	NE	8	2	0	0	0	0	10
WSW	ENE	1	3	0	0	0	0	4
W	E	5	3	0	0	0	0	8
WNW	ESE	4	0	0	0	0	0	4
NW	SE	8	1	0	0	0	0	9
NNW	SSE	10	1	0	0	0	0	11
TOTAL		1080	406	0	0	0	0	1486

OYSTER CREEK 33 FOOT DATA
JOINT FREQUENCY TABLES
VERSION: 2001.01 PRINTED 04-24-2009

HOURS AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD 08010101 TO 08123123
STABILITY CLASS ALL

SECTOR TO	WINDS FROM	WIND SPEED 1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	S	100	190	207	82	14	0	593
NNE	SSW	92	238	247	134	6	0	717
NE	SW	179	307	121	9	1	0	617
ENE	WSW	398	482	119	17	0	0	1016
E	W	404	415	205	72	1	0	1097
ESE	WNW	224	319	290	94	0	0	927
SE	NW	204	329	187	33	1	0	754
SSE	NNW	105	228	106	8	0	0	447
S	N	57	107	35	0	0	0	199
SSW	NNE	37	100	65	10	0	0	212
SW	NE	44	159	124	21	1	0	349
WSW	ENE	38	146	149	17	5	0	355
W	E	28	173	147	6	0	0	354
WNW	ESE	26	131	79	3	0	0	239
NW	SE	37	181	110	8	0	0	336
NNW	SSE	71	144	155	15	1	0	386
TOTAL		2044	3649	2346	529	30	0	8598

Hours of Missing/Invalid Data: 185