

8.0 Environmental Impacts of Alternatives to Operating License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of the operating licenses (OLs) (i.e., the no-action alternative), the potential environmental impacts from electric generating sources other than North Anna Power Station (North Anna), Units 1 and 2, the possibility of purchasing electric power from other sources to replace power generated by Units 1 and 2 and the associated environmental impacts, the potential environmental impacts from a combination of generating and conservation measures, and other generation alternatives that were deemed unsuitable for replacement of power generated by Units 1 and 2. The environmental impacts were evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines and set forth in a footnote to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

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.

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999)^(a) with the additional impact categories of environmental justice and transportation.

8.1 No-Action Alternative

NRC's regulations implementing the National Environmental Policy Act (NEPA) (42 USC 4321) specify that the no-action alternative be discussed in an NRC environmental impact statement [10 CFR Part 51, Subpart A, Appendix A(4)]. For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the North Anna Units 1 and 2 OLs, and the Virginia Electric and Power Company (VEPCo) would then decommission North Anna Units 1 and 2 when plant operations cease. Replacement of North Anna Units 1 and 2 electricity

(a) 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.

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generation capacity would be met by (1) demand-side management and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than North Anna Units 1 and 2, or (4) some combination of these options.

VEPCo will be required to comply with NRC decommissioning requirements whether or not the OLs are renewed. If the North Anna Units 1 and 2 OLs are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the OLs are not renewed, VEPCo would conduct decommissioning activities according to the requirements in 10 CFR 50.82.

The environmental impacts associated with decommissioning under both license renewal and the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of this draft Supplemental Environmental Impact Statement (SEIS), and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (NRC 1988).^(a) The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts for the socioeconomic, historic and archaeological resources, and environmental justice impact categories are summarized in Table 8-1 and discussed in the ensuing paragraphs.

Table 8-1. Summary of Environmental Impacts of the No-Action Alternative

Impact Category	Impact	Comment
Socioeconomic	SMALL to MODERATE	Decrease in employment, higher-paying jobs and tax revenues. Most adverse impacts would be on Louisa County.
Historic and Archaeological Resources	SMALL to MODERATE	Land occupied by Units 1 and 2 could be developed after decommissioning.
Environmental Justice	SMALL to MODERATE	Loss of employment opportunities and social programs, particularly in Louisa County.

- **Socioeconomic:** When North Anna Units 1 and 2 cease operation, there will be a decrease in employment and tax revenues associated with the closure. These impacts would be felt in Henrico, Orange, Spotsylvania, and Richmond counties and the City of Richmond.

(a) The NRC staff is supplementing NUREG-0586 for reactor decommissioning. In October 2001, the staff issued draft Supplement 1 to NUREG-0586 dealing with Decommissioning of Nuclear Power Reactors (66 FR 56721, NRC 2001a) for public comment. The staff is currently finalizing the draft Supplement for publication as a final document.

Louisa County would be more adversely impacted than the other counties in both employment and tax revenue. Most secondary employment impacts and impacts on population would also be felt in the preceding locations. Approximately 80 percent of the employees who work at North Anna Units 1 and 2 live in these counties.

The no-action alternative would result in the loss of the taxes attributable to North Anna Units 1 and 2 as well as the loss of plant payrolls 20 years earlier than if the OLs were renewed. As previously mentioned, most of the tax revenue losses resulting from closure of North Anna Units 1 and 2 would occur in Louisa County. In 2000, VEPCo paid \$10.58 million in property taxes to Louisa County for the nuclear generation units at North Anna, or about 42 percent of all property taxes collected by the County (see Table 2-15).^(a) For the remaining two counties to which property taxes are paid, the loss in real property tax would not be significant, amounting to 1.2 and 1.4 percent for Orange and Spotsylvania Counties, respectively, in 2000.

Loss of the property tax revenue could have a significant, short-term negative impact on the ability of Louisa County to provide public services such as schools and road maintenance. There could also be an adverse, short-term impact on housing values, the local economy in Louisa County and surrounding areas, and employment if North Anna Units 1 and 2 were to cease operations.

VEPCo employees working at North Anna Units 1 and 2 currently contribute time and money toward community involvement, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, community involvement efforts by VEPCo and its employees in the region would be reduced.

The degree and extent of such adverse impacts would depend on the economic development taking place in Louisa County and the other counties and cities over the next 20 years. If the Richmond area continues its growth and diversification into the first quarter of the 21st century as it has for the last decade, and assuming that the economic growth spills over to surrounding counties such as Louisa, Spotsylvania, and Orange, then the consequences of not renewing the OLs could be partially or entirely offset by the new jobs created by such growth. While many of the jobs from past economic development are higher-paying, white-collar positions (e.g., banking and financial service centers), it is not known if these types of jobs and the pay scale of the projected employment increase will be maintained. If the new jobs are skilled, higher-paying jobs, then the impacts of nonrenewal of the North Anna, Units 1 and 2, OLs could be significantly mitigated, and the socioeconomic consequence of

(a) Information obtained during an interview of Ms. Nancy Pleasants, Commissioner of Revenue, Louisa County October 15, 2001.

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plant closure would be SMALL. If the jobs are less-skilled and lower-paying, then the impact of plant closure could be only partially offset and impacts could be MODERATE, particularly in Louisa County.

- Historic and Archaeological Resources: The potential for future adverse impacts to known or unrecorded cultural resources at North Anna following decommissioning of Units 1 and 2 will depend on the future use of the land occupied by the two units. Following decommissioning, land occupied by Units 1 and 2 would likely be retained by VEPCo for other corporate purposes, including potential development of the site given its location on Lake Anna. Eventual sale or transfer of the land occupied by Units 1 and 2, however, could result in adverse impacts to cultural resources if land-use patterns of the site, and lands surrounding the site, change dramatically. Notwithstanding this possibility, the impacts of this alternative on historic and archaeological resources are considered SMALL.
- Environmental Justice for No-Action: Current operations at North Anna Units 1 and 2 have no disproportionate impacts on the minority and low-income populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of Units 1 and 2 could result in decreased employment opportunities in Henrico, Orange, and Spotsylvania Counties and Richmond County and City, with Louisa County potentially seeing the greatest impact. Real property tax revenues lost in Louisa County would be large, with possible negative and disproportionate impacts on minority or low-income populations depending on the County's ability to continue providing services to these populations. The environmental justice impacts under the no-action alternative are considered SMALL to MODERATE.

Impacts for all other impact categories would be SMALL, as shown in Table 9-1.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated by North Anna Units 1 and 2, assuming that the OLs for Units 1 and 2 are not renewed. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would most likely occur or have the least environmental impacts. The following generation alternatives are considered in detail:

- coal-fired generation at the North Anna site and at an alternate greenfield site (Section 8.2.1)
- natural-gas-fired generation at the North Anna site and at an alternate greenfield site (Section 8.2.2)

- nuclear generation at the North Anna site and an alternate greenfield site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at North Anna Units 1 and 2 is discussed in Section 8.2.4. Other power generation alternatives and conservation alternatives considered by the staff and found not to be reasonable replacements for Units 1 and 2 are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an Annual Energy Outlook. In the *Annual Energy Outlook 2002*, issued in December 2001 (DOE/EIA 2001a), EIA projects that combined-cycle or combustion turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electric generating capacity between the years 2001 and 2020. Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology also can be used to meet baseload^(a) requirements. Coal-fired plants are projected by EIA to account for approximately 9 percent of new capacity during this period. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, geothermal, and municipal solid waste units, are projected by EIA to account for the remaining 3 percent of capacity additions. The EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by EIA to have the lowest generation cost in 2005 and 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2001a).

EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States during the 2000 to 2020 time period because natural gas and coal-fired plants are projected to be more economical (DOE/EIA 2001a). In spite of this projection, a new nuclear plant alternative for replacing power generated by North Anna Units 1 and 2 is considered in Section 8.2.3. Since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR Part 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants. The NRC has recently established a New Reactor Licensing Program to prepare for and manage future reactor and site licensing applications (NRC 2001b).

North Anna Units 1 and 2 have a combined average net capacity of 1,790 megawatts electric (MW[e]). For the coal and natural gas alternatives, VEPCo's Environmental Report (ER)

(a) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation; i.e., these units generally run near full load.

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assumes three standard 508-MW(e) units^(a) as potential replacements for Units 1 and 2 (VEPCo 2001). The staff used this assumption in their evaluation, although it results in some environmental impacts that are roughly 17 percent lower than if full replacement capacity were constructed. VEPCo's reasoning is that although custom-sized units can be built, use of standardized sizes is more economical. Moreover, using four 508-MW(e) units for the analysis would overestimate environmental impacts and tend to make the fossil fuel alternatives less attractive.

8.2.1 Coal-Fired Generation

The coal-fired alternative is analyzed at both the North Anna site and at an alternate site. As discussed in Section 8.2, the staff assumed construction of three 508-MW(e) units.

The VEPCo ER (VEPCo 2001) assumes that coal and lime or limestone for a coal-fired plant sited at the North Anna would be delivered by a CSX rail line to an existing 11.3-km (7-mi) rail spur that leads to North Anna. The rail system at North Anna would require modifications to handle the increased traffic (VEPCo 2001). Lime^(b) or limestone is used in the scrubbing process for control of sulfur dioxide (SO₂) emissions.

While construction at an alternate, greenfield site is not specifically discussed in VEPCo's ER, rail delivery would be the most likely option for delivering coal and lime/limestone to an alternate inland site for the coal-fired plant. Barge delivery of coal and lime/limestone is potentially feasible for a coastal site. A coal slurry pipeline is also a technically feasible delivery option; however, the associated cost and environmental impacts make a slurry pipeline an unlikely transportation alternative. Construction at an alternate site could necessitate the construction of a new transmission line to connect to existing lines and a rail spur to the plant site.

The coal-fired plant would consume approximately 4.4 million MT (4.9 million tons) per year of pulverized bituminous coal with an ash content by weight of approximately 10.7 percent (VEPCo 2001). The ER assumes a heat rate^(c) of 3 J fuel/J electricity (10,200 Btu/kWh) and a

(a) Each of the coal-fired units would have a rating of 538 gross MW and 508 net MW. Each of the gas-fired units would have a rating of 528 gross MW and 508 net MW. The difference between "gross" and "net" is the electricity consumed onsite.

(b) In a typical wet scrubber, lime (calcium hydroxide) or limestone (calcium carbonate) is injected as a slurry into the hot effluent combustion gases to remove entrained sulfur dioxide. The lime-based scrubbing solution reacts with sulfur dioxide to form calcium sulfite, which precipitates out and is removed in sludge form.

(c) Heat rate is a measure of generating station thermal efficiency. In English units, it is generally expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electric generation by the resulting net kWh generation.

capacity factor^(a) of 0.85 (VEPCo 2001). After combustion, 99.9 percent of the ash (approximately 474,000 MT/yr [522,000 tons/yr]) would be collected and disposed of at the plant site. In addition, approximately 221,000 MT/yr (244,000 tons/yr) of scrubber sludge would be disposed of at the plant site based on annual lime usage of approximately 76,000 MT (84,000 tons) (VEPCo 2001).

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the VEPCo ER (VEPCo 2001). The staff reviewed this information and compared it to environmental impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant).

8.2.1.1 Once-Through Cooling System

For purposes of this SEIS, the staff assumed that a coal-fired plant located at North Anna would use the existing once-through system as a source of cooling. An alternate greenfield site could use either a closed-cycle or a once-through cooling system.

The overall impacts of the coal-fired generating system are discussed in the following sections and summarized in Table 8-2. The extent of impacts at an alternate site would depend on the location of the particular site selected.

• Land Use

The North Anna site is approximately 422 ha (1043 ac). Construction of the power block and coal storage area would impact some land area and associated terrestrial habitat. However, in the ER VEPCo states it will make maximum use of existing facilities and infrastructure, limiting the amount of new construction that would be required (VEPCo 2001). Specifically, the staff assumed that the coal-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line right-of-way.

The coal-fired generation alternative would necessitate converting some of the unused land at North Anna to coal storage and ash and scrubber sludge disposal. VEPCo estimates that ash and scrubber waste disposal over a 40-year plant life would require approximately

(a) The capacity factor is the ratio of electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

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Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at North Anna Power Station and an Alternate Greenfield Site Using Once-Through Cooling

North Anna			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	Extensive use of existing infrastructure. Uses 172 ha (425 ac) of undeveloped portion of North Anna for waste disposal of coal ash and scrubber sludge over 40-year plant life. Additional offsite land impacts for coal and limestone mining.	SMALL to LARGE	Uses up to 1100 ha (2600 ac) for plant, offices, parking, and waste disposal; additional offsite land impacts for coal and limestone mining; possible impacts for transmission line and rail spur. Degree of impact dependent on whether alternate site is disturbed: SMALL to MODERATE impact previously developed site, LARGE impact greenfield site.
Ecology	SMALL to MODERATE	Uses previously developed areas except for waste disposal of coal ash and scrubber sludge. Potential habitat loss and fragmentation and reduced productivity and biological diversity could result from disturbing lands not previously disturbed.	SMALL to LARGE	Impact depends on whether site is previously developed (SMALL to MODERATE) or greenfield (MODERATE to LARGE), location and ecology of the site, surface water body used for intake and discharge, transmission line route; potential habitat loss and fragmentation, reduced productivity, and biological diversity.
Water Use and Quality				
Surface Water	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body at the alternate site.
Groundwater	SMALL	Groundwater use is <1000 gpm; once-through cooling is employed.	SMALL	Groundwater use similar to impacts at North Anna site; impacts depend on groundwater use and availability.

Table 8-2. (contd)

North Anna			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Air Quality	MODERATE	Sulfur oxides • 4130 MT/yr (4550 tons/yr) Nitrogen oxides • 1075 MT/yr (1185 tons/yr) Particulates • 237 MT/yr (261 tons/yr) of total suspended particulates, which would include 54 MT/yr (60 tons/yr) of PM ₁₀ . Carbon monoxide • 1100 MT/yr (1215 tons/yr) Small amounts of mercury and other hazardous air pollutants and naturally occurring radioactive materials – mainly uranium and thorium. • Other pollutants—arsenic, beryllium, cadmium, chromium, dioxin, hydrogen chloride and fluoride, lead, manganese, mercury, uranium, and thorium.	MODERATE	Potentially same impacts as at North Anna, although pollution-control standards may vary.
Waste	MODERATE	Total waste volume would be approximately 695,000 MT/yr (765,000 tons/yr) of ash and scrubber sludge requiring approximately 172 ha (425 ac) for disposal during the 40-year life of the plant.	MODERATE	Same impacts as at North Anna; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.	SMALL	Same impact as at North Anna.

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Table 8-2. (contd)

North Anna			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 2500 workers during the peak period of the 5-year construction period, followed by reduction of current North Anna Units 1 and 2 workforce from approximately 921 to 961 permanent and contractor employees to 200. Tax base preserved. Impacts during operation would be SMALL to MODERATE due to loss of employment in Louisa County, which may be offset by future economic growth in the County and surrounding Richmond metropolitan area.	SMALL to LARGE	Construction impacts depend on location, but could be LARGE if plant is located in a rural area. Louisa County would experience loss of Units 1 and 2 tax base and employment with potentially LARGE impacts. Impacts during operation at alternate site would be SMALL to MODERATE, depending upon the economy at the alternate site.
	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts during operation would be SMALL due to decreased workforce.	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE, depending on the transportation infrastructure at the alternate site. Transportation impacts during operation would be SMALL due to the decreased workforce.
		For rail transportation of coal and lime/limestone, the impact is considered SMALL.		For rail transportation of coal and lime/limestone, the impact is considered SMALL in a rural area and MODERATE in a more crowded, suburban area. For barge transportation, the impact is considered SMALL.

Table 8-2. (contd)

North Anna		Alternate Greenfield Site		
Impact Category	Impact	Comments	Impact	Comments
Aesthetics	SMALL to MODERATE	Three coal-fired power plant units and exhaust stacks would be visible in daylight hours from offsite. The plant would also be visible at night because of outside lighting. Rail transportation of coal and lime/limestone would also have a SMALL to MODERATE aesthetic impact. Coal-fired generation would introduce mechanical sources of noise audible offsite. These impacts are SMALL to MODERATE.	SMALL to LARGE	Impact would depend on the site selected and the surrounding land features and could be LARGE if a greenfield site is selected. If needed, a new transmission line or rail spur would add to the aesthetic impact. Rail transportation of coal and lime/limestone would be SMALL to MODERATE, again depending on the characteristics of the alternate site. Barge transportation of coal and lime/limestone would have a SMALL to MODERATE esthetic impact. Noise impact would be SMALL to MODERATE.
Historic and Archeological Resources	SMALL	Some construction would affect previously undeveloped parts of North Anna; cultural resource inventory should minimize any impacts on undeveloped lands. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on undeveloped land on cultural resources, even at a developed site.	SMALL	Alternate location would necessitate cultural resource studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on undeveloped sites on cultural resources.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of from 721 to 761 operating jobs (permanent and contractor) at North Anna could reduce employment prospects for minority and low-income populations. Dependent, to some extent, on the economic vitality/expansion of the Richmond metropolitan and surrounding area.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup. Could be SMALL to LARGE. Louisa County would lose significant revenue, which could have MODERATE to LARGE impacts on minority and low-income populations in terms of services the County could provide with the smaller property tax and employment base.

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172 ha (425 ac) (VEPCo 2001).^(a) Approximately 86 ha (213 ac) of second-growth mixed pine hardwoods would be converted to waste disposal facilities during the 20-year license renewal term. VEPCo believes that there is space within the existing North Anna footprint to accommodate waste disposal. After closure, the waste site would be re-vegetated and the land would become available for other uses. Additional land-use changes would occur offsite in an undetermined coal-mining area to supply coal for the plant. The GEIS estimates that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a 1000 MW(e) coal plant during its operational life (NRC 1996). A replacement coal-fired plant for North Anna Units 1 and 2 would be 1524 MW(e) and would affect proportionately more land. Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Units 1 and 2. The GEIS states that approximately 405 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant (NRC 1996).

The impact of a coal-fired generating unit on land use at North Anna is best characterized as SMALL to MODERATE. The impact would definitely be greater than the OL renewal alternative.

In the GEIS, NRC staff estimated that a 1000-MW(e) coal-fired plant would require approximately 700 ha (1700 ac) (NRC 1996). Construction of a 1524 MW(e) coal-fired generation alternative at an alternate site could impact proportionately more land. The degree to which the land use would be impacted depends on whether the alternate site is a greenfield site or previously developed industrial site. Additional land could be needed for a transmission line and for a rail spur to the plant site. Depending on transmission line and rail line routing requirements, this alternative would result in SMALL to LARGE land-use impacts.

• Ecology

Locating a coal-fired plant at the North Anna site would have some impact on ecological and terrestrial resources because of the need to convert 86 ha (213 ac) of undisturbed land for ash and scrubber sludge disposal. In addition, construction of the power block and coal storage area would impact some land area and associated terrestrial habitat. Operation of the coal-fired plant would use the existing cooling system, which would minimize impacts to aquatic resources. In summary, because the coal-fired alternative is developed on a previously disturbed area, is at an existing industrial site, and makes maximum use of

(a) While only half of the 172 ha (425 ac) would be attributable to the 20-year license renewal alternative, the total numbers are pertinent as a cumulative impact (VEPCo 2001).

existing facilities, it is expected that the ecological impacts would be SMALL to MODERATE, but still greater than renewal of the North Anna Units 1 and 2 OLS.

At an alternate site, the coal-fired generation alternative would introduce construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts could alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling makeup water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of a transmission line and a rail spur would have ecological impacts. Overall, the ecological impacts at an alternate site would be SMALL to MODERATE (previously developed site) or MODERATE to LARGE (greenfield site).

• Water Use and Quality

Surface water. The coal-fired generation alternative at the North Anna site is assumed to use the existing once-through cooling system, which would minimize incremental water use and quality impacts. Operation using the existing cooling system should minimize any impacts on water quality. Thus, surface water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For a coal-fired plant located at an alternate site, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the Commonwealth of Virginia or another state. Some erosion and sedimentation would also likely occur during construction (NRC 1996). The impacts could range between SMALL to MODERATE.

Groundwater. The staff assumed that a coal-fired plant located at North Anna would obtain potable, process, and fire-protection water from the series of groundwater wells that currently supply Units 1 and 2 (see Section 2.2.2). Groundwater withdrawals would be less than no-action and license renewal alternatives because of the reduced workforce. Hence, impacts are considered SMALL. Use of groundwater for a coal-fired plant sited at an alternate site is a possibility. Groundwater withdrawal at an alternate site would likely require a permit from the Virginia Department of Environmental Quality (VDEQ). The impacts are considered SMALL.

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• Air Quality

The air-quality impacts of coal-fired generation vary considerably from those of nuclear generation due to emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), particulates, carbon monoxide, hazardous air pollutants such as mercury, and naturally occurring radioactive materials.

Louisa County is in the Northeastern Air Quality Control Region (40 CFR 81.145). Louisa County is in compliance with the national ambient air quality standards for particulate matter, carbon monoxide, nitrogen dioxide, lead, sulfur dioxide, and ozone (40 CFR 81.347).

A new coal-fired generating plant located at North Anna would likely need a prevention of significant deterioration permit and an operating permit under the Clean Air Act (CAA). The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60, Subpart Da. The standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO₂ (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

Section 169A of the CAA (42 USC 7401) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. If a coal-fired plant were located close to a mandatory Class I area, additional air pollution control requirement could be imposed. However, the mandatory Class I Federal areas closest to the North Anna site are the Swanquarter Wilderness Area in eastern North Carolina, located approximately 312 km (194 mi) southeast of North Anna; Shenandoah National Park, located approximately 177 km (110 mi) northwest of North Anna; and the James River Face Wilderness located approximately 166 km (103 mi) west of North Anna. The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the CAA. Louisa County is classified as attainment or unclassified for criteria pollutants.^(a) EPA issued a new regional haze rule in 1999 (64 FR 35714; July 1, 1999 [EPA 1999]). The rule specifies that for each mandatory Class I Federal area located within a state, the state must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period [40 CFR 51.308(d)(1)].

(a) Existing criteria pollutants under the CAA are ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxide. Emission standards for criteria pollutants are set out at 40 CFR Part 50.

In 1998, EPA issued a rule requiring 22 eastern states, including Virginia, to revise their state implementation plans to reduce nitrogen oxide emissions (63 FR 49442, EPA 1998). Nitrogen oxide emissions contribute to violations of the national ambient air quality standard for ozone. The total amount of nitrogen oxides that can be emitted by each of the 22 states in the year 2007 ozone season (May 1 - September 30) is set out at 40 CFR 51.121(e). For Virginia, the amount is 163,470 MT (180,195 tons). Any new coal-fired plant in Virginia would be subject to this limitation.

Impacts for particular pollutants are as follows:

Sulfur oxides emissions. VEPCo states in its ER that an alternative coal-fired plant located at North Anna would use wet scrubber-lime/limestone for flue gas desulfurization (VEPCo 2001).

A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x), the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO₂ emissions and imposes controls on SO₂ emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO₂ that a unit is allowed to emit. New units do not receive allowances but are required to have allowances to cover their SO₂ emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO₂ emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO₂ emissions, although it might do so locally.

VEPCo estimates that by using the best technology to minimize SO_x emissions, the total annual stack emissions would be approximately 4130 MT (4548 tons) of SO_x (VEPCo 2001). This level of SO_x emission would be greater than the OL renewal alternative.

Nitrogen oxides emissions. Section 407 of the CAA establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO₂ emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants in 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (EPA 1998), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_x) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

VEPCo estimates that by using low NO_x burners with overfire air and selective catalytic reduction the total annual NO_x emissions for a new coal-fired power plant would be approxi-

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mately 1075 MT (1185 tons) (VEPCo 2001). This level of NO_x emissions would be greater than the OL renewal alternative.

Particulate emissions. VEPCo estimates that the total annual stack emissions would include 237 MT (261 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 µm up to approximately 45 µm). The 237 MT would include 54 MT (60 tons) of PM₁₀ (particulate matter having an aerodynamic diameter less than or equal to 10 µm). Fabric filters or electrostatic precipitators would be used for control. In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the OL renewal alternative.

During construction of a coal-fired plant, fugitive dust would be generated. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

Carbon monoxide emissions. VEPCo estimates that the total carbon monoxide emissions would be approximately 1110 MT (1221 tons) per year. This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam generating units (65 FR 79825, EPA 2000b). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) there is a link between coal consumption and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the CAA for which emission standards for hazardous air pollutants will be issued (EPA 2000b).

Uranium and thorium. Coal contains uranium and thorium. Uranium concentrations are generally in the range of 1 to 10 parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant released roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the

uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

Summary. The GEIS analysis does not quantify emissions from coal-fired power plants, but implies that air impacts would be substantial. The GEIS also mentions global warming from unregulated carbon dioxide emissions and acid rain from SO_x and NO_x emissions as potential impacts (NRC 1996). Adverse human health effects, such as cancer and emphysema, have been associated with the products of coal combustion. The appropriate characterization of air impacts from coal-fired generation would be MODERATE. The impacts would be clearly noticeable but would not destabilize air quality.

Siting a coal-fired generation plant at a site other than North Anna would not significantly change air-quality impacts, although it could result in installing more or less stringent pollution-control equipment to meet applicable local requirements. Therefore, the impacts would be MODERATE.

• Waste

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates spent selective catalytic reduction catalyst, additional ash, and scrubber sludge. Three 508-MW(e) coal-fired plants would generate approximately 695,000 MT (766,060 tons) of this waste annually for 40 years. The waste would be disposed of onsite, accounting for approximately 172 ha (425 ac) of land area over the 40-year plant life.

Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses. Construction-related debris would also be generated during construction activities.

In May 2000, EPA issued a Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels (65 FR 33213, EPA 2000a). EPA concluded that some form of national regulation is warranted to address coal combustion waste products because (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that, in 1995, these wastes were being managed in 40 to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and

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(4) EPA identified gaps in state oversight of coal combustion wastes. Accordingly, EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act (RCRA).

For these reasons, the appropriate characterization of impacts from waste generated from burning coal is MODERATE; the impacts would be clearly noticeable but would not destabilize any important resource.

Siting the facility at a site other than the North Anna would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

• Human Health

Coal-fired power generation introduces worker risks from coal and limestone mining, and worker and public risks from coal and lime/limestone transportation and inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal alternative also introduces the risk of coal pile fires and attendant inhalation risks.

The staff stated in the GEIS that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from coal-fired plants, but does not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal are characterized as SMALL.

• Socioeconomics

Construction and Operation. Construction of the coal-fired alternative would take approximately 5 years. The staff assumed that construction would take place while North Anna Units 1 and 2 continue operation and would be completed by the time Units 1 and 2

permanently cease operations. The construction workforce would be expected to vary between 1200 and 2500 workers during the 5-year construction period (NRC 1996). These workers would be in addition to the approximately 851 permanent and 70 to 110 contract workers employed at Units 1 and 2. During construction of the new coal-fired plant, communities near North Anna would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from outside the immediate area of the site, including the Richmond metropolitan area, Fredericksburg, and Charlottesville, among others. Nearby communities to North Anna would be impacted by the loss of the construction jobs once construction is completed.

If the coal-fired replacement plant were constructed at North Anna and Units 1 and 2 were decommissioned, there would be a loss of approximately 721 to 761 permanent and contract employees, as VEPCo estimates that the completed coal-fired plant would employ approximately 200 workers (VEPCo 2001). There would be a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. The coal-fired plants would provide a new tax base to offset the loss of tax base associated with decommissioning of the nuclear units. For all of these reasons, the appropriate characterization of non-transportation socioeconomic impacts for a coal-fired plant constructed at the North Anna site would be SMALL to MODERATE; the socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area. The impacts could be mitigated by the site's proximity to the Richmond metropolitan area and may be additionally offset if economic growth in Richmond and surrounding areas continues as during the last decade.

Construction of a replacement coal-fired power plant at an alternate site would relocate some socioeconomic impacts but would not eliminate them. Louisa County would experience the brunt of North Anna Units 1 and 2 operational job loss and would lose a significant tax base. These losses could have potentially LARGE socioeconomic impacts to the County, particularly over the short to intermediate term (from 5 to 10 years following plant closure). Communities around the new site would have to absorb the impacts of a large, temporary workforce (up to 2500 workers at the peak of construction) and a permanent workforce of approximately 200 workers. The staff stated in the GEIS that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction workforce would need to move to the area to work. Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at or near an urban, previously developed industrial area would be SMALL. Socioeconomic impacts at a rural site could be MODERATE to LARGE, depending on the relative location of the site to towns and cities that might be able to accommodate such impacts.

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1 Transportation. During the 5-year construction period of replacement coal-fired units, up to
2 2500 construction workers would be working at the site in addition to the 921 to 961
3 permanent and contract workers employed at Units 1 and 2. The addition of these workers
4 could place significant traffic loads on existing highways near North Anna. Such impacts
5 would be MODERATE to LARGE.

6
7 For transportation related to the commuting of plant operating personnel, the impacts are
8 considered SMALL. The maximum number of plant operating personnel would be approxi-
9 mately 200 compared to the current commuting workforce of approximately 921 to 961
10 permanent and contract workers. Therefore, traffic impacts associated with plant personnel
11 commuting to a coal-fired plant would be expected to be SMALL compared to the current
12 impacts from Unit 1 and 2 operations.

13
14 At North Anna, coal and lime/limestone likely would be delivered by rail. Each train would
15 have approximately 115 rail cars. Each open-top rail car holds about 90 MT (100 tons) of
16 coal. Additional rail cars would be needed for lime/limestone delivery. In all, approximately
17 425 trains per year would deliver the coal and lime/limestone for the three units. An
18 average of roughly 16 train trips per week would be needed to transport the coal and
19 lime/limestone. For each full train delivery, an empty train would return. On several days
20 per week, there could be two to three trains per day using the rail spur to North Anna,
21 resulting in blocking at grade crossings. North Anna is located in a semi-rural area, and the
22 roads are lightly traveled during most parts of the day except at shift changes at the site.
23 Therefore, the effect of the increased rail traffic on residents and vehicular traffic in the
24 North Anna area is considered SMALL.

25
26 Transportation-related impacts associated with commuting construction workers at an
27 alternate rural site are also site-dependent and could be MODERATE to LARGE. Transpor-
28 tation impacts related to commuting of plant operating personnel would also be site-
29 dependent but can be characterized as SMALL.

30
31 At an alternate site, coal and limestone delivery likely would be delivered by rail, although
32 barge delivery would be feasible at a coastal location. Impacts of rail transportation would
33 be SMALL in a rural area and MODERATE in a more crowded, suburban area. Barge
34 delivery of coal and lime/limestone would likely have SMALL socioeconomic impacts.

• Aesthetics

35
36
37
38 The three coal-fired power plant units could be as high as 60 m (200 ft) and be visible in
39 daylight hours from offsite. The three exhaust stacks would be as high as 185 m (600 ft)
40 (VEPCo 2001). The stacks would be visible in daylight hours. The plant units and

associated stacks also would be visible at night because of outside lighting. Visual impacts of a new coal-fired plant could be mitigated by landscaping and selecting building color consistent with the environment. Visual impact at night could be mitigated by reducing lighting and using shielding appropriately.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing North Anna Units 1 and 2 operations are considered to be SMALL to MODERATE.

At an alternate site, there would be an aesthetic impact from the buildings and exhaust stacks. This impact could be LARGE if a greenfield site is used. There would also be an aesthetic impact if construction of a new transmission line and/or rail spur is needed. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. In a more suburban location, the impacts are considered MODERATE. This is due to the frequency of train transport, the fact that many people are likely to be within hearing distance of the rail route, and the impacts of noise on residents in the vicinity of the facility and the rail line. At a more rural location, the impacts could be SMALL. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities, in which case the impacts could be SMALL. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as SMALL to LARGE, depending on the characteristics of the alternate site.

• **Historic and Archaeological Resources**

At the North Anna site or an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at North Anna or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction

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on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such are considered SMALL.

• **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the North Anna. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority and low-income populations to the extent housing frequented by these populations could come into increased demand. Closure of North Anna Units 1 and 2 would result in a decrease in employment of approximately 721 to 761 permanent and contract employees at the site. Resulting economic conditions could reduce employment prospects for minority or low-income populations. Overall, impacts are expected to be SMALL to MODERATE and may be mitigated by the economic vitality/expansion of the Richmond metropolitan and surrounding area.

Impacts at other sites would depend on the site chosen and the nearby population distribution. If a replacement coal-fired plant were constructed at an alternate site, Louisa County would experience a significant loss of property tax revenue that would affect the County's ability (at least in the short- to mid-term following plant closure) to provide services and programs. Impacts to minority and low-income populations in Louisa County could be SMALL to LARGE. Impacts at the alternate site would vary between MODERATE to LARGE, depending on the population makeup and distribution and the economy.

8.2.1.2 Closed-Cycle Cooling System

This section discusses the environmental impacts of constructing a coal-fired generation system at an alternate site using closed-cycle cooling with cooling towers. The impacts (SMALL, MODERATE, or LARGE) of this option are essentially the same as the impacts for a coal-fired plant using the once-through system. However, there are some environmental impact differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences.

Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Greenfield Site with Closed-Cycle Cooling System Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 - 12 additional ha (25 - 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	No change
Air Quality	No change
Waste	No change
Human Health	No change
Socioeconomics	No change
Aesthetics	Introduction of cooling towers and associated plume. Natural draft towers could be up to 158 m (520 ft) high. Mechanical draft towers could be up to 30 m (100 ft) high and also have an associated noise impact.
Historic and Archaeological Resources	No change.
Environmental Justice	No change

8.2.2 Natural-Gas-Fired Generation

The environmental impacts of the natural-gas-fired alternative are examined in this section for both the North Anna site and an alternate site. For the North Anna site, the staff assumed that the plant would use the existing once-through cooling system.

North Anna is not served by natural gas pipelines. A dedicated, high-pressure 6-m (2-ft) pipeline would have to be constructed to North Anna from Gordonsville, Virginia, a distance of

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1 approximately 65 km (40 mi). The pipeline right-of-way would require 295 ha (729 ac).^(a)
2 VEPCo also notes in its ER that in the winter, when demand for natural gas is high, it may
3 become necessary for a replacement natural-gas-fired plant to operate on fuel oil due to lack of
4 gas supply. Operation with oil would result in more stack emissions (VEPCo 2001).

5
6 If a new natural-gas-fired plant were built elsewhere to replace North Anna Units 1 and 2, a
7 new transmission line would need to be constructed to connect to existing lines. In addition,
8 construction or upgrade of a natural gas pipeline from the plant to a supply point where a firm
9 supply of gas would be available could be needed. One potential source of natural gas is
10 liquefied natural gas (LNG) imported to either the Cove Point facility in Maryland or the Elba
11 Island facility in Georgia. Both facilities are expected to be reactivated in 2003 (DOE/EIA
12 2000a). LNG imported to either facility would need to be vaporized and transported to the plant
13 via pipeline.

14
15 The staff assumed that a replacement natural-gas-fired plant would use combined-cycle
16 combustion turbines (VEPCo 2001). In a combined-cycle unit, hot combustion gases in a
17 combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the
18 combustion turbine is routed through a heat-recovery boiler to make steam to generate
19 additional electricity.

20
21 The following additional assumptions are made for the natural-gas-fired plants (VEPCo 2001):

- 22
- 23 • three 508-MW(e) units will be needed, each consisting of two 168-MW combustion turbines
 - 24 and a 172-MW heat recovery boiler
 - 25 • natural gas with an average heating value of 39 MJ/m³ (1059 Btu/ft³) will be the primary fuel
 - 26 • low-sulfur number 2 fuel oil will be used as backup fuel
 - 27 • heat rate will be 2 J fuel/J electricity (6,700 Btu/kWh)
 - 28 • capacity factor will be 0.85
 - 29 • gas consumption will be 2.11 billion m³/yr (74.7 billion ft³/yr).
- 30

31 Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.2 are
32 from the VEPCo ER. The staff reviewed this information and compared it to environmental
33 impact information in the GEIS. Although the OL renewal period is only 20 years, the impact of
34 operating the natural-gas-fired alternative for 40 years is considered because this is as a
35 reasonable projection of the operating life of the plant.

36

(a) Calculated as follows: 40 mi X 150 ft easement = 295 ha or 727 ac.

8.2.2.1 Once-Through Cooling System

The overall impacts of the natural gas-generating system are discussed in the following sections and summarized in Table 8-4. The extent of impacts at an alternate site will depend on the location of the particular site selected.

- **Land Use**

For siting at North Anna, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that the natural-gas-fired replacement plant alternative would use the existing once-through cooling system, switchyard, offices, and transmission line rights-of-way. In the GEIS staff estimated that 45 ha (110 ac) are needed for a plant site (NRC 1996). At North Anna, this much previously disturbed land is available within the boundaries of the plant site (VEPCo 2001). Additional land for backup oil storage facilities is required. There would be an additional impact of up to approximately 295 ha (729 ac) for construction of a natural gas pipeline to the North Anna site (VEPCo 2001). VEPCo states it would apply best management practices during construction of the pipeline such as minimizing soil loss, restoring vegetation immediately after the excavation is backfilled, and constructing the pipeline adjacent to existing, previously disturbed easements, if possible (VEPCo 2001). Land-use impacts of siting at North Anna would be SMALL to MODERATE and depend on the extent to which ecological damage could be minimized in the construction of the natural gas pipeline.

For construction at an alternate site, the staff assumed that 45 ha (110 ac) would be needed for the plant and associated infrastructure (NRC 1996). A previously developed site with substantial infrastructure in place (e.g., gas line and transmission line), would be characterized as having SMALL impacts. For any new natural gas plant, additional land could be impacted for construction of a transmission line and/or natural gas pipeline to serve the plant and for backup oil facilities, in which case the impacts could be MODERATE. Land-use impacts at a greenfield site could be considered LARGE.

Offsite of the North Anna or alternate site, additional land would be required for natural gas wells and collection stations. NRC staff estimated in the GEIS that approximately 1500 ha (3600 ac) would be needed for a 1000 MW(e) plant. A replacement gas-fired plant for North Anna Units 1 and 2 would be 1524 MW(e) and would affect proportionately more land. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Units 1 and 2. The staff estimated in the GEIS (NRC 1996) that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000 MW(e) nuclear power plant. Because

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Table 8-4. Summary of Environmental Impacts of Natural-Gas-Fired Generation at North Anna and an Alternate Greenfield Site Using Once-Through Cooling

North Anna Power Station Site			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	45 ha (110 ac) of previously disturbed land needed for plant site. Additional impact of up to approximately 295 ha (729 ac) for construction of an underground gas pipeline. Maximum use of existing infrastructure at the site.	SMALL to LARGE	SMALL if infrastructure in place, 45 ha (110 ac) for power- block, offices, roads, and parking areas. MODERATE if additional land needed for transmission line and/or natural gas pipeline. LARGE if greenfield site and transmission lines required.
Ecology	SMALL to MODERATE	Uses undeveloped areas at North Anna plus land for a new gas pipeline.	SMALL to LARGE	Impact depends on whether a greenfield or previously developed site. Also, impacts depend on ecology of the site, surface water body used for intake and discharge, possible transmission and pipeline routes, potential habitat loss and fragmentation, reduced productivity, and biological diversity.
Water Use and Quality				
Surface Water	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce.	SMALL	Groundwater impacts would depend on use and availability.
Air Quality	SMALL to MODERATE	Sulfur oxides • 122 MT/yr (134 tons/yr) Nitrogen oxides • 459 MT/yr (506 tons/yr) Carbon monoxide • 602 MT/yr (664 tons/yr) PM ₁₀ particulates • 180 MT/yr (198 tons/yr) Some hazardous air pollutants.	SMALL to MODERATE	Same emissions as at North Anna site.
Waste	SMALL	Small amount of ash produced.	SMALL	Small amount of ash produced.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-4. (contd)

North Anna Power Station Site			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period, followed by reduction from current North Anna Units 1 and 2 workforce from 921 to 961 (permanent and contract) to 150; tax base preserved. Impacts during operation would be SMALL to MODERATE, due to loss of employment in Louisa County which may be offset by proximity to Richmond economy.	SMALL to LARGE	Impacts depend on site characteristics. During construction, impacts would be SMALL to MODERATE. Tax impacts on receiving county could be SMALL to LARGE. Up to 1200 additional workers during the peak of the 3-year construction period. Louisa County would experience loss of North Anna Units 1 and 2 tax base and employment with potentially MODERATE to LARGE associated impacts.
	SMALL to MODERATE	Transportation impacts associated with construction workers would be SMALL to MODERATE. Transportation impacts during operation would be SMALL due to smaller workforce.	SMALL to LARGE	Transportation impacts associated with construction workers would be SMALL to LARGE and would depend on population density and road infrastructure at alternate site. Impacts during operation would be SMALL due to smaller workforce.
Aesthetics	SMALL	Some visibility of structures offsite.	SMALL to LARGE	SMALL if previously developed site and site disturbance minimal. SMALL to MODERATE impact from plant and stacks and whether site is previously developed. Impacts increased to strongly MODERATE with construction of a transmission line to previously developed site. LARGE if greenfield site developed.
Historic and Archeological Resources	SMALL	Any potential impacts likely can be managed effectively.	SMALL	Same as at North Anna Power Station site; any potential impacts likely can be managed effectively.

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Table 8-4. (contd)

North Anna Power Station Site			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of 771 to 811 permanent and contract operating jobs at North Anna could reduce employment prospects for minority and low-income populations. Proximity to Richmond economic area may mitigate impacts.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site could be SMALL to LARGE. Louisa County would lose significant revenue, which could have MODERATE to LARGE impacts on minority and low-income populations. Proximity to Richmond economic area may mitigate Louisa impacts.

the assumed replacement units for North Anna would generate 1524 MW(e), the land needed for gas wells and collection stations (and the land not needed for nuclear fuel) would be proportionately higher.

• Ecology

At North Anna, there would be ecological land-related impacts for siting of the gas-fired plant. There would also be moderate ecological impacts associated with bringing a new underground gas pipeline to North Anna. There would be losses to less mobile animals such as toads and turtles. Because these animals are fairly common throughout the area, VEPCo expects negligible reduction in their population resulting from construction of the pipeline and does not expect that pipeline construction would create any long-term reduction in the local or regional diversity of plants and animals (VEPCo 2001). Overall, the ecological impacts are considered SMALL to MODERATE.

Ecological impacts at an alternate site would depend on the nature of the land converted for the plant and the possible need for a new transmission line and/or gas pipeline. At a greenfield site, construction of a transmission line and a gas pipeline to serve the plant could be expected to have ecological impacts. Whether these impacts are temporary or permanent and the extent to which ecological resources are impacted is highly dependent on the location of the alternative site. Ecological impacts resulting from plant siting and utility easements could impact threatened or endangered species. There could be wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. The cooling water intake and discharge could have aquatic resource impacts. Hence, at a greenfield site the ecological impacts are expected to be MODERATE to LARGE. If the alternative site selected already has been developed, then the ecological impacts would be SMALL if the required infrastructure is already in place. Overall, the

ecological impacts at an alternate site are considered SMALL to LARGE, depending on the characteristics of the site selected.

• Water Use and Quality

Surface water. Overall, water-use and quality impacts at the North Anna site are considered SMALL as operation impacts are minimized by use of the existing intake/discharge system. Water-quality impacts from sedimentation during construction of a natural-gas-fired plant is characterized by the staff in the GEIS as SMALL (NRC 1996). The staff also note that operational water quality impacts would be similar to, or less than, those from other generating technologies.

For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the Commonwealth of Virginia or another state. Water use and quality impacts at an alternate site are considered SMALL to MODERATE, depending on the characteristics of the alternate site.

Groundwater. The staff assumed that a natural-gas-fired plant located at North Anna would obtain potable, process, and fire-protection water from the series of groundwater wells that currently supply Units 1 and 2 (see Section 2.2.2). Groundwater withdrawals would be less than the no-action and license renewal alternatives because of the reduced workforce. Hence, impacts are considered SMALL.

It is possible that a gas-fired plant sited at an alternate site could use groundwater. Groundwater withdrawal at an alternate site would likely require a permit. For alternate greenfield sites, the impact to groundwater would depend on the site characteristics, including the amount of groundwater available. Overall, the impacts are considered SMALL.

• Air Quality

Natural gas is a relatively clean-burning fuel. The gas-fired alternative would release similar types of emissions but in lesser quantities than the coal-fired alternative. Hence, it would be subject to the same air quality regulations as a coal-fired plant.

VEPCo projects the following emissions for the natural-gas-fired alternative (VEPCo 2001):

Sulfur oxides - 122 MT/yr (134 tons/yr)

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1 Nitrogen oxides - 459 MT/yr (506 tons/yr)
2 Carbon monoxide - 602 MT/yr (664 tons/yr)
3 PM₁₀ particulates - 180MT/yr (198 tons/yr).
4

5 A natural-gas-fired plant would also have unregulated carbon dioxide emissions that could
6 contribute to global warming.
7

8 As previously discussed, in December 2000, EPA issued regulatory findings on emissions
9 of hazardous air pollutants from electric utility steam-generating units (EPA 2000b).
10 Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel
11 (EPA 2000b). Unlike coal and oil-fired plants, EPA did not determine that regulation of
12 emissions of hazardous air pollutants from natural-gas-fired power plants should be
13 regulated under Section 112 of the CAA.
14

15 In addition, construction activities would result in temporary fugitive dust. Exhaust
16 emissions would also come from vehicles and motorized equipment used during the
17 construction process. These would be similar to the coal-fired alternative, but smaller due
18 to the smaller construction workforce.
19

20 Air emissions from the burning of natural gas would likely be the same at North Anna or at
21 an alternate site. Impacts from the emissions would be clearly noticeable, but would not be
22 sufficient to destabilize air resources as a whole. The overall air quality impact for a new
23 natural gas-generating plant sited at North Anna or at an alternate site is considered SMALL
24 to MODERATE, depending on the state of air quality at the alternate, greenfield site and the
25 amount of number 2 fuel oil that may be needed to substitute for natural gas in winter
26 months should a natural gas shortage develop—a situation applicable to both sites.
27

28 • Waste

29

30 There will be small amounts of solid-waste products (i.e., ash) from burning natural gas. In
31 the GEIS the staff concluded that waste generation from gas-fired technology would be
32 minimal (NRC 1996). Gas firing results in very few combustion by-products because of the
33 clean nature of the fuel. Waste generation at a gas-fired plant would be largely limited to
34 typical office wastes. Waste generation impacts would be so minor that they would not
35 noticeably alter any important resource attribute. Construction-related debris would be
36 generated during construction activities. Overall, the waste impacts would be SMALL for a
37 natural-gas-fired plant sited at North Anna or at an alternate site.
38

39 In the winter, it may become necessary for a replacement baseload natural-gas-fired plant
40 to operate on fuel oil due to shortages of natural gas. Oil combustion generates waste in

the form of ash, and equipment for controlling air pollution generates additional ash and scrubber sludge. The amount of ash and sludge generated would depend on the quantity of fuel oil combusted. Overall, the waste impacts associated with fuel oil combustion at a combined cycle plant are expected to be SMALL because the amount of oil combusted is expected to be relatively small. When natural gas is available, fuel oil is generally not price-competitive with gas.

• Human Health

In the GEIS the staff identified cancer and emphysema as potential health risks from gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from the plant would be regulated. Human health effects would not be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural-gas-fired alternative sited at North Anna or at an alternate site are considered SMALL.

• Socioeconomics

Construction and Operation. Construction of a natural-gas-fired plant would take approximately 3 years. Peak employment could be up to 1200 workers (NRC 1996). The staff assumed that construction would take place while Units 1 and 2 continue operation and would be completed by the time they permanently cease operations. During construction, the communities surrounding North Anna would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from cities such as Richmond, Fredericksburg, and Charlottesville, among others. After construction, the communities would be impacted by the loss of jobs. The current North Anna Units 1 and 2 workforce (approximately 921 to 961 permanent and contract workers) would decline through a decommissioning period to a minimal maintenance size. Approximately 150 workers would be needed to operate the natural-gas-fired plant. The new natural-gas-fired plant would replace the nuclear tax base in Louisa County. The impacts could be SMALL to MODERATE and may be moderated by Louisa County's proximity to Richmond.

Siting at an alternate site would result in the loss of the nuclear tax base and associated employment in Louisa County with potentially MODERATE to LARGE socioeconomic impacts. Socioeconomic impacts from locating the facilities at an alternate site would depend on the characteristics of the site. Impacts of construction could range between SMALL to MODERATE. Impacts during plant operation would be SMALL (smaller workforce), and the tax impacts could be SMALL to LARGE, depending on the relative proportion

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of taxes paid by the plant to total county taxes. In the GEIS (NRC 1996), the staff concluded that socioeconomic impacts from constructing a natural-gas-fired plant would not be very noticeable and that the small operational workforce would have the lowest socioeconomic impacts of any nonrenewable technology. Compared to the coal-fired and nuclear alternatives, socioeconomic impacts would be mitigated by the smaller construction workforce and the shorter construction time frame, and the smaller operations workforce.

Overall, socioeconomic impacts resulting from construction of a natural-gas-fired plant at North Anna would be SMALL to MODERATE and may be offset by the continued growth of the economy in Richmond and the surrounding area. For construction at an alternate site, socioeconomic impacts would be SMALL to LARGE, depending on the site characteristics at the alternate site.

Transportation. Transportation impacts associated with construction and operating personnel commuting to North Anna would be SMALL to MODERATE. The impacts can be classified as SMALL to LARGE for siting at an alternate site and would depend on the characteristics of the alternate site, including transportation infrastructure.

• Aesthetics

The turbine buildings and stacks (approximately 60 m [200 ft] high) would be visible during daylight hours from offsite, creating incremental visual impacts to those from existing North Anna facilities. The gas pipeline compressors would also be visible. Noise and light from the plant would be detectable offsite. At North Anna, these impacts would result in a SMALL aesthetic impact.

At an alternate site, the buildings and stacks could be visible offsite. Aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities. Overall, the aesthetic impacts associated with a replacement natural-gas-fired plant at an alternate site are categorized as SMALL. The impacts would be greater if a new transmission line is needed and could be considered MODERATE. The impacts could be LARGE if a greenfield site is developed.

• Historic and Archaeological Resources

At both North Anna and an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and

possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at North Anna or at an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated rights-of-way where new construction would occur (e.g., roads, transmission and pipeline rights-of-way, or other rights-of-way). Hence, impacts to cultural resources can be effectively managed under current laws and regulations and kept SMALL at either the existing North Anna site or at an alternate site.

• **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural-gas-fired plant were built at North Anna. Some impacts on housing availability and prices during construction might occur in Louisa County, which could disproportionately affect minority and low-income populations. Closure of North Anna Units 1 and 2 would result in a decrease in employment of approximately 771 to 811 permanent and contract operating employees. Resulting economic conditions could reduce employment prospects for minority or low-income populations in Louisa County. The impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs in the County or nearby Richmond. Overall, impacts are expected to be SMALL to MODERATE.

Impacts at an alternate site would depend on the site chosen and the nearby population distribution. Minority and low-income populations at the alternate site could benefit from the plant's relocation through improved job prospects and the increased tax base that could enable more services to be provided. These impacts could be SMALL to LARGE.

However, if a replacement natural-gas-fired plant were constructed at an alternate site, Louisa County would experience a significant loss of property tax revenue, as well as jobs, which would affect the County's ability to provide services and programs. Impacts to minority and low-income populations in Louisa County could be MODERATE to LARGE, again potentially offset by other economic growth in the area not related to North Anna.

8.2.2.2 Closed-Cycle Cooling System

This section discusses the environmental impacts of constructing a natural-gas-fired generation system at an alternate location using a closed-cycle cooling system with cooling towers. The

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impacts (SMALL, MODERATE, or LARGE) of this option are essentially the same as the impacts for a natural-gas-fired plant using once-through cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-5 summarizes the incremental differences.

Table 8-5. Summary of Environmental Impacts of Natural-Gas-Fired Generation at an Alternate Greenfield Site with Closed-Cycle Cooling Utilizing Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 - 12 additional ha (25 - 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Aesthetics	Introduction of cooling towers and associated plume. Possible noise impact from operation of cooling towers.
Historic and Archaeological Resources	No change.
Environmental Justice	No change.

8.2.3 Nuclear Power Generation

Since 1997, the NRC has certified three new standard designs for nuclear power plants under 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR Part 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). All of these plants are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants.

In addition, recent escalation in prices of natural gas and electricity have made new nuclear power plant construction potentially more attractive from a cost standpoint. Consequently, construction of a new nuclear power plant at North Anna using the existing once-through cooling system and at an alternate site using both closed- and open-cycle cooling are considered in this section. The staff assumed that the new nuclear plant would have a 40-year lifetime.

The NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs sited at North Anna or an alternate site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of Units 1 and 2, which have a net total capacity of 1790 MW(e) (VEPCo 2001). The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of NRC's findings on NEPA issues for license renewal of nuclear power plants in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B is also relevant, although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using once-through cooling is presented in Section 8.2.3.1, and environmental impact information for using closed-cycle cooling is presented in Section 8.2.3.2.

8.2.3.1 Once-Through Cooling System

The overall impacts of the nuclear generating system are discussed in the following sections. The impacts are summarized in Table 8-6. The extent of impacts at an alternate site will depend on the location of the particular site selected.

- **Land Use**

The existing facilities and infrastructure at North Anna would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the staff assumed that a replacement nuclear power plant would use the existing cooling system, switchyard, offices, and transmission line rights-of-way. Approximately 200 ha (500 ac) would be needed for the construction of the new plant. North Anna Units 1 and 2 would continue to operate as the new nuclear power facilities are being constructed.

The impact of a replacement nuclear generating plant on land use at the North Anna site is best characterized as MODERATE. The impact would be greater than the OL renewal alternative.

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Table 8-6. Summary of Environmental Impacts of New Nuclear Power Generation at North Anna Power Station and an Alternate Greenfield Site Using Once-Through Cooling

North Anna Power Station Site			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	MODERATE	Requires approximately 200 ha (500 ac) for the plant.	MODERATE to LARGE	Requires approximately 200 to 400 ha (500 to 1000 ac) for the plant. Possible additional land if a new transmission line is needed.
Ecology	MODERATE	Uses undeveloped areas at current North Anna site plus additional offsite land. Potential habitat loss and fragmentation, and reduced productivity and biological diversity on offsite land.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation, reduced productivity, and biological diversity.
Water Use and Quality				
Surface water	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Groundwater	SMALL		SMALL	Impacts will depend on site characteristics and availability of groundwater.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation.	SMALL	Same impacts as at North Anna site.
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as at North Anna site.
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1.	SMALL	Same impacts as at North Anna site.

Table 8-6. (contd)

North Anna Power Station Site			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 2500 workers during peak period of the 6-year construction period. Operating workforce assumed to be similar to Units 1 and 2. Louisa County tax base preserved. Impacts during operation would be SMALL.	SMALL to LARGE	Construction impacts depend on location. Impacts at a rural location could be LARGE. Louisa County would experience loss of tax base and employment, potentially offset by projected economic growth of Richmond metropolitan area. Operation impacts at an alternate site would SMALL to MODERATE.
	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Operation impacts would be SMALL.	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of operating the plant would be SMALL to MODERATE.
Aesthetics	SMALL	No exhaust stacks or cooling towers would be needed. Daytime visual impact could be mitigated by landscaping and appropriate color selection for buildings. Visual impact at night could be mitigated by reduced use of lighting and appropriate shielding. Noise impacts would be relatively SMALL and could be mitigated.	SMALL to LARGE	Impacts would depend on the characteristics of the alternate site. Impacts would be SMALL if the plant were located adjacent to an industrial area. New transmission lines would add to the impact and would be SMALL to MODERATE depending on the alternate site's characteristics. If a greenfield site is selected, then the impacts could be LARGE.
Historic and Archeological Resources	SMALL	Any potential impacts likely can be managed effectively.	SMALL	Any potential impacts likely can be managed effectively.
Environmental Justice	SMALL	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction.	SMALL to LARGE	Impacts will vary depending on population distribution and makeup at the site. Impacts to minority and low-income residents of Louisa County associated with closure of North Anna Units 1 and 2 could be significant – MODERATE to LARGE. Impacts to receiving County is site-specific and could range from SMALL to LARGE.

Land-use impacts at an alternate site would be greater than at North Anna, including the possible need for a new transmission line. In addition, it may be necessary to construct a rail spur to an alternate site to bring in equipment during construction. Depending particularly on transmission line routing and whether an existing industrial site is used as the

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alternate site, siting a new nuclear plant at an alternate site could result in MODERATE to LARGE land-use impacts.

• Ecology

Locating a replacement nuclear power plant at the North Anna site would alter ecological resources because of the need to convert land to an industrial use. Some of this land, however, would have been previously disturbed. Potential habitat loss and fragmentation and reduced productivity and biological diversity could result. Siting at North Anna would have a MODERATE ecological impact that would be greater than renewal of Units 1 and 2 OLS.

At an alternate site, there would be construction impacts and new incremental operational impacts. The impacts would be the greatest at an alternate greenfield site. Even assuming siting at a previously disturbed area, the impacts would alter the ecology. Impacts could include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity. Use of cooling water from a nearby surface water body could have adverse aquatic resource impacts. If needed, construction and maintenance of the transmission line would have ecological impacts. Overall, the ecological impacts at an alternate site could be MODERATE to LARGE.

• Water Use and Quality

Surface water. The staff assumed that a replacement nuclear power plant at North Anna would use the existing cooling system, which would minimize incremental water-use and quality impacts. Surface-water impacts are expected to remain SMALL; the impacts would be sufficiently minor that they would not noticeably alter any important attribute of the resource.

For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the Commonwealth of Virginia or another state. The impacts would be SMALL to MODERATE.

Groundwater. The staff assumed that a new nuclear power plant located at North Anna would obtain potable, process, and fire-protection water from onsite groundwater wells similarly to the current practice for Units 1 and 2 (see Section 2.2.2). The impacts are considered SMALL.

A nuclear power plant sited at an alternate site may use groundwater. Groundwater withdrawal at an alternate site would likely require a permit. The impacts would depend on availability and how water is withdrawn, but overall are considered SMALL.

- **Air Quality**

Construction of a new nuclear power plant sited at the North Anna site or an alternate site would result in fugitive emissions during construction. Exhaust emissions would also emanate from vehicles and motorized equipment used during construction. An operating nuclear power plant would have minor air emissions associated with diesel generators. These emissions would be regulated by VDEQ or another state. Overall, emissions and associated impacts are considered SMALL.

- **Waste**

The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, Table B-1. In addition to the impacts shown in Table B-1, construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts are considered SMALL.

Siting the replacement nuclear power plant at a site other than North Anna would not alter waste generation. Therefore, the impacts would be SMALL.

- **Human Health**

Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Overall, human health impacts are considered SMALL.

Siting the replacement nuclear power plant at a site other than North Anna would not alter human health impacts. Therefore, the impacts would be SMALL.

- **Socioeconomics**

Construction and Operation. The construction period and the peak workforce associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantified data, the staff assumed a construction period of 5 years and a peak construction workforce of 2500. The staff assumed that construction would take place while the existing North Anna Units 1 and 2 continue operation and would be completed by the time Units 1 and 2 permanently cease operations. During construction, the communities

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1 surrounding North Anna would experience demands on housing and public services that
2 could have SMALL to MODERATE impacts. These impacts would be tempered by
3 construction workers commuting to the site from more distant communities outside of
4 Louisa County. After construction, the communities would be impacted by the loss of the
5 construction jobs.

6
7 The replacement nuclear units are assumed to have an operating workforce comparable to
8 the 921 to 961 permanent and contract workers currently working at North Anna Units 1
9 and 2. The replacement nuclear units would provide a new tax base to offset the loss of tax
10 base associated with decommissioning of North Anna Units 1 and 2. For all of these
11 reasons, the appropriate characterization of non-transportation socioeconomic impacts for
12 replacement nuclear units constructed at North Anna would be SMALL to MODERATE; the
13 socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area.

14
15 Socioeconomic impacts at alternate sites would need to be analyzed on a case-by-case
16 basis. In the GEIS (NRC 1996), the staff noted that socioeconomic impacts at a rural site
17 would be larger than at an urban site because more of the peak construction workforce
18 would need to move to the area to work. Construction of a replacement nuclear power plant
19 at an alternate site would relocate some socioeconomic impacts, but would not eliminate
20 them. Louisa County would experience the impact of North Anna Units 1 and 2 operational
21 job loss and loss of tax base, and the communities around the new site would have to
22 absorb the impacts of a large, temporary workforce (up to 2500 workers at the peak of
23 construction) and a permanent workforce of up to 961 workers. For Louisa County, the
24 socioeconomic impacts could be LARGE. The socioeconomic impacts to the county at the
25 alternate location could be SMALL to LARGE depending on the degree of economic
26 development, the proportion of the county's property tax base represented by the new plant,
27 etc.

28
29 Transportation. The addition of up to 2500 construction workers to the 921 to 961
30 permanent and contract workers at Units 1 and 2 could place significant traffic loads on
31 existing highways, particularly those leading to North Anna. Such impacts would be
32 MODERATE to LARGE. Transportation impacts related to commuting of plant operating
33 personnel would be similar to current impacts associated with operation of Units 1 and 2
34 and are considered SMALL.

35
36 Transportation impacts associated with commuting workers at an alternate site are site-
37 dependent but could be MODERATE to LARGE. Transportation impacts related to
38 commuting of plant operating personnel would also be site-dependent but can be
39 characterized as SMALL to MODERATE.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant sited at North Anna and other associated buildings would likely be visible in daylight hours from offsite. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. The visual impact could also be mitigated by below-grade construction. Visual impact at night could be mitigated by reducing lighting and using shielding appropriately. No exhaust stacks would be needed. No cooling towers would be needed, assuming use of the existing once-through cooling system.

Noise from operation of a replacement nuclear power plant would potentially be audible offsite in calm wind conditions or when the wind is blowing from the direction of the plant. Mitigation measures such as reducing or eliminating use of outside loudspeakers could reduce the noise level and keep the impact SMALL.

At an alternate site, there would be an aesthetic impact from the buildings. There would also be a significant aesthetic impact if a new transmission line were needed. Noise and light from the plant would be detectable offsite. The impact of noise and light could be mitigated if the plant is located in an industrial area adjacent to other power plants, in which case the impacts could be SMALL. The impact could be MODERATE if a new transmission line is needed to connect the plant to the power grid, or LARGE if a greenfield site is selected. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as SMALL to LARGE, depending on the characteristics of the alternate site.

- **Historic and Archaeological Resources**

At both the North Anna site and an alternate site, a cultural resource inventory likely would be needed for any onsite property not previously surveyed. Other lands, if any, that are acquired to support the plant likely would also need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at North Anna or another site, studies likely would be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies likely would be needed for all areas of potential disturbance at the proposed plant site and along associated rights-of-way where new construction would occur (e.g., roads, transmission line rights-of-way, rail lines, or other rights-of-way). Historic and archaeological resource impacts generally can be managed effectively and as such are considered SMALL.

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• Environmental Justice

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement nuclear power plant were built at North Anna. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. However, this is expected to be mitigated by North Anna's proximity to Richmond. After completion of construction, it is possible that the local government's ability to maintain social services could be reduced at the same time that diminished economic conditions reduce employment prospects for minority and low-income populations. However, Louisa County's economic health should improve as the tax base of the older nuclear units are replaced by the new, higher-valued (i.e., less-depreciated) plant. Hence, the ability of the County to provide social services should improve because of the higher tax base, assuming assessment rates remain stable. Overall, socioeconomic impacts are expected to be SMALL.

Impacts at an alternate site would depend on the site chosen and the nearby population distribution. If a replacement nuclear power plant were constructed at an alternate site, Louisa County would experience a significant loss of property tax revenue which could affect the county's ability to provide services and programs. Impacts to minority and low-income populations in Louisa County could be MODERATE to LARGE but potentially offset by other related economic growth in the area. Impacts to the receiving county could be SMALL to LARGE and depend on the relative increase to the tax base resulting from the new plant's construction.

8.2.3.2 Closed-Cycle Cooling System

This section discusses the environmental impacts of constructing a nuclear power plant at an alternate site using closed-cycle cooling with cooling towers. The impacts (SMALL, MODERATE, or LARGE) of this option are essentially the same as the impacts for a nuclear power plant using the once-through cooling system. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences.

8.2.4 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew North Anna, Units 1 and 2 OLS. VEPCo currently has purchase agreements for 145 MW from the Southeastern Power Administration and approximately 3500 MW of non-utility generation (VEPCo 2001). Overall, Virginia is a net importer of electricity.

Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant Sited at an Alternate Greenfield Site with Closed-Cycle Cooling

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 - 12 additional ha (25 - 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impact would depend on ecology at the site. Additional impact to terrestrial ecology from cooling tower drift. Reduced impact to aquatic ecology.
Surface Water Use and Quality	Discharge of cooling tower blowdown containing dissolved solids. Discharge would be regulated. Decreased water withdrawal and less thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Aesthetics	Introduction of cooling towers and associated plume. Natural draft towers could be up to 158 m (520 ft). Mechanical draft towers could be up to 30 m (100 ft) high and also could have an associated noise impact.
Historic and Archaeological Resources	No change.
Environmental Justice	No change.

To replace North Anna, Units 1 and 2 capacity with imported power, VEPCo would need to construct a new 500-kV transmission line that VEPCo estimates would be approximately 160 km (100 mi) long (VEPCo 2001). Assuming a 0.09-km (300-ft) easement width, the transmission line would impact approximately 15 km² (6 mi²).

Imported power from Canada or Mexico is unlikely to be available for replacement of North Anna, Units 1 and 2 capacity. In Canada, 62 percent of the country's electricity capacity is derived from renewable energy sources, principally hydropower (DOE/EIA 2001b). Canada has plans to continue developing hydroelectric power, but the plans generally do not include large-scale projects (DOE/EIA 2001b). Canada's nuclear generation is projected to increase by 1.7 percent by 2020, but its share of power generation is projected to decrease from 14 percent currently to 13 percent by 2020 (DOE/EIA 2001b). EIA projects that total gross U.S. imports of electricity from Canada and Mexico will gradually increase from 47.9 billion kWh in 2000 to

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66.1 billion kWh in 2005 and then gradually decrease to 47.4 billion kWh in 2020 (DOE/EIA 2001a). On balance, it is unlikely that electricity imported from Canada or Mexico would be able to replace the North Anna Units 1 and 2 capacity.

If power to replace North Anna, Units 1 and 2 capacity were to be purchased from sources within the United States or a foreign country, the generating technology would likely be one of those described in this SEIS and in the GEIS (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies in Chapter 8 of the GEIS is representative of the purchased electrical power alternative to renewal of North Anna, Units 1 and 2 OLS. Thus, the environmental impacts of imported power would still occur, but would be located elsewhere within the region, nation, or another country.

8.2.5 Other Alternatives

Other generation technologies are discussed in the following sections.

8.2.5.1 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States from 2000 to 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. Construction and operation of an oil-fired plant would also have environmental impacts. For example, in Section 8.3.11 of the GEIS, the staff estimated that construction of a 1,000-MW(e) oil-fired plant would require about 50 ha (120 ac). Additionally, operation of oil-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant.

8.2.5.2 Wind Power

The Commonwealth of Virginia is in a wind power Class 1 region (average wind speeds at 10-m [30-ft] elevation of 0 to 4.4 m/s [9.8 mph]). Class 1 has the lowest potential for wind energy generation (DOE 2001a). Wind turbines are economical in wind power Classes 4 through 7 (average wind speeds of 5.6 to 9.4 m/s [12.5 to 21.1 mph] [DOE 2001a]). Consequently, the staff concludes that locating a wind-energy facility on or near the North Anna site would not be economically feasible given the current state of wind energy generation technology.

8.2.5.3 Solar Power

Solar power technologies, photovoltaic and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to the higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent, and the capacity factor for solar thermal systems is about 25 to 40 percent (NRC 1996). Energy storage requirements limit the use of solar-energy systems as a baseload electricity supply.

There are substantial impacts to natural resources (wildlife habitat, land-use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS, land requirements are high—14,000 ha (35,000 ac) per 1000 MW(e) for photovoltaic and approximately 6000 ha (14,000 ac) per 1000 MW(e) for solar thermal systems. Neither type of solar electric system would fit at the North Anna site, and both would have large environmental impacts at a greenfield site.

The North Anna site receives approximately 4 kWh of solar radiation per m² per day, compared to 7 to 8 kWh of solar radiation per m² per day in areas of the western United States, such as California, which are the most promising for solar technologies (DOE/EIA 2000a). Because of the natural resource impacts (land and ecological), the area's relatively low rate of solar radiation, and high cost, solar power is not deemed a feasible baseload alternative to renewal of the North Anna, Units 1 and 2 OLS. Some solar power may substitute for electric power in rooftop and building applications. Implementation of nonrooftop solar generation on a scale large enough to replace North Anna, Units 1 and 2 would likely result in LARGE environmental impacts.

8.2.5.4 Hydropower

Virginia has an estimated 617 MW of undeveloped hydroelectric resource (INEEL 1997). This amount is less than needed to replace the 1790 MW(e) capacity of North Anna, Units 1 and 2. As stated in Section 8.3.4 of the GEIS, hydropower's percentage of U.S. generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern about flooding, destruction of natural habitat, and alteration of natural river courses. In the GEIS, estimated land requirements for hydroelectric power are approximately 400,000 ha (1 million ac) per 1000 MW(e) (NRC 1996). Replacement of North Anna Units 1 and 2 generating capacity would require flooding more than this amount of land. Due to the relatively low amount of undeveloped hydropower resource in Virginia and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace North Anna Units 1 and 2, the staff concludes that local hydropower is not a feasible alternative to renewal of the North Anna Units 1 and 2 OLS. Any

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attempts to site hydroelectric facilities large enough to replace North Anna Units 1 and 2 would result in LARGE environmental impacts.

8.2.5.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload generation due to the limited geographical availability of the resource and immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to North Anna Units 1 and 2. The staff concludes that geothermal energy is not a feasible alternative to renewal of the North Anna Units 1 and 2 OLs.

8.2.5.6 Wood Waste

A wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered fuel cost and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per MW of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a base-load generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the North Anna Units 1 and 2 OLs.

8.2.5.7 Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001). Municipal waste combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001c). Mass burning technologies are most commonly used in the United States. This group of technologies process raw municipal solid waste "as is," with little or no sizing,

shredding, or separation before combustion. The initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities. This is due to the need for specialized waste-separation and waste-handling equipment for municipal solid waste (NRC 1996).

Growth in the municipal waste combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste combustion facilities more expensive relative to less capital-intensive waste disposal alternatives such as landfills; (2) the 1994 Supreme Court decision (*C&A Carbone, Inc. v. Town of Clarkstown*), which struck down local flow-control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than at landfills that may have had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001c).

Municipal solid waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue gases using fabric filters and/or scrubbers (DOE/EIA 2001c).

Currently, there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2001). The staff concludes that generating electricity from municipal solid waste would not be a feasible alternative to replace the 1790 MW(e) baseload capacity of North Anna Units 1 and 2 and, consequently, would not be a feasible alternative to renewal of the North Anna Units 1 and 2 OLs.

8.2.5.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff stated that none of these technologies has progressed to the point of being competitive on a large scale or being reliable enough to replace a baseload plant such as North Anna Units 1 and 2 (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the North Anna Units 1 and 2 OLs.

Alternatives

8.2.5.9 Fuel Cells

Fuel cells work without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Phosphoric acid fuel cells are generally considered first-generation technology. Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations. DOE projects that by 2003, two second-generation fuel cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes up to 2 MW at a cost of \$1000 to \$1500 per kW of installed capacity (DOE 2001b). For comparison, the installed capacity cost for a natural-gas-fired combined-cycle plant is on the order of \$500 to \$600 per kW (NWPPC 2000). As market acceptance and manufacturing capacity increase, natural gas-fueled fuel cell plants in the 50- to 100-MW range are projected to become available (DOE 2001b). Presently, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Fuel cells are, consequently, not a feasible alternative to renewal of the North Anna Units 1 and 2 OLS.

8.2.5.10 Delayed Retirement

The only VEPCo generating plants currently scheduled for retirement are Possum Point Units 1 and 2 located about 15 km (25 mi) south of Washington, D.C. These oil-fired units each have a nameplate-generating capacity^(a) of 69 MW (DOE/EIA 2000b). Delayed retirement of Possum Point Units 1 and 2 would not come close to replacing the 1790 MW(e) capacity of North Anna Units 1 and 2. For this reason, delayed retirement of VEPCo generating units would not be a feasible alternative to renewal of the North Anna Units 1 and 2 OLS.

8.2.5.11 Utility-Sponsored Conservation

VEPCo has developed residential, commercial, and industrial programs to reduce both peak demands and daily energy consumption. These programs are commonly referred to as demand-side management (DSM). VEPCo currently operates the following DSM programs: Rate Schedule SG (standby generation), Rate Schedule CS (curtailable service), Rider J (interruptible electric water heater service), and the Real Time Pricing Rate. VEPCo projects that by 2007, its DSM programs will reduce peak power requirements in the summer and winter by 74 and 130 MW, respectively (VEPCo 2001). VEPCo also projects that energy requirements

(a) The nameplate-generating capacity is the full-load, continuous rating of a generating plant.

in 2007 will be reduced by 14 gigawatt hours, 99 percent of which would be from load management programs (VEPCo 2001).

Historic and projected reduction in generation needs as a result of DSM programs have been credited in VEPCo's planning to meet projected customer demand. Because these DSM savings are part of the long-range plan for meeting projected demand, they are not available offsets for North Anna Units 1 and 2. Therefore, the conservation option is not considered a reasonable replacement for the OL renewal alternative.

8.2.6 Combination of Alternatives

Although individual alternatives to North Anna Units 1 and 2 might not be sufficient on their own to replace the capacity of these units due to size or cost, it is conceivable that a combination of alternatives might be cost-effective.

As discussed in Section 8.2, North Anna Units 1 and 2 have a combined average net capacity of 1790 MW(e). For the coal and natural gas alternatives, VEPCo assumes in its ER three standard 508-MW(e) units as potential replacements for Units 1 and 2 (VEPCo 2001). This approach is followed in this SEIS, although it results in some environmental impacts that are roughly 17 percent lower than if full replacement capacity were constructed.

There are many possible combinations of alternatives. Table 8-8 summarizes the environmental impacts of an assumed combination of alternatives consisting of 1016 MW(e) of combined-cycle natural-gas-fired generation at North Anna using the existing once-through cooling system, and at an alternate location using closed-cycle cooling, with 387 MW(e) purchased from other generators and 387 MW(e) gained from additional DSM measures. The impacts associated with the combined-cycle natural-gas-fired units are based on the gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generating capacity. While the DSM measures would have few environmental impacts, operation of the new gas-fired plant would result in increased emissions and environmental impacts. The environmental impacts of imported power would still occur but would be located elsewhere within the region, nation, or another country as discussed in Section 8.2.4. The environmental impacts associated with purchased power are not shown in Table 8-8. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewal of North Anna Units 1 and 2 OLs.

Alternatives

Table 8-8. Summary of Environmental Impacts for an Assumed Combination of Generating and Acquisition Alternatives

North Anna			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	9 ha (23 ac) for powerblock, offices, roads, and parking areas. Additional impact of up to approximately 295 ha (729 ac) for construction of an underground gas pipeline.	SMALL to LARGE	30 ha (74 ac) for powerblock, offices, roads, and parking areas. Additional impact for construction of an underground natural gas pipeline and a transmission line – MODERATE. Greenfield site increases impact to LARGE.
Ecology	SMALL to MODERATE	Uses undeveloped areas at the North Anna site plus land for a new gas pipeline.	SMALL to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission and pipeline routes; potential habitat loss and fragmentation, reduced productivity, and biological diversity. Greenfield site increases impact.
Water Use and Quality				
Surface water	SMALL	Uses existing once-through cooling system.	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce.	SMALL	Groundwater impacts would depend on use and available supply.
Air Quality	SMALL to MODERATE	Sulfur oxides • 81 MT/yr (89 tons/yr) Nitrogen oxides • 306 MT/yr (337 tons/yr) Carbon monoxide • 402 MT/yr (443 tons/yr) PM ₁₀ particulates • 120 MT/yr (132 tons/yr) Some hazardous air pollutants.	SMALL to MODERATE	Same as siting at North Anna Power Station.
Waste	SMALL	Small amount of ash produced.	SMALL	Same as siting at North Anna Power Station.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.

Table 8-8. (contd)

North Anna			Alternate Greenfield Site	
Impact Category	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period, followed by reduction from current North Anna Power Station, Units 1 and 2, workforce of 921 to 961 (permanent and contract) to approximately 150; tax base preserved. Impacts during operation would be SMALL to MODERATE due to loss of employment to Louisa County.	SMALL to LARGE	Construction impacts depend on location, but could be significant if location is in a rural area. Louisa County would experience loss of tax base and employment with potentially LARGE impacts. Impacts during operation at an alternate site would be SMALL to MODERATE depending on economy at alternate site and relative impact of plant to tax base.
	SMALL to MODERATE	Transportation impacts associated with construction workers would be SMALL to MODERATE. Transportation impacts during operation would be SMALL due to smaller workforce.	SMALL to LARGE	Transportation impacts associated with construction workers would be SMALL to LARGE and dependent on population density at alternative site. Impacts during operation would be SMALL due to smaller workforce.
Aesthetics	SMALL	Some visibility of structures offsite.	SMALL to LARGE	SMALL if alternate site previously developed. MODERATE impact from plant, stacks, cooling tower plumes, and new transmission lines. LARGE if greenfield site.
Historic and Archeological Resources	SMALL	Any potential impacts likely can be managed effectively.	SMALL	Any potential impacts likely can be managed effectively.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Some impacts on housing may occur during construction; loss of approximately 750 operating jobs at North Anna could reduce employment prospects for minority and low-income populations.	SMALL to LARGE	Impacts at alternate site vary depending on population distribution and makeup at site. Louisa County would lose significant revenue, which could have MODERATE to LARGE impacts to minority and low-income populations. Impacts to receiving County could be SMALL to MODERATE.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, license renewal, are SMALL for all impact categories (except collective offsite radiological impacts from the fuel cycle and from high level waste and spent fuel disposal, for which a single significance level was not assigned). The alternative actions, i.e., no-action alternative (discussed in Section 8.1), new generation alternatives (from coal, natural gas, and nuclear, discussed in Sections 8.2.1 through 8.2.3, respectively), purchased electrical power (discussed in Section 8.2.4), alternative technologies (discussed in Section 8.2.5), and the combination of alternatives (discussed in Section 8.2.6) were considered.

The no-action alternative would result in decommissioning North Anna Power Station, Units 1 and 2, and would require replacing electrical generating capacity by (1) DSM and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than North Anna Units 1 and 2, or (4) some combination of these options. For each of the new generation alternatives (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For example, the land-disturbance impacts resulting from construction of any new facility would be greater than the impacts of continued operation of North Anna Units 1 and 2. The impacts of purchased electrical power (imported power) would still occur, but would occur elsewhere. Alternative technologies are not considered feasible at this time, and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with renewal of the OLs for North Anna Units 1 and 2.

The staff concludes that the alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

8.4 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR Part 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Ambient Air Quality Standards."

40 CFR Part 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR Part 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

40 CFR Part 81. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

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9.0 Summary and Conclusions

By letter dated May 29, 2001, the Virginia Electric and Power Company (VEPCo) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for North Anna Power Station, Units 1 and 2, for an additional 20-year period (VEPCo 2001). If the OLs are renewed, State regulatory agencies and VEPCo will ultimately decide whether the plants will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the plants must be shut down at or before the expiration date of the current OLs, which is April 1, 2018, for Unit 1 and August 21, 2020, for Unit 2.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321), directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).^(a)

Upon acceptance of the VEPCo 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 (66 FR 46294 [NRC 2001]) for North Anna on September 4, 2001. The staff visited North Anna in October 2001 and held public scoping meetings on October 18, 2001, in Louisa County, Virginia. The staff reviewed the VEPCo Environmental Report (ER) (VEPCo 2001) and compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of this draft Supplemental Environmental Impact Statement (SEIS) for North Anna Power Station, Units 1 and 2. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this SEIS.

The staff will hold two public meetings near North Anna Power Station in June 2002 to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments. When the comment period ends, the staff will consider and disposition all of the comments received.

(a) 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.

Summary and Conclusions

1 These comments will be addressed in Appendix A, Part 2, of the final SEIS. Additional details
2 concerning the meetings will be provided in a future meeting notice and in the Notice of
3 Availability concerning this SEIS in the *Federal Register*.
4

5 This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the
6 environmental effects of the proposed action, the environmental impacts of alternatives to the
7 proposed action, and mitigation measures available for reducing or avoiding adverse effects. It
8 also includes the staff's preliminary recommendation regarding the proposed action.
9

10 The NRC has adopted the following statement of purpose and need for license renewal from
11 the GEIS:
12

13 The purpose and need for the proposed action (renewal of an operating license) is to
14 provide an option that allows for power generation capability beyond the term of a
15 current nuclear power plant operating license to meet future system generating needs,
16 as such needs may be determined by State, utility, and, where authorized, Federal
17 (other than NRC) decisionmakers.
18

19 The goal of the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is
20 to determine
21

22 ...whether or not the adverse environmental impacts of license renewal are so great that
23 preserving the option of license renewal for energy planning decisionmakers would be
24 unreasonable.
25

26 Both the statement of purpose and need and the evaluation criterion implicitly acknowledge
27 that, even if an OL is renewed, there are other factors that will ultimately determine whether an
28 existing nuclear power plant continues to operate beyond the period of the current OL.
29

30 NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of
31 SEISs prepared at the license renewal stage:
32

33 The supplemental environmental impact statement for license renewal is not required to
34 include discussion of need for power or the economic costs and economic benefits of
35 the proposed action or of alternatives to the proposed action except insofar as such
36 benefits and costs are either essential for a determination regarding the inclusion of an
37 alternative in the range of alternatives considered or relevant to mitigation. In addition,
38 the supplemental environmental impact statement prepared at the license renewal stage
39 need not discuss other issues not related to the environmental effects of the proposed

1 action and the alternatives, or any aspect of the storage of spent fuel for the facility
2 within the scope of the generic determination in § 51.23(a) and in accordance with
3 § 51.23(b).^(a)
4

5 The GEIS contains the results of a systematic evaluation of the consequences of renewing an
6 OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmen-
7 tal issues using the NRC's three-level standard of significance—SMALL, MODERATE, or
8 LARGE—developed using the Council on Environmental Quality guidelines. The following
9 definitions of the three significance levels are set forth in a footnote to Table B-1 of 10 CFR
10 Part 51, Subpart A, Appendix B:
11

12 SMALL - Environmental effects are not detectable or are so minor that they will neither
13 destabilize nor noticeably alter any important attribute of the resource.
14

15 MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize,
16 important attributes of the resource.
17

18 LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize
19 important attributes of the resource.
20

21 For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS shows the following:
22

- 23 (1) The environmental impacts associated with the issue have been determined to apply either
24 to all plants or, for some issues, to plants having a specific type of cooling system or other
25 specified plant or site characteristic.
26
- 27 (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the
28 impacts (except for collective offsite radiological impacts from the fuel cycle and from high
29 level waste [HLW] and spent fuel disposal).
30
- 31 (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis,
32 and it has been determined that additional plant-specific mitigation measures are likely not
33 to be sufficiently beneficial to warrant implementation.
34

35 These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and
36 significant information, the staff relied on conclusions as amplified by supporting information in

(a) The title of 10 CFR 51.23 is "Temporary storage of spent fuel after cessation of reactor operations-
generic determination of no significant environmental impact."

Summary and Conclusions

the GEIS for issues designated Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

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 also 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 draft SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The 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 OLs for North Anna Power Station, Units 1 and 2) and alternative methods of power generation. These alternatives were evaluated assuming that the replacement power generation plant is located at either the North Anna site or some other unspecified location.

9.1 Environmental Impacts of the Proposed Action — License Renewal

VEPCo and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither VEPCo 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, VEPCo, nor the staff has identified any new issue applicable to North Anna Power Station, Units 1 and 2, that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to North Anna Power Station, Units 1 and 2.

VEPCo's license renewal application presents an analysis of the Category 2 issues that are applicable to North Anna Power Station, Units 1 and 2. In addition, the staff has evaluated the two uncategorized issues, environmental justice and chronic effects from electromagnetic fields. The staff has reviewed the VEPCo analysis for each issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at North Anna. Four Category 2 issues are not discussed in this draft SEIS because they are specifically related to refurbishment. VEPCo (VEPCo 2001) has stated that its evaluation of structures and

components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of North Anna Power Station, Units 1 and 2, for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to the Continuation of Construction and the Operation of North Anna Unit 1 and 2 and the Construction of Units 3 and 4*, issued in 1973, and the two addenda to the final environmental statements related to the operation of North Anna Power Station, Units 1 and 2, issued by the NRC in 1976 and 1980.

Twelve Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this draft SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are discussed in this draft SEIS only in relation to operation during the renewal term. For all 12 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff 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 North Anna Power Station, Units 1 and 2, and the plant improvements already made, the staff concludes that none of the candidate SAMAs are cost-beneficial.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate the environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have

Summary and Conclusions

1 already occurred. The environmental impacts to be evaluated for license renewal are those
2 associated with refurbishment and continued operation during the renewal term.

3
4 The adverse impacts of continued operation identified are considered to be of SMALL signifi-
5 cance, and none warrants implementation of additional mitigation measures. The adverse
6 impacts of likely alternatives if North Anna Power Station, Units 1 and 2, cease operation at or
7 before the expiration of the current OLs will not be smaller than those associated with continued
8 operation of these units, and they may be greater for some impact categories in some
9 locations.

10 11 **9.1.2 Irreversible or Irretrievable Resource Commitments**

12
13 The commitment of resources related to construction and operation of North Anna Power
14 Station, Units 1 and 2, during its current license period was made when the plant was built. The
15 resource commitments to be considered in this draft SEIS are associated with continued
16 operation of the plant for an additional 20 years. These resources include materials and
17 equipment required for plant maintenance and operation, the nuclear fuel used by the reactors,
18 and ultimately, permanent offsite storage space for the spent fuel assemblies.

19
20 The most significant resource commitments related to operation during the renewal term are
21 the fuel and the permanent storage space. North Anna Power Station, Units 1 and 2, replace
22 approximately one-third of the fuel assemblies in each of the two units during every refueling
23 outage, which occurs on an 18-month cycle.

24
25 If North Anna Power Station, Units 1 and 2, cease operation on or before the expiration of the
26 current OLs, the likely power generation alternatives will require a commitment of resources for
27 construction of the replacement plants as well as for fuel to run the plants.

28 29 **9.1.3 Short-Term Use Versus Long-Term Productivity**

30
31 An initial balance between short-term use and long-term productivity of the environment at the
32 North Anna Power Station site was set when the plants were approved and construction began.
33 That balance is now well established. Renewal of the OLs for North Anna Power Station,
34 Units 1 and 2, and continued operation of the plants will not alter the existing balance, but may
35 postpone the availability of the site for other uses. Denial of the application to renew the OLs
36 will lead to shutdown of the plants and will alter the balance in a manner that depends on
37 subsequent uses of the site. For example, the environmental consequences of turning the
38 North Anna Power Station site into a park or an industrial facility are quite different.
39

9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OLS for North Anna Power Station, Units 1 and 2. Chapter 2 describes the site, power plants, and interactions of the plants with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at North Anna Power Station, Units 1 and 2. Chapters 4 through 7 discuss environmental issues associated with renewal of the OLS. Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OLS), the no-action alternative (denial of the application), alternatives involving nuclear, coal, or gas generation of power at North Anna Power Station, Units 1 and 2, an unspecified "greenfield site," and a combination of alternatives are compared in Table 9-1.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the GEIS (NRC 1996; 1999), (2) the ER submitted by VEPCo (VEPCo 2001), (3) consultation with Federal, State, and local agencies, (4) the staff's own independent review, and (5) the staff's consideration of public comments received during the scoping process, the preliminary recommendation of the staff is that the Commission determine that the adverse environmental impacts of license renewal for North Anna Power Station, Units 1 and 2, are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

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Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation

Summary and Conclusions

Impact Category	Proposed Action	No-Action Alternative	Coal-Fired Generation		Natural Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
	License Renewal	Denial of Renewal	North Anna Site	Alternate Greenfield Site	North Anna Site	Alternate Greenfield Site	North Anna Site	Alternate Greenfield Site	North Anna Site	Alternate Greenfield Site
Land Use	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Ecology	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Transportation	SMALL	SMALL	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Aesthetics	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE
Historic and Archaeological Resources	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent-fuel disposal, for which a significance level was not assigned. See Chapter 6 for details.

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9.4 References

- 10 CFR Part 51. Code of Federal Regulations, *Title 10, Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- 10 CFR Part 54. Code of Federal Regulations, *Title 10, Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
- National Environmental Policy Act of 1969 (NEPA). 42 USC 4321, et seq.
- U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to the Continuation of Construction and Operation of Units 1 and 2 and the Construction of Units 3 and 4 of the North Anna Power Station*. Docket Nos. 50-338 and 50-339, Washington, D.C.
- U.S. Nuclear Regulatory Commission (NRC). 1976. *Addendum to the Final Environmental Statement Related to Operation of North Anna Power Station, Units 1 and 2*. Docket Nos. 50-338 and 50-339, NUREG-0134. Washington, D.C.
- U.S. Nuclear Regulatory Commission (NRC). 1980. *Addendum to the Final Environmental Statement Related to Operation of North Anna Power Station, Units 1 and 2*. Docket Nos. 50-338 and 50-339, NUREG-0134. Washington, D.C.
- U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.
- U.S. 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, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.
- U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1, Washington, D.C.
- U.S. Nuclear Regulatory Commission (NRC). 2001. "Notice of Intent To Prepare an Environmental Impact Statement and Conduct Scoping Process." *Federal Register*. Vol. 66, No. 171, p. 46294. Washington, D.C.
- Virginia Electric and Power Company (VEPCo). 2001. *Application for License Renewal for North Anna Power Station, Units 1 and 2*, "Appendix E, Environmental Report - Operating License Renewal Stage." Richmond, Virginia.

Appendix A

Comments Received on the Environmental Review

Appendix A

Comments Received on the Environmental Review

Part I - Comments Received During Scoping

On September 4, 2001, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the Federal Register (66 FR 46294), to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, to support the renewal application for the North Anna Power Station operating licenses and to conduct scoping. This plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) guidelines, and 10 CFR Part 51. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the Federal Register Notice. The NRC invited the applicant; Federal, State, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at scheduled public meetings and/or submitting written suggestions and comments no later than November 5, 2001.

The scoping process included two public scoping meetings, which were held at the Louisa County Office Building in Louisa County, Virginia on October 18, 2001. Approximately 45 individuals attended the meetings. Each session began with NRC staff members providing brief overviews of the license renewal process and the NEPA process. After the NRC's prepared statements, the meetings were opened for public comments. Eighteen attendees provided either oral statements that were recorded and transcribed by a certified court reporter or written statements. The meeting transcripts are an attachment to the Scoping Meeting Summary dated November 6, 2001. In addition to the comments provided during the public meetings, three comment letters and an email were received by the NRC in response to the Notice of Intent.

At the conclusion of the scoping period, the NRC staff and its contractors reviewed the transcripts and all written material received to identify specific comments and issues. Each set of comments from an individual was given a unique identifier (Commenter ID), so that the comments could be traced back to the original transcript, letter, or e-mail containing the comment. Specific comments were numbered sequentially within each comment set. Several commenters submitted more than one set of comments (e.g., they made statements in both the afternoon and evening scoping meetings). In these cases, there is a unique Commenter ID for each set of comments.

Table A-1 identifies the individuals who provided comments applicable to the environmental review and gives the Commenter ID associated with each set of comments. Individuals who spoke at the scoping meetings are listed in the order in which they spoke at the public meeting.

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Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number(a)
NAS-A	Lee Lintecum	Louisa County	Afternoon Scoping Meeting
NAS-B	Linda Edwards	Louisa County	Afternoon Scoping Meeting
NAS-C	Jimmy Candeto	Mineral Town Manager	Afternoon Scoping Meeting
NAS-D	Duff Green	Orange County	Afternoon Scoping Meeting
NAS-E	Ashland Fortune	Louisa County Sheriff	Afternoon Scoping Meeting
NAS-F	William Hayden	President of Lake Anna Civic Association	Afternoon Scoping Meeting
NAS-G	Jerry Rosenthal	Concerned Citizens of Louisa	Afternoon Scoping Meeting
NAS-H	Lisa Gue	Public Citizen	Afternoon Scoping Meeting
NAS-J	Dave Heacock	Dominion	Afternoon Scoping Meeting
NAS-K	Bill Bolin	Dominion	Afternoon Scoping Meeting
NAS-L	Ashland Fortune	Louisa County Sheriff	Evening Scoping Meeting
NAS-M	V. Earl Dickinson	Virginia General Assembly	Evening Scoping Meeting
NAS-N	Mary Lou Dickinson	LinkAges Community Services	Evening Scoping Meeting
NAS-P	Donald Gallihugh	Mayor of Louisa	Evening Scoping Meeting
NAS-Q	Edward Kube	Louisa County Board of Supervisors	Evening Scoping Meeting
NAS-R	Jerry Rosenthal	Concerned Citizens of Louisa	Evening Scoping Meeting
NAS-S	Tom Filen	Louisa Chamber of Commerce and Virginia Community Bank	Evening Scoping Meeting
NAS-T	Hugh Jackson	Public Citizen	Evening Scoping Meeting
NAS-U	Matthew Kersey	Town of Louisa	Evening Scoping Meeting
NAS-V	Lisa Gue	Public Citizen	Evening Scoping Meeting
NAS-W	Dave Heacock	Dominion	Evening Scoping Meeting
NAS-X	Bill Bolin	Dominion	Evening Scoping Meeting
NAS-Y	Bill Murphey	Citizen of Louisa County	Evening Scoping Meeting
NAS-Z	Jerry Rosenthal	Concerned Citizens of Louisa	Email - Letter (ML013460243)
NAS-AA	John Wolflin	U.S. Fish and Wildlife Service	Letter (ML013460246)
NAS-AB	R. Edward Houck	Senate of Virginia	Letter (ML012920545)
NAS-AC	Honorable Eric Cantor	U.S. Congress	Letter (ML013650011)

(a) The afternoon and evening transcripts can be found under accession number ML013120266.

To maintain consistency with the scoping summary report (North Anna Power Station Scoping Summary Report, dated January 2, 2002), the unique identifier used in that report for each set of comments is retained in this report.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of several general groups. These groups include

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related Federal actions.
- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the license renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the North Anna Power Station license renewal application.
- Questions that do not provide new information.
- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations. These comments typically address issues such as the need for power, emergency preparedness, current operational safety issues, and safety issues related to operation during the renewal period.

Each comment applicable to this environmental review is summarized in this section. This information, which was extracted from the North Anna Power Station Scoping Summary Report, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that are general or outside the scope of the environmental review for North Anna Power Station are not included here. More detail regarding the disposition of general or nonapplicable comments can be found in the summary report. The ADAMS accession number for the summary report is ML020160608. This accession number is provided to facilitate access to the document through the Public Electronic Reading Room (ADAMS) <http://www.nrc.gov/reading-rm.html>.

The following pages summarize the comments and suggestions received as part of the scoping process that are applicable to this environmental review, and discuss the disposition of the comments and suggestions. The parenthetical alpha-numeric identifier after each comment refers to the comment set (Commenter ID) and the comment number.

Comments in this section are grouped in the following categories:

1. Comments Concerning Category 1 Socioeconomic Issues
2. Comments Concerning Category 1 Air-Quality Issues

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3. Comments Concerning Category 1 Human Health Issues
4. Comments Concerning Aquatic Resource Issues
5. Comments Concerning Terrestrial Resource Issues
6. Comments Concerning Category 1 Postulated Accident Issues
7. Comments Concerning Category 1 Uranium Fuel Cycle and Waste Management Issues
8. Comments Concerning Category 2 Socioeconomic Issues
9. Comments Concerning Category 2 Aquatic Ecology Species Issues
10. Comments Concerning Category 2 Threatened and Endangered Species Issues

1. Comments Concerning Category 1 Socioeconomic Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 socioeconomic issues include:

- Public services: public safety, social services, and tourism and recreation
- Public services: education (license renewal term)
- Aesthetics impacts (refurbishment)
- Aesthetics impacts (license renewal term)
- Aesthetics impacts of transmission lines (license renewal term).

Comment: We have found Dominion to be a very good corporate citizen. (NAS-A-1)

Comment: Dominion has proved to be a very good civic citizen, contributing both time and financial resources. (NAS-A-4)

Comment: Dominion Power has for many years provided marketing material in economic development. (NAS-B-2)

Comment: Their employees [Dominion] are also generous with their money. (NAS-C-7)

Comment: Virginia Power also has kept food on people's tables here, clothes on the children's backs, helped the school system, given millions of dollars a year to needy families. (NAS-E-2)

Comment: Dominion quickly stepped forward with an offer to let us use their Visitor Center facilities and, in addition, donated \$1,000 to us to assist in funding the program. (NAS-F-4)

Comment: We have a longstanding tradition at North Anna and Dominion of investing in our communities. (NAS-J-15)

Comment: We [North Anna] are involved in community stewardship in many fronts. (NAS-K-4)

Comment: The new schools, many things that you see that we have developed in Louisa County could not have happened if we did not have this additional revenue coming from the power plant. (NAS-M-8)

Comment: Along with that, we have one of the nicest Little League ball diamonds in the State of Virginia, and that was done through Dominion Power. (NAS-N-3)

Comment: Through the development of the water source needed to maintain water temperatures, the Dominion Virginia Power has created one of the premier lakes in the State of Virginia for all who enjoy various recreational activities. (NAS-P-9)

Comment: So they [North Anna] do lots of public service and volunteerism in our community. (NAS-Q-3)

Comment: I have served the last two years as President of the Chamber of Commerce and can tell you that we didn't have a more supportive member than Virginia Power. (NAS-S-1)

Comment: I'm personally in support of this, and on behalf of the Chamber of Commerce I can't tell you that we've had a better neighbor or friend to our economic community. (NAS-S-2)

Comment: Their contributions through tax dollars enabled us to build three fine elementary schools in the county. There have been expansions to the high school, the middle school, a number of other public facilities. (NAS-U-2)

Comment: They've been a good corporate citizen. (NAS-U-3)

Comment: As mentioned several times tonight, we also pride ourselves at Dominion in an active role in whatever community we are a part of, and North Anna is no exception. (NAS-X-3)

Comment: One that I'd like to highlight tonight of particular importance at North Anna is the partnership with the Lake Anna State Park. (NAS-X-4)

Comment: Dominion Resources, through the Employee Volunteer Program, facilitates the donation of tens of thousands of volunteer hours to projects which directly benefit the communities where employees work and live. Financial support for civic and charitable endeavors are provided as well. (NAS-AB-4)

Comment: Many of these [North Anna] employees routinely volunteer their time and resources to help make their communities better places in which to live. The employee volunteer program facilitates the donation of tens of thousands of volunteer hours to projects that directly benefit

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the communities in which the employees work and live. Financial support for civic and charitable endeavors are provided as well. (NAS-AC-3)

Comment: Plant and marine life in Lake Anna are at healthy levels, and Lake Anna continues to be a major recreational area and one of Virginia's outstanding freshwater fishing spots. (NAS-AC-6)

Response: The comments are noted. The comments are supportive of license renewal at the North Anna Power Station, Units 1 and 2. Public services were evaluated in the GEIS and determined to be a Category 1 issue. Information regarding the impact on education will be discussed in Chapter 4 of the SEIS.

2. Comments Concerning Category 1 Air Quality Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 air quality issues include:

- Air-quality effects of transmission lines.

Comment: The primary advantage of a nuclear plant is that it doesn't produce any carbon -- doesn't emit any carbon dioxides, carbon monoxides, nitrous oxides, sulfur dioxides. All of those things are not emitted at the plant during normal operation. (NAS-J-11)

Comment: So we don't have an impact for greenhouse gases like you might have from a replacement plant, and that's one factor that goes into this decision. (NAS-J-12)

Comment: Thirdly, electricity provided from the North Anna Power Station is emission free energy. (NAS-M-5)

Response: The comments are noted. Air quality impacts from plant operations were evaluated in the GEIS and found to be minimal. These emissions are regulated through permits issued by the U.S. Environmental Protection Agency and Virginia. Air Quality will be discussed in Chapter 2 of the SEIS. The comments provide no new information and, therefore, will not be evaluated further.

3. Comments Concerning Category 1 Human Health Issues

As stated in 10 CFR Part 51, Table B-1, Category 1 human health issues include:

- Radiation exposure to the public during refurbishment
- Occupational radiation exposure during refurbishment

- Microbiological organisms (occupational health)
- Noise
- Radiation exposures to public (license renewal term)
- Occupational radiation exposures (license renewal term).

Comment: We need to deal with the regular releases that come from the plant, the radioactivity that is regularly vented off of the reactors. (NAS-G-10)

Comment: In terms of I heard the gentleman from Lake Anna Civic Association talk about all of the things they're checking at the lake, but radioactivity was not one of them. That's seems incongruous that they would be checking fecal samples, but next to a nuclear plant they're not interested in checking for radioactivity in either the water, the fish, the algae? (NAS-G-11)

Comment: The Russian experience has shown over a long period of time a lot of the radioactivity ends up sinking to the bottom in the mud. This type of stuff needs to be checked. (NAS-G-12)

Comment: Power plants are not only poised on the brink of this kind of catastrophic accident [Chernobyl] at all times, but also releasing routine amounts of radiation into the air and the water. (NAS-H-4)

Response: The comments are noted. Impacts from routine radiological releases are addressed in Chapters 2 and 4 of the SEIS. The comments provide no new information and, therefore, will not be evaluated further.

Comment: It would be advantageous to have independent monitors, separate from the nuclear power company itself or the Nuclear Regulatory Commission. Let's get some independent monitors, and let's monitor the workers. What is the long-term health of the workers? Let's do epidemiological studies. Let's monitor the community. Let's monitor the environment, all -- all completely independently. (NAS-G-13)

Comment: I discussed the need for independent monitoring of the workers at the plant long term, of the community long term, of the environment long term. This is independent, not just what is done by the state and what is done by Virginia Power. (NAS-R-7)

Comment: There exists a need for independent monitoring of all environmental matters -- air, water, lake bottom, vegetation. (NAS-Z-18)

Comment: There should be independent monitoring of workers' health and community health (epidemiological studies over time). These should be funded by the utility and overseen by

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completely independent (not utility or state or federal) professionals. This requirement in a license renewal will help provide greater public trust in the process. Has there been a problem in the past? YOU BET! (NAS-Z-19)

Response: The comments are noted. Radiation exposure to the public and workers was evaluated in the GEIS and determined to be a Category 1 issue. The requirements for monitoring of the environment are beyond the scope of license renewal. The NRC requires the licensee to routinely conduct radiological monitoring of all plant effluents, as well as foodstuffs and biota. The NRC also communicates with permitting agencies that administer the Clean Water Act and the Clean Air Act, State radiological agencies, the Fish and Wildlife Service, and other organizations. Any potential noncompliance of monitoring requirements is an operational safety issue, handled through the inspection and reporting process, and is therefore beyond the scope of license renewal. The comments provide no new information, and do not pertain to the scope of license renewal as set in 10 CFR Part 51 and Part 54. Therefore they will not be evaluated further.

4. Comments Concerning Aquatic Resource Issues

Comment: Dominion biologists regularly monitor the health of the fish in Lake Anna. (NAS-C-5)

Comment: After the lake was created and flooded, they monitored the aging or maturing of the lake for over 20 years on a continuous basis at a number of sampling points to insure that no negative impacts were developing. (NAS-F-1)

Comment: The formation of Lake Anna immediately improved conditions in the Contrary Creek arm of the lake, as well as the North Anna River below the dam. (NAS-X-2)

Response: The comments are noted. Aquatic ecology will be discussed in Chapters 2 and 4 of the SEIS. The comments provide no new information and, therefore, will not be evaluated further.

Comment: Page 2-2. The Service is concerned with the impacts to fish and aquatic vegetation (Issue # 3 & 19) associated with the structures described as, "In addition to the two nuclear reactors, their turbine building, intake structure, discharge canal, and auxiliary buildings." Our concerns also include the impacts of dams on the passage and distribution of fish and mussel species. (NAS-AA-1)

Comment: P. 2-8. What is your reference for a healthy fish population stated in, "Reservoirs like Lake Anna with healthy populations of "landlocked" small shad and herring (Lake Anna has

1 both threadfin shad (*Dorosoma petenense*) and blueback herring (*Alosa aestivalis*), are often
2 dominated by small-bodied zooplankters (rotifers and copepods), because larger-bodied forms
3 are selectively preyed upon by schooling clupeids (Ref. 2.2-11)." (NAS-AA-2)

4
5 **Comment:** Page 2-9. How do you account for the reduction in abundance of yellow perch,
6 black crappie, pumpkinseed sunfish and an increase in other species of fish as stated in "The
7 community structure remained relatively stable over the 1975-1985 period, with some year-to-
8 year variation in species composition caused by: (1) normal population fluctuations; (2)
9 reservoir aging; (3) the introduction of forage species and competing predators; (4) the
10 installation of fish attractors and artificial habitat; and (5) the increase in Corbicula densities.
11 Post-1975 changes included: (1) a decline in relative abundance of yellow perch (*Perca*
12 *flavescens*) and black crappie (*Promoxis nigromaculatus*); (2) an increase in relative abundance
13 of white perch (*Morone americana*) and threadfin shad; and (3) an increase in redear sunfish
14 (*Lepomis microlophus*) abundance, with a corresponding decrease in pumpkinseed (*Lepomis*
15 *gibbosus*). None of these changes appeared to be related to NAPS operation." (NAS-AA-3)

16
17 **Response:** The comments/questions are noted. They do not provide any new information.
18 However, NRC plans to discuss these issues further with the Fish and Wildlife Service (FWS)
19 because it is a cognizant Federal agency.

20
21 **Comment:** Page 2-10. There continues to be disagreement between the scientific community
22 as to the historical range of anadromous fish spawning habitat in the North Anna River.
23 American shad, hickory shad, blueback herring, sea lamprey, and American eel are reported to
24 migrate to the base of the Ashland Mill Dam on the South Anna River. The VEPCo report
25 states, "Four non-native fish species (striped bass, walleye, threadfin shad, and blueback
26 herring) have been stocked in Lake Anna by the Virginia Department of Game & Inland
27 Fisheries since 1972. Striped bass were introduced in 1973, and have been stocked annually
28 since 1975. They provide a "put-grow-and-take" fishery; streams, including the North Anna
29 River that flow into Lake Anna lack the flow, depth, and length to support striped bass spawning
30 runs. Studies show that striped bass grow and provide a substantial recreational fishery in
31 Lake Anna, but adults are subject to late-summer habitat restrictions (limited to cooler-water
32 refuge areas) and growth limitations. Walleye are also stocked annually by the Virginia
33 Department of Game & Inland Fisheries and are highly sought-after game fish. Threadfin shad
34 were introduced in 1983 to provide additional forage for striped bass and other top-of-the-food-
35 chain predators. This species is vulnerable to cold shock and winter kills, and would not be
36 able to survive in Lake Anna if it were not for NAPS operation. Threadfin shad appear to be
37 thriving in Lake Anna and are an important source of food for game fish. Blueback herring, fish
38 stocked by the Virginia Department of Game & Inland Fisheries in 1980 as a forage species,
39 have not been as successful. A fifth non-native species, the herbivorous grass carp, was
40 stocked by Dominion (with the approval of the Virginia Department of Game & Inland Fisheries)

Appendix A

1 in the WHTF in 1994 to control growth of the nuisance submersed aquatic plant hydrilla
2 (*Hydrilla verticillata*).” (NAS-AA-4)
3

4 **Comment:** Page 2-11. The water flow in the North Anna River System changed drastically
5 after the impoundment was created. The reduction in river flow from Lake Anna during the
6 Spring spawning migration may limit the range of anadromous and riverine species of fish in the
7 river. The report describes the river as, “The North Anna River joins the South Anna River
8 23 miles downstream from the North Anna Dam, forming the Pamunkey River. Before 1972,
9 when the river was impounded, flows varied considerably (1 to 24,000 cfs) from year to year
10 and water quality was degraded by acid mine drainage from Contrary Creek. After 1972,
11 fluctuations in flow were moderated (40 to 16,000 cfs from 1972 through 1985) and water
12 quality was improved as a result of reclamation activities at the Contrary Creek mine site and
13 the acid-neutralizing effect of Lake Anna’s waters. Water quality downstream from the North
14 Anna Dam is strongly influenced by conditions in the reservoir and releases at the Dam. Water
15 moving from Lake Anna to the North Anna River is less turbid and more chemically stable than
16 the pre-impoundment flow. Dissolved oxygen levels are high (averaging 9.6 milligrams per liter
17 over the 1981-1985 period) immediately downstream of the Dam and increase further
18 downstream, presumably as a result of turbulent mixing (Ref. 2.2-3). Summer water
19 temperatures from 1970-1985 were higher near the Dam than downstream, reflecting
20 temperatures in the reservoir. The highest water temperature recorded in pre-operational years
21 was 89.4°F in July 1977, at a station one kilometer below the North Anna Dam. The highest
22 temperature recorded in operational years was slightly higher, 90.9°F, recorded in August 1983
23 at the same station.” Each of these flow related impacts warrant additional river flow study.
24 (NAS-AA-5)
25

26 **Comment:** Page 3-15. The Service believes the North Anna Hydroelectric project and the
27 dam may be causing significant impacts to the North Anna River and the results from earlier
28 studies should be reevaluated. The report states, “An exemption from licensing (Ref. 3.5-1)
29 was filed with the Federal Energy Regulatory Commission (FERC) in March 1984; an order
30 granting the exemption was issued in September 1984. As part of the exemption from licensing
31 by FERC, the U.S. Fish and Wildlife Service requested that Dominion perform pre-operational
32 and operational fish passage studies to evaluate the need for intake screening. Studies were
33 conducted in 1986, 1987, and 1988 (Ref. 3.5-3). Results of these studies indicated that the
34 number of fish passing from Lake Anna to the North Anna River was minimal (Ref. 3.5-4).
35 (NAS-AA-6)
36

37 **Response:** The comments are noted. The comments relate to impacts associated with the
38 construction or operation of the North Anna Dam. Construction impacts are beyond the scope
39 of this review. Operational impacts during the license renewal term will be addressed in the
40 SEIS.

Comment: Page 2-12. The Service's main goal is the protection and restoration of ecosystems for people. During a license review, the Service' mitigation goal is to work with the license applicant to avoid, minimize, and compensate (in that order) to the fullest extent possible. The National Environmental Policy Act calls for past, present, and future environmental impacts be identified, as well as summarized to determine cumulative effects of the environmental impacts. The VEPCo report clearly identifies ecosystem impacts, but the Service disagrees with VEPCo's conclusion regarding fish and the ecosystem. The report states, "In pre-impoundment surveys, the fish community of the North Anna River downstream from the Contrary Creek inflow was dominated by pollution-tolerant species. In the years following impoundment (and reclamation of the Contrary Creek mine site), there was a steady increase in measures of abundance and diversity (species richness) of fish. In 1984-85, 38 species from 10 families were found in the North Anna River, compared to 25 species from eight families in the control stream, the South Anna River. When reservoir species from Lake Anna were subtracted from the North Anna River totals, the two fish communities showed striking similarities, indicating that operation of NAPS has had little or no effect on fish populations downstream from the North Anna Dam." "Based on the 1999 Annual Report for Lake Anna and the North Anna River, the North Anna River downstream of the North Anna Dam has no major changes in the ecosystem (Ref. 2.2-10). A review of the data from the 1999 monitoring studies indicate that Lake Anna and the North Anna River continue to contain healthy, well-balanced ecological communities." (NAS-AA-16)

Response: The comment is noted. The comment relates to cumulative impact issues and will be considered in the preparation of the SEIS. Aquatic resources are discussed in Chapters 2 and 4 of the SEIS.

Comment: Page 6-2. The Service believes many of the impacts discussed above will fall under this policy [mitigation]. We do not agree that all impacts of license renewal are small and would not require mitigation. The current operations do include some mitigation activities that would continue during the term of the license renewal, but additional efforts in the areas of fisheries, water quality, and possibly endangered species will protect and enhance the natural resources in Lake Anna and North Anna River. As stated, Dominion performs routine mitigation and monitoring activities associated with environmental permits to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program, continuous emission monitoring, monitoring of aquatic biota that could be affected by NAPS operation, effluent chemistry monitoring, and effluent toxicity testing." As the NRC's statutory requirements state, "The report must contain a consideration of alternatives for reducing adverse impacts...for all Category 2 license renewal issues.... 10 CFR 51.53(c)(3)(iii). The environmental report shall include an analysis that considers and balances...alternatives available for reducing or avoiding adverse environmental effects.... 10 CFR 51.45(c) as incorporated by 10 CFR 51.53(c)(2)." (NAS-AA-17)

Appendix A

Response: The comment is noted. Mitigation will be considered for all Category 2 issues that are applicable. [For Category 1 issues, Table B-1 in Subpart A of Part 51 states that mitigation has been considered in the staff's analysis of these issues, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation. Unless the staff finds new and significant information in relation to these issues, the NRC will adopt the conclusion from Table B-1.] The comment did not provide any new information. However, the NRC plans to discuss this issue further with FWS because it is a cognizant Federal agency.

5. Comments Concerning Terrestrial Resource Issues

Comment: The Company [Dominion] has adopted policies that are compatible with protecting our natural resources. They work to protect all migratory birds with policies and procedures from the U.S. Department of Wildlife. (NAS-C-4)

Response: The comment is noted. Terrestrial resources will be discussed in Chapter 2 of the SEIS. The comment supports North Anna Power Station, Units 1 and 2. The comment provides no new information and, therefore, will not be evaluated further.

6. Comments Concerning Postulated Accident Issues

As stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, design basis accidents is the only Category 1 issue associated with postulated accidents. For severe accidents (i.e., beyond design basis accidents), the staff concluded that the probability-weighted environmental consequences from severe accidents are small for all plants, but that alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives. See 10 CFR 51.53(c)(3)(ii)(L).

Comment: There are earthquake fault lines under the storage pools. What would happen if there were an earthquake and the pools leaked? (NAS-Z-11)

Comment: Any environmental study must include the possibilities of a substantial release of radioactivity due to: 3) earthquake greater than 6.5 on the Richter scale, and its effects, specifically on the storage pools which are on a known earthquake fault line; tornadoes. (NAS-Z-23)

Response: The comments are noted. Severe accidents, including events initiated by earthquakes and tornadoes, were evaluated in the GEIS and the impacts were determined to be small for all plants. A site-specific analysis of Severe Accident Mitigation Alternatives for North Anna will be performed by the NRC staff within this environmental analysis. The

1 comments provide no new information and will not be evaluated further in the context of the
2 environmental review.

3
4 **7. Comments Concerning Category 1 Uranium Fuel Cycle and Waste Management**
5 **Issues**

6
7 As stated in 10 CFR Part 51, Table B-1, Category 1 uranium fuel cycle and waste management
8 issues include:

- 9
10 • Offsite radiological impacts (individual effects from other than the disposal of spent fuel
11 and high-level waste)
12 • Offsite radiological impacts (collective effects)
13 • Offsite radiological impacts (spent fuel and high-level waste)
14 • Nonradiological impacts of the uranium fuel cycle
15 • Low-level waste storage and disposal
16 • Mixed waste storage and disposal
17 • Onsite spent fuel
18 • Nonradiological waste.

19
20 **Comment:** There is the issue of the high level nuclear waste that is generated through the
21 process of irradiating the fuel, and at this point there is no known way to safely dispose of high-
22 level nuclear waste. (NAS-H-5)

23
24 **Comment:** Just (operating) the North Anna Power Plant for the 20 years that's being proposed
25 would result in an additional 400 metric tons of high level waste being added to the mix, the mix
26 being already a mounting stockpile with no solution in sight. (NAS-H-6)

27
28 **Comment:** The issue of high-level waste needs to be looked at as a very severe environmental
29 impact and at this point an unsolvable environmental impact of nuclear power. (NAS-H-15)

30
31 **Comment:** The county has an agreement with Virginia Power limiting how much storage space
32 they can use on the dry cask, which could be a limiting factor in extending the life of the plant.
33 So that's something that needs to be looked at. (NAS-R-3)

34
35 **Comment:** We need to talk about high and low level waste. The high level waste has not been
36 moved, Yucca Mountain, or a storage place hasn't been done. The regional low-level waste
37 compact is bankrupt, and we're sitting -- there are hundreds of tons of low-level waste sitting on
38 the shores of Lake Anna. (NAS-R-9)

Appendix A

1 **Comment:** Further, each operating nuclear reactor generates about 20 metric tons of high-
2 level nuclear waste annually. Relicensing North Anna would add 800 metric tons of waste to
3 the nation's mounting waste stockpile, which already poses health, safety, and environmental
4 concerns. (NAS-T-5)

5
6 **Comment:** That dump [Yucca Mountain in Nevada] would not be able to accommodate the
7 additional volume of waste from relicensed reactors, such as North Anna. (NAS-T-6)

8
9 **Comment:** Dry cask storage has been the answer to the waste problem at the plant. That
10 multiplies our exposure, and a 20-year extension on the license will only extend our possibilities
11 for exposure. So this issue needs to be dealt with. (NAS-U-6)

12
13 **Comment:** I know the NRC cannot make policy on how to deal with radioactive spent fuel, but
14 this is an issue that has been talked about and discussed and waffled back and forth for at least
15 25 years, and we still sit at the same position we did that many years ago with a very limited
16 policy and no long-range plan. (NAS-U-7)

17
18 **Comment:** First and foremost are the issues of high and low level radioactive wastes. It is
19 philosophically impossible to divorce the matters of waste from the operations of the plants or
20 from the consideration of license renewal for extended operation. One cannot logically say that
21 this matter is being taken care of in another venue when it clearly is not; in spite of repeated
22 attempts by the NRC, the Congress, the nuclear industry, the DOE, the DOD, and others over
23 many, many years, there is not, nor will there be in the near future, a permanent repository for
24 the tons of high level wastes that are already stored and continue to be generated annually by
25 this and other nuclear power plants. Because there currently is no approved off-site storage for
26 the high level wastes, and even under the most optimistic forecasts of the NRC and utilities,
27 these wastes will not be completely moved by either the original end date of the license, or even
28 by the new end date (if the renewal is approved), the multiple matters of the storage of these
29 wastes on site must be considered. Further, logic dictates that no renewal should even be
30 considered unless and until the ultimate disposal has been approved and the facility(ies) open
31 and operational. To ignore this fundamental issue in this relicensing matter is a fundamental
32 flaw in the process. (NAS-Z-1)

33
34 **Comment:** One must consider the low level wastes that are stored on site and continue to be
35 generated. The Congressional mandate for the radioactive material generating states to band
36 into regional compacts has been reduced to a shambles in the case of Virginia and the North
37 Anna Power Station. There is no compact, no agreement, no plan. Barnwell has set a cut off
38 date. Hundreds of tons of low-level waste sit next to Lake Anna (mostly in the form of the old
39 discarded generators) without a reasonable expectation of how, where, or when they will be
40 disposed of properly. (NAS-Z-2)

1 **Comment:** The County and VA Power have an agreement concerning the use of dry cask
2 storage. The County may deny further pad construction. If there is no place to put the high
3 level wastes, is it prudent to approve license renewal? How much space would it take to hold
4 all the wastes if there is no permanent repository? Is there space available? Where?
5 (NAS-Z-13)
6

7 **Comment:** With North Carolina dropping out, the Southeastern Compact is dead. Barnwell
8 has put an end date on accepting out of state rad waste. Where will these wastes go? When?
9 When will the generators be cut up and disposed? What would be the effect if a tornado hit the
10 stored generators and threw them into the Lake? Is any low level waste now being disposed of
11 in the local landfill? How much? What are the environmental effects? (NAS-Z-15)
12

13 **Comment:** There has been open discussion, in light of the federal government's failure to
14 provide an environmentally safe permanent repository for the spent fuel, that the title of these
15 high level wastes be given to the DOE and the DOE be responsible for the wastes on site. This
16 matter must be seriously considered. The DOE has an unblemished record of failure in dealing
17 with all matters nuclear. Every facility has serious environmental problems. Granting a license
18 renewal to the utility, with the possibility of the DOE operating on site, is very, very, very risky.
19 (NAS-Z-16)
20

21 **Response:** Onsite storage of spent nuclear fuel is a Category 1 issue. The safety and
22 environmental effects of long-term storage of spent fuel onsite have been evaluated by the
23 NRC and, as set forth in the Waste Confidence Rule (10 CFR 51.23), the NRC generically
24 determined that such storage could be accomplished without significant environmental impact.
25 In the Waste Confidence Rule, the Commission determined that spent fuel can be stored onsite
26 for at least 30 years beyond the licensed operating life, which may include the term of a
27 renewed license. At or before the end of that period, the fuel would be moved to a permanent
28 repository. The "Generic Environmental Impact Statement for License Renewal of Nuclear
29 Plants (GEIS)," NUREG-1437 is based upon the assumption that storage of the spent fuel
30 onsite is not permanent. The plant-specific supplement to the GEIS that will be prepared
31 regarding license renewal for the North Anna Power Station, Units 1 and 2, will be based on the
32 same assumption.
33

34 Likewise, the matter of processing and storage of low-level waste is considered a Category 1
35 issue. The conclusion regarding this issue in the GEIS included consideration of the long-term
36 storage of low level waste on site during the license renewal term. The comments provide no
37 new information and, therefore, will not be evaluated further.
38

39 **Comment:** We have the issue of MOX [mixed oxide fuel]. (NAS-G-5)
40

Appendix A

1 **Comment:** If MOX is used at the plant, the protocol of an accident changes, and we're set with
2 hot spots on the core. (NAS-G-6)

3
4 **Comment:** Virginia Power has not signed out of the MOX agreement. While they've said
5 they're not going to use it, they're in agreement with the DOE, and they haven't signed out of
6 the agreement. They're still in it. (NAS-G-7)

7
8 **Comment:** We talked about MOX, that Virginia Power had flip-flopped on MOX, gone back
9 and forth. It now says they don't want to use it, but a profile needs to be used if they're going to
10 bring in weapons grade plutonium MOX and use it here at the plant. (NAS-R-4)

11
12 **Comment:** VA. Power had been asked at one of the annual meetings if they planned to use
13 MOX fuel at North Anna. W.R. Matthews, then Station Manager and now Senior Vice-
14 President, Nuclear Operations, wrote to the Board of Supervisors and to me, specifically stating
15 that they would not use MOX. Within two years they reversed course and signed with the DOE,
16 Duke and Cogema to participate in the US MOX program at North Anna. Subsequently they
17 announced they were dropping the MOX program for North Anna. In a meeting of the dry cask
18 committee, representatives of VA Power admitted to me and members of the Board of
19 Supervisors that they only dropped the MOX program for public relations reasons in order to
20 satisfy the public and regulators in Connecticut while they were buying Millstone Nuclear Power
21 Plant. They have not ended their contractual agreement with the DOE yet. With a clear
22 message that VA Power is untrustworthy on this specific issue, MOX must be considered in this
23 license renewal. The releases in the event of any accident would be different if MOX were
24 being used; storage issues, in both the pools and the dry casks, are different. The long term
25 effects on the core, including hot spots and extra plutonium in the rods, must be considered.
26 Without going into greater scientific detail (all of which is easily available), MOX considerably
27 alters both operations and potential accidents. (NAS-Z-8)

28
29 **Response:** The comments are noted. At the time the VEPCo application for North Anna
30 license renewal was submitted, the licensee stated that MOX fuel was not going to be
31 considered for North Anna. The licensee's withdrawal from the Department of Energy's
32 Plutonium Disposition Project (the source of the MOX fuel) is documented in a letter to the NRC
33 dated April 24, 2000. To date that position has not changed. However, even if VEPCo were to
34 consider using MOX fuel in the future, any evaluation of the associated application would be an
35 operational issue and not one for license renewal. If the North Anna licenses are renewed and
36 a future application for the use of MOX fuel is received, the staff's review would consider the
37 period of the renewed licenses. The comments provide no new information, and do not pertain
38 to the scope of license renewal as set forth in 10 CFR Part 51 and Part 54 and will not be
39 considered further.
40

1 **8. Comments Concerning Category 2 Socioeconomic Issues**

2
3 As stated in 10 CFR Part 51, Table B-1, Category 2 socioeconomic issues are:

- 4
5
 - 6 • Housing
 - 7 • Public services: public utilities
 - 8 • Public services: education (refurbishment)
 - 9 • Offsite land use (refurbishment)
 - 10 • Offsite land use (license renewal term)
 - 11 • Public services: transportation
 - 12 • Historic and archaeological resources.

13 **Comment:** The biggest contribution that Dominion makes is in regard to our employment and
14 tax base. (NAS-A-5)

15
16 **Comment:** Dominion is, by far, the largest employer in the county, employing over 900 people,
17 and it contributes over \$12 million a year in real property tax. (NAS-A-6)

18
19 **Comment:** North Anna Power Station is a good economic development partner. (NAS-B-1)

20
21 **Comment:** The financial benefits are extremely attractive to the county. (NAS-C-1)

22
23 **Comment:** The combined salaries reach almost \$50 million, which contributes significantly to
24 our local economy. (NAS-C-2)

25
26 **Comment:** They paid last year ten and a half million dollars to the County of Louisa, and since
27 the inception, they have paid \$160 million in taxes to the County of Louisa. (NAS-C-3)

28
29 **Comment:** North Anna desires to be a good corporate citizen, and they've proven to be one.
30 (NAS-C-6)

31
32 **Comment:** This facility has had a tremendous economic benefit to the citizens of Orange
33 County and its other surrounding counties. (NAS-D-2)

34
35 **Comment:** We have 300 of our employees that live in Louisa, and then we have almost
36 900 people who work at the plant, and then during outages, we bring another eight or 900
37 people in from other locations to work for up to a month at North Anna. (NAS-J-16)

38
39 **Comment:** All of the people [North Anna employees] live in the local community; support the
40 local community and the restaurants here. (NAS-J-17)

Appendix A

1 **Comment:** Other site-specific issues that we [North Anna] looked at included socioeconomic
2 impacts. We found positive contribution to the local infrastructure. (NAS-K-10)

3
4 **Comment:** This generation contributes to the economy of Virginia and the counties in which
5 they operate. (NAS-M-6)

6
7 **Comment:** Fourthly, since 1966, Dominion Resources, North Anna Power Company, has paid
8 approximately \$160 million in property taxes to Louisa County. (NAS-M-7)

9
10 **Comment:** So the employees in the town that work at Dominion Power and the money that is
11 made there that comes back through, and they get gas at the gas station, and they run by and
12 get a loaf of bread on their way home. (NAS-N-2)

13
14 **Comment:** Through the availability of the tax base assessed on the North Anna Power Plant,
15 the county has been available and able to provide services, which could only have been
16 accomplished through double and triple taxation on the citizens that are already here without
17 North Anna's help. (NAS-P-6)

18
19 **Comment:** The North Anna Power plant employs more than 825 people of which a large
20 number consists of Louisa County citizens and town citizens, which in turn share their salaries
21 with many of the businesses in the town and county. (NAS-P-7)

22
23 **Comment:** The biggest [way North Anna contributes], of course, is the tax dollars, over
24 \$10 million a year. (NAS-Q-2)

25
26 **Comment:** Dominion Power has 825 employees, I believe. About a third of those are from
27 Louisa County. So a lot of our citizens work there and rely on that. (NAS-Q-4)

28
29 **Comment:** Just recently I had over 830 people at North Anna in addition to the normal
30 workers. Those people all live in Louisa and in Mineral. They spend their money here. They
31 spend time in the restaurants, hotels, food stores, and so forth, and they are part of the
32 community. They may come and go, but they're part of the community for that short period of
33 time. (NAS-W-3)

34
35 **Comment:** We [North Anna] looked at site specific issues including socioeconomic impacts.
36 (NAS-X-11)

37
38 **Comment:** With regard to socioeconomic impacts, we [North Anna] found positive contribution
39 to the local infrastructure. (NAS-X13)

Comment: Over 900 persons are employed at the station, making it one of the largest employers in the area. (NAS-AB-2)

Response: The comments are noted. Socioeconomic issues specific to the plant are Category 2 issues and will be addressed in Chapter 4 of the SEIS. The comments support license renewal at the North Anna Power Station, Units 1 and 2.

Comment: Many of the speakers praised VA Power for its positive economic effects on the community and the taxes paid. What would be the effect if the plant did not get a license renewal? How would the County budget be affected? What would happen to land and house values? On the same course, what would happen if there were an accident at the plant? What would happen to land and house values? How much insurance does VA Power have, and who and what would it cover? (NAS-Z-25)

Response: Socioeconomic factors of license renewal are considered as a Category 2 issue in the GEIS and therefore are looked at site specifically and will be discussed in the plant-specific supplement to the GEIS for North Anna license renewal. No new information was provided by the comment. Therefore it will not be evaluated further.

Comment: Other site-specific issues that we [North Anna] looked at included impacts on cultural resources. Because there will be no new construction activity, continued operation of the station means that the cultural resources impacts are also negligible. (NAS-K-12)

Comment: Other site-specific issues that we [North Anna] looked at included impacts on cultural resources. Because there will be no new construction activity, continued operation of the station means that the cultural resources impacts are also negligible. (NAS-X-12)

Response: The comments are noted. Historic and archaeological resources are considered a Category 2 issue and will be discussed in Chapters 2 and 4 of the SEIS. The comment provides no new information and, therefore, will not be evaluated further.

9. Comments Concerning Category 2 Aquatic Ecology Issues

As stated in 10 CFR Part 51, Table B-1, Category 2 aquatic ecology and threatened and endangered species issues are:

- Entrainment of fish and shellfish in early life stages
- Impingement of fish and shellfish
- Heat shock.

Appendix A

Comment: Page 4-6. The Service is concerned with impacts from entrainment of fish and shellfish in early life stages that occur at most power plants. In light of fish passage measures that may be prescribed to mitigate these impacts, this issue should be evaluated for the current and post restoration fish community. The report states, "Section 316(b) of the CWA requires that any standard established pursuant to Sections 301 or 306 of the CWA shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment through the condenser cooling system of fish and shellfish in the early life stages is one of the adverse environmental impacts that the best technology available minimizes. Virginia State Water Control Board regulations provide that compliance with a Virginia Pollutant Discharge Elimination System (VPDES) permit constitutes compliance with Sections 301 and 306 of the CWA (Ref. 4.2-1). In response to Board requirements, Dominion submitted a CWA Section 316(b) demonstration for NAPS in May 1985 (Ref. 4.2-2). Based on this and other input, the Board issued the NAPS VPDES Permit (Appendix B). Issuance of the NAPS VPDES permit indicates the Board's conclusion that NAPS, is operating in conformance with the permit, would be in compliance with the CWA requirements (Commonwealth of Virginia 2001). Dominion concludes that the Commonwealth regulation and the NAPS VPDES permit constitute the NAPS CWA 316(b) determination. Dominion also concludes that any environmental impact from entrainment of fish and shellfish in early life stages is small and does not require further mitigation." (NAS-AA-7)

Comment: Page 4-8. The Service agrees with the NRC that concludes that impingement of fish and shellfish is a significant issue. "NRC made impacts on fish and shellfish resources resulting from impingement a Category 2 issue because it could not assign a single significance level to the issue." The Service believes the impacts will likely require mitigation. The report states, "Impingement impacts are small at many plants, but might be moderate or large at other plants (Ref. 4.0-1, Chapter 4.2.2.1.3). Information to be ascertained includes: (1) type of cooling system (whether once-through or cooling pond), and (2) current CWA 316(b) determination or equivalent state documentation. As Chapter 3.1.2 describes, NAPS has a once-through heat dissipation system. Chapter 4.2 discusses the CWA 316(b) demonstration for NAPS, indicating compliance with the use of best available technology. Chapter 2.5 also states that no federally- or state listed fish species have been collected in any monitoring studies, nor has any listed species been observed in creel surveys conducted by Dominion biologists and affiliated researchers. Based on the results of the CWA 316(b) Demonstration, Dominion concludes that this environmental impact is small. (NAS-AA-8).

Comment: Page 2-6. The Service is concerned with water quality and aquatic habitat impacts from thermal discharges, the canal systems, and the Waste Heat Treatment Facilities (Issues # 5, 18, & 44). The report described the conditions as, "Since its creation, Lake Anna has developed into a reservoir with three distinct ecological zones: Upper Lake, Mid-Lake, and

1 Lower Lake. The Upper Lake is essentially riverine, shallow (average depth of 13 feet), and
2 shows some evidence of stratification in summer. The Mid-Lake is deeper and stratifies in
3 summer. It receives waters from Contrary Creek that, because of years of mining in its
4 floodplain, are sometimes low in pH and high in metals. As noted earlier in this chapter,
5 creation of Lake Anna has reduced the impacts of acid mine drainage on the North Anna River.
6 The Lower Lake is deeper (average depth of 36 feet), clearer (with more light penetration), and
7 shows pronounced annual patterns of winter mixing and summer stratification. The epilimnion
8 (warm layer above the thermocline) was generally eight feet deep during pre-operational years,
9 and 26 to 33 feet deep during operational years. The increase in depth of the epilimnion
10 appears to be related to the heated discharge entering the reservoir from dike 3 (see Figure 3-
11 2) and the withdrawal of cooler, deeper water at the NAPS intake (Ref. 2.2-3)." (NAS-AA-9)

12
13 **Comment:** Page 2-7. The VEPCo report continues to describe adverse thermal effect on
14 aquatic organisms, "Results of Lake Anna temperature monitoring indicate that the shallower
15 Upper Lake warms earlier in spring and reaches maximum temperature in summer sooner than
16 the Lower Lake. The Lower Lake, with its greater depth and volume, warms more slowly in
17 spring and retains its heat later in the year. It is estimated that the heat contributed by NAPS
18 corresponds to about 10 percent of the solar heat that enters the reservoir on summer days
19 (Ref. 2.2-3)". (NAS-AA-10)

20
21 **Comment:** Page 2-7. The Service would like to review the water temperature ranges from the
22 report "Dominion's Environmental Policy & Compliance-Environmental Biology group submits
23 annual reports to the Virginia Department of Environmental Quality on water temperatures and
24 fisheries monitoring in Lake Anna and the Lower North Anna River." Specifically, the water
25 temperature data from the month of August, 1983, when the mean water temperature was
26 greater than 88°F. (NAS-AA-11)

27
28 **Comment:** Page 4-9. As the NRC states, the Service believes heat shock impacts are
29 important and need to be mitigated to the fullest extent possible. The report states, "NRC made
30 impacts on fish and shellfish resources resulting from heat shock a Category 2 issue, because
31 of continuing concerns about thermal discharge effects and the possible need to modify thermal
32 discharges in the future in response to changing environmental conditions (Ref. 4.0-1,
33 Chapter 4.2.2.1.4). Information to be ascertained includes: (1) type of cooling system (whether
34 once-through or cooling pond), and (2) evidence of a CWA Section 316(a) variance or
35 equivalent state documentation. As Chapter 3.1.2 describes, NAPS has a once-through heat
36 dissipation system. As discussed below, Dominion has a Section 316(a) variance for NAPS
37 discharges. Section 316(a) of the CWA establishes a process whereby a thermal effluent
38 discharger can demonstrate that thermal discharge limitations are more stringent than
39 necessary and, using a variance, obtain alternative facility-specific thermal discharge limits (33
40 USC 1326). Dominion submitted a CWA Section 316(a) Demonstration for NAPS to the

Appendix A

1 Virginia State Water Control Board on June 24, 1986 (Ref. 4.4-1). The Fact Sheet (Item 22)
2 accompanying the current NAPS VPDES permit (Appendix B) refers to this submittal, indicating
3 that effluent limitations more stringent than the thermal limitations included in the permit are not
4 necessary to assure the protection and propagation of a balanced indigenous community of
5 shellfish, fish, and wildlife in Lake Anna and in the North Anna River downstream of the Lake.
6 Based on the results of the CWA Section 316(a) Demonstration and the NAPS VPDES permit,
7 Dominion concludes that this environmental impact is small and does not warrant further
8 mitigation." (NAS-AA-12)

9
10 **Comment:** We [North Anna] also designed and constructed a series of three cooling lagoons
11 totaling 3,400 surface acres, designated as the waste heat treatment facility. (NAS-K-2)

12
13 **Comment:** We [North Anna] conducted a study that looked at the impacts of this waste heat
14 on the biota of Lake Anna. Using past information, coupled with new information, we found no
15 long-term deleterious effects, and the Virginia State Water Control Board, which is now the
16 Department of Environmental Quality, agreed with our findings. (NAS-K-7)

17
18 **Comment:** We [North Anna] studied water withdrawal issues, and again, we demonstrated no
19 long-term deleterious effects on the lake, and the Water Board again concurred with our
20 findings. (NAS-K-8)

21
22 **Comment:** In the mid-'80s, we conducted a study that looked at the impacts of this waste heat
23 on the biota of Lake Anna. Using past information coupled with new information, we found no
24 long-term deleterious effects, and the Virginia State Water Control Board, which is now called
25 the Department of Environmental Quality, agreed with our findings. (NAS-X-8)

26
27 **Comment:** We [North Anna] looked at water withdrawal, which is the water that I mentioned
28 earlier that is used for cooling, we did a study of the water withdrawal, and again, we
29 demonstrated no long-term deleterious effects on the lake, and the Water Board, now DEQ,
30 again, concurred with our findings. (NAS-X-9)

31
32 **Response:** The comments are noted and relate to aquatic Category 2 issues. Aquatic ecology
33 will be discussed in Chapter 2 and environmental impacts of operation will be discussed in
34 Chapter 4 of the SEIS. The comments provide no new information and, therefore, will not be
35 evaluated further. The NRC will provide the information that FWS requested.
36

10. Comments Concerning Category 2 Threatened and Endangered Species Issues

As stated in 10 CFR Part 51, Table B-1, Category 2 threatened or endangered species issues are:

- Threatened or endangered species

Comment: Page 2-16. The Service commends VEPCo for their description of Federal and State threatened and endangered species, and the company's efforts to initiate informal consultation on these issues. The report describes the conditions as, "Animal and plant species that are federally- or state-listed as endangered or threatened and that occur or could occur (based on habitat and known geographic range) in the vicinity of NAPS or along associated transmission lines are listed in Table 2-1. Bald eagles (*Haliaeetus leucocephalus*), state and federally classified as threatened, are occasionally observed along Lake Anna. The bald eagle forages along coasts, rivers, and large lakes. Dominion is not aware of any eagle nests at NAPS or along the transmission lines. Loggerhead shrikes (*Lanius ludovicianus*), state-classified as threatened, have been observed in the vicinity of NAPS. Loggerhead shrikes inhabit agricultural lands and other open areas. With the exception of the bald eagle and loggerhead shrike (*Lanius ludovicianus*), terrestrial species that are federally- and/or state-listed as endangered or threatened are not known to exist at NAPS or along the transmission lines. As of February 2000, there were no candidate federally threatened or endangered species that Dominion believes might occur at NAPS or along the transmission lines (Ref. 2.5-1)." (NAS-AA-13)

Comment: Page 2-17. The report states errors and gaps in the data regarding some fish and mussel species that need clarification. The report states, "No federally-listed fish species' range includes the North Anna River and Lake Anna. One state-listed species, the emerald shiner (*Notropis atherinoides*), appears on a Final Environmental Statement list of fish collected in the North Anna River prior to its impoundment (Ref. 2.2-1, Appendix 2.14). However, according to several authoritative sources (Refs. 2.5-3, pp. 397-401, and 2.5-4, pp. 321-409), this species is known only from the Clinch and Powell Rivers in the extreme western part of the state. It appears that the fish was misidentified. The emerald shiner is often confused with the closely related comely shiner (*Notropis amoenus*), which occurs throughout the York River drainage and has been documented from Lake Anna and the North Anna River (Ref. 2.5-3). The comely shiner was not listed in the Final Environmental Statement, but has been collected regularly by Dominion biologists in post-operational monitoring of the lower North Anna River (Ref. 2.2-8, Tables 4.2.2 and 4.2.3). The emerald shiner has not been collected in any of the post-operational surveys or monitoring studies. Based on the Virginia Department of Game & Inland Fisheries' Fish and Wildlife Information Service database, as many as two state- and federally-listed freshwater mussel species could occur in streams in the vicinity of NAPS, or in

Appendix A

streams crossed by NAPS transmission corridors (Table 2-1). It should be emphasized that neither of these species has actually been observed as occurring in streams in the vicinity of NAPS or in streams crossed by its transmission corridors." (NAS-AA-14)

Comment: Page 2-18. "None of these mussel species was collected in pre-impoundment surveys of the North Anna River, and none has been collected in more recent years by Dominion biologists conducting routine monitoring surveys. Three bivalve species were collected in the North Anna basin prior to impoundment: *Elliptio complanatus*, *Elliptio productus*, and *Sphaerium striatum* (Ref. 2.2-1, Appendix 2.13). None of these is a special-status species. In more recent years, the introduced Asiatic clam (*Corbicula fluminea*) has dominated collections from both Lake Anna and the lower North Anna River. Small numbers of Unionids (*Elliptio* sp.) and fingernail clams (*Sphaeriidae*) have also been collected. Acid drainage and sediment from the Contrary Creek mine site (see Chapter 2.2 discussion) historically depressed mussel populations downstream from the Contrary Creek-North Anna River confluence but, in the 1980s, there were indications that mussel populations (*Elliptio* sp.) were recovering in the lower North Anna River (Ref. 2.2-3, Chapter 6.2)." (NAS-AA-15)

Response: The staff acknowledges the comments. The appropriate descriptive information regarding the plant-specific ecology and threatened or endangered species of the site will be addressed in Chapters 2 and 4 of the SEIS.

Comment: The evaluation of threatened and endangered species was a little different in that we [North Anna] had to go to state and Federal agencies to investigate possible impacts on listed species. The research showed no impact to any threatened or endangered species as a result of the operation of North Anna Power Station and its associated transmission lines. (NAS-K-9)

Comment: The evaluation of threatened and endangered species was a little different in that we had to go to state and Federal agencies to investigate possible impacts on listed species. The research showed no impact to any threatened or endangered species as a result of the operation of North Anna and its associated transmission lines. (NAS-X-10)

Response: The comments are noted. The comments acknowledge the importance of the manner in which North Anna Power Station operates the site to the benefit of threatened and endangered species. The appropriate descriptive information regarding the plant-specific ecology of the site will be addressed in Chapter 2 of the SEIS.

Part II - Comments Received on the Draft SEIS

(Reserved for comments received on the draft SEIS.)

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations and Pacific Northwest National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Argonne National Laboratory.

Name	Affiliation	Function or Expertise
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John Tappert	Nuclear Reactor Regulation	Section Chief
Barry Zaloman	Nuclear Reactor Regulation	Technical Monitor
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Michael Masnik	Nuclear Reactor Regulation	Project Management
James Wilson	Nuclear Reactor Regulation	Project Management
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Duke Wheeler	Nuclear Reactor Regulation	Project Management
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Eva Eckert Hickey		Decommissioning
Mary Ann Parkhurst		Radiation Protection
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John Jaksch		Socioeconomics, Alternatives
Paul Nickens		Cultural Resources
Lance Vail		Water Use, Hydrology
Rosalind Schrempf		Technical Editor
Jean Cheyney		Word Processor
(a) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.		

Appendix B

1	Name	Affiliation	Function or Expertise
		LAWRENCE LIVERMORE NATIONAL LABORATORY^(b)	
2	Tina Carlsen		Aquatic Ecology
3		LOS ALAMOS NATIONAL LABORATORY^(c)	
4	Ted Doerr		Terrestrial Ecology
5		ARGONNE NATIONAL LABORATORY^(d)	
6	Bill Metz		Land Use
7		Energy Research Incorporated	
8	Mohsen Khatib-Rahbar		Severe Accident Mitigation Alternatives
9	Michael Zavisca		Severe Accident Mitigation Alternatives
10		Information Systems Laboratory	
11	Kim Green		Severe Accident Mitigation Alternatives
12	Jim Meyer		Severe Accident Mitigation Alternatives
13	(b) Lawrence Livermore National Laboratory is operated for the U.S. Department of Energy by the University of California.		
14	(c) Los Alamos National Laboratory is operated for the U.S. Department of Energy by the University of California.		
15	(d) Argonne National Laboratory is operated for the U.S. Department of Energy by the University of Chicago.		
16			
17			
18			

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Virginia Electric and Power Company's Application for License Renewal of North Anna Power Station, Units 1 and 2

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Virginia Electric and Power Company's Application for License Renewal of North Anna Power Station, Units 1 and 2

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Virginia Electric and Power Company (VEPCo) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of VEPCo's application for renewal of the North Anna Power Station, Units 1 and 2, operating licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: <http://www.nrc.gov/reading-rm.html>. From this site, the public can gain access to the NRC's Agencywide Document Access and Management Systems (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records (PARS) component of ADAMS. The ADAMS accession numbers for each document are included below.

May 29, 2001	Letter from NRC to Mr. Walter Newsome, Alderman Library, University of Virginia at Charlottesville, concerning the maintenance of reference material for the North Anna license renewal application (Accession No. ML011500106)
May 29, 2001	Letter from Mr. David A. Christian, Virginia Electric Power Company (VEPCo) to the NRC, submitting the application for the renewal of the operating licenses for the Surry and North Anna Power Stations, Units 1 and 2 (Accession No. ML011500502)
August 6, 2001	Letter from NRC to Ms. JoAnn Tetrault, Director, Louisa County Public Library, concerning the maintenance of reference material for the North Anna license renewal application (Accession No. ML012180137)
August 28, 2001	Letter from NRC to Mr. David A. Christian, VEPCo, forwarding the Notice of Intent to prepare an environmental impact statement and conduct scoping process for license renewal for North Anna Power Station, Units 1 and 2 (Accession No. ML012220583)

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- September 26, 2001 Notice of October 18, 2001, public meeting to discuss environmental scoping process for the North Anna Power Station, Units 1 and 2, license renewal application (Accession No. ML012690346)
- September 27, 2001 Letter from NRC to Ms. Reeva Tilley, Chairman, Virginia Council on Indians, inviting scoping comments (Accession No. ML012710136)
- October 12, 2001 Scoping comment letter from Hon. R. Edward Houck, Senate of Virginia (Accession No. ML012920545)
- October 17, 2001 NRC letter to Mr. David A. Christian, VEPCo, "Request for Additional Information Related to the Staff's Review of Severe Accident Mitigation Alternatives for the Surry and North Anna Power Stations, Units 1 and 2" (Accession No. ML012910292)
- October 25, 2001 Email from Mr. Jerry Rosenthal providing scoping comments on North Anna Power Station license renewal (Accession No. ML013460243)
- October 26, 2001 Letter to NRC from John P. Wolflin, U.S. Fish and Wildlife Service, providing scoping comments on North Anna Power Station license renewal (Accession No. ML013460246)
- November 1, 2001 Letter from Hon. Eric Cantor, U.S. Congress, providing scoping comments on North Anna Power Station license renewal (Accession No. ML013650011)
- November 6, 2001 Summary of October 18, 2001, public scoping meetings for the North Anna Power Station, Units 1 and 2, license renewal application (Accession No. ML013120266)
- December 10, 2001 Letter from Mr. David A. Christian, VEPCo, to NRC, responding to the October 17, 2001, Request for Additional Information Related to the Staff's Review of Severe Accident Mitigation Alternatives for the Surry and North Anna Power Stations, Units 1 and 2 (Accession No. ML013520484)
- December 26, 2001 Memo to file, socioeconomic and aquatic information provided by VEPCo (Accession No. ML013610514)

January 2, 2002	NRC letter to Mr. David A. Christian, VEPCo, "Issuance of Environmental Scoping Summary Report Associated with the Staff's Review of the Application by Dominion for Renewal of the Operating Licences for North Anna Power Station, Units 1 and 2" (Accession No. ML020160608)
January 3, 2002	NRC letter to Ms. Cara H. Metz, Virginia Department of Historic Resources, concerning the potential for license renewal at the Surry and North Anna Power Stations to affect historic resources (Accession No. ML020070569)
January 17, 2002	NRC note to file, information provided by VEPCo during the NRC site audits in relation to the license renewal applications for the Surry and North Anna Power Stations, Units 1 and 2 (Accession No. ML020180119)
January 23, 2002	NRC note to file, information provided by VEPCo in relation to severe accident mitigation alternatives in its license renewal application for the Surry Power Station, Units 1 and 2 (Accession No. ML020250545)
January 24, 2002	NRC letter to Ms. Karen Mayne of the U.S. Fish and Wildlife Service requesting a list of protected species within the area under evaluation for the Surry and North Anna Power Stations license renewal (Accession No. ML020250611)
February 1, 2002	NRC note to file, information provided by VEPCo in relation to severe accident mitigation alternatives in its license renewal application for the Surry Power Station, Units 1 and 2 (Accession No. ML020430372)
March 14, 2002	NRC letter to Mr. John P. Wolflin, U.S. Fish and Wildlife Service, responding to scoping comments regarding license renewal for the Surry and North Anna Power Stations (Accession Nos. ML020740498 and ML020230063)

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State, regional, and local agencies were contacted:

U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, Maryland

U.S. Fish and Wildlife Service, Virginia Field Office, Gloucester, Virginia

Virginia Department of Agriculture and Consumer Services (Plant Protection), Richmond, Virginia

Virginia Department of Conservation and Recreation, Richmond, Virginia

Virginia Department of Conservation and Recreation (Division Of Natural Heritage), Richmond, Virginia

Virginia Department of Environmental Quality, Richmond, Virginia

Virginia Department of Game and Inland Fisheries. Richmond, Virginia.

Virginia Department of Historic Resources, Richmond, Virginia

Assessor, Commissioner of Revenue, Louisa County, Virginia

Commissioner of Revenue, Louisa County, Virginia

County Administrator, Louisa County, Virginia

Department of Social Services, Louisa County, Virginia

Director of Finance, Louisa County, Virginia

Economic Development, Louisa County, Virginia

Farm Service Agency, Louisa County, Virginia

Louisa County, Director of Planning and Community Development, Louisa, Virginia

Town of Mineral, Town Manager, Mineral, Virginia

Chamber of Commerce, Louisa, Virginia

Appendix D

1 Lake Anna Advisory Committee, Lake Anna, Virginia

2
3 Louisa County Historical Society, Louisa, Virginia

4
5 Treasurer's Office, Orange County, Virginia

6
7 Administrative Assistant for School Admissions, Spotsylvania Public Schools, Virginia,

8
9 Budget Manager, Spotsylvania County, Virginia

10
11 Lake Anna State Park, Spotsylvania, Virginia

12
13 Lloyd Real Estate, Louisa, Virginia

14
15 VEPCo, Reservoir Coordinator, Nuclear Site Services, North Anna Power Station, Virginia

16
17 Dominion Resource Services, Environmental Lead, License Renewal, Glenn Allen, Virginia

18
19 Duke Oil Company, Mineral, Virginia

Appendix E

Virginia Electric and Power Company's Compliance Status and Consultation Correspondence

Appendix E

Virginia Electric and Power Company's Compliance Status and Consultation Correspondence

1 The list of licenses, permits, consultations, and other approvals obtained from Federal, State,
2 regional, and local authorities for North Anna Power Station, Units 1 and 2, are shown in
3 Table E-1.

4
5 Following Table E-1 are reproductions of correspondence prepared and sent during the evalua-
6 tion process of the application for renewal of the operating licenses for North Anna Power
7 Station, Units 1 and 2.

Table E-1. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for North Anna Power Station, Units 1 and 2

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	10 CFR Part 50	Operating license, North Anna Unit 1	NPF-4	04/01/78	04/01/18	Authorizes operation of Unit 1
NRC	10 CFR Part 50	Operating license, North Anna Unit 2	NPF-7	08/21/80	08/21/20	Authorizes operation of Unit 2
FWS	Migratory Bird Treaty Act (16 USC 703-712)	Permit	MB705136-0	01/01/01	12/31/01	The permit authorizes removal of up to 15 osprey nests causing safety hazards.
FWS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation	NA	Letter from NRC to FWS 01/24/02	NA	Requires a Federal agency to consult with FWS regarding whether a proposed action will affect endangered or threatened species. FWS determined that the renewal of the North Anna OLS may affect the bald eagle.
DOT Research and Special Programs Administration	49 CFR Part 107, Subpart G	Registration	053000020241	06/05/00	06/30/02	Registration covers hazardous materials shipments
VDHR	Section 106 of the National Historic Preservation Act (16 USC 470f)	Consultation	NA	Letter from NRC to VDHR 01/03/02	NA	The National Historic Preservation Act requires Federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.
VDEQ	Section 307(c)(3)(A) of the Coastal Zone Management Act [16 USC 1456(c)(3)(A)]	Consistency determination with the Virginia Coastal Management Program	NA	02/21/02	NA	Certification that North Anna complies with the Virginia Coastal Program
VDH	12 VAC 5-590-190	Permit	2109610	06/17/91; Revised 05/04/98	None	Permit authorizes operation of potable water potable water supply system

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Table E-1. (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
VDEQ	Federal Clean Water Act, Section 402 (33 USC 1342); 9 VAC 25-31-50	National pollutant discharge elimination system (NPDES) permit	VA0052451	01/11/01	01/11/06	The NPDES permit covers plant and stormwater discharges
VDEQ	Federal Clean Water Act, Section 401 (33 USC 1341)	NPDES permit	VA0052451	01/11/01	01/11/06	Issuance of a NPDES permit constitutes Section 401 certification by the Commonwealth
VDEQ	Federal Clean Air Act, Title V (42 USC 7661, et seq.); 9 VAC 5-80-10	Air operating permit	None	01/06/99	None	General air emission source operation
VDEQ	9 VAC 5-20-160	Registration	40726	NA	Annual recertification	Annual recertification of air emission sources
VDEQ	9 VAC 5-80-10	Permit	None	10/20/93	None	New source review permit covering installation of the emergency blackout generator
VDEQ	9-VAC 5, Chapter 500	Exclusionary general permit	None	6/18/98	None	Covers operating emissions from auxiliary boilers, emergency diesel generators, and station blackout generator

CFR = Code of Federal Regulations
 COV = Code of Virginia
 DOT = U.S. Department of Transportation
 EPA = U.S. Environmental Protection Agency
 FWS = U.S. Fish and Wildlife Service
 NRC = U.S. Nuclear Regulatory Commission
 USC = United States Code
 VAC = Virginia Administrative Code
 VDEQ = Virginia Department of Environmental Quality
 VDH = Virginia Department of Health
 VDHR = Virginia Division of Historic Resources
 VMRC = Virginia Marine Resources Commission

Appendix E

January 3, 2002

Ms. Cara H. Metz, Director
Division of Resource Services and Review
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

Dear Ms. Metz:

This letter responds to issues raised in your letter dated February 13, 2001, to Mr. William Corbin of Virginia Electric and Power Company (VEPCo), regarding the license renewal Environmental Reports for the Surry and North Anna Power Stations. Our response has benefitted from productive discussions between representatives of my staff and Dr. Ethel Eaton of your staff, including a meeting held at the Virginia Department of Historic Resources on September 21, 2001, for Surry.

In response to your original letter, VEPCo authorized cultural resource assessments of the Surry and North Anna sites. These assessments were conducted by the Louis Berger Group, Inc., and the completed reports were delivered to VEPCo in March 2001, with an addendum to the North Anna report delivered in October 2001. A copy of the Surry report was provided to the U.S. Nuclear Regulatory Commission (NRC) during our recent visit to the site in September 2001. Also during this September visit, Dr. Eaton and our consulting archaeologist, Dr. W. Bruce Masse of Los Alamos National Laboratory, had the opportunity to tour the grounds of the Surry Power Plant. Dr. Masse later reviewed the assessment report and pertinent archival records on file at the Virginia Department of Historic Resources. We received a copy of the North Anna report and its addendum following our visit to that site in October 2001.

The NRC is acutely aware of the richness of the history in and around Gravel Neck Peninsula, and the lower James River in general. We are also aware of the potential for significant intact historic and archaeological resources to be present in the undeveloped portions of the Surry and North Anna Power Stations. We have discussed this topic at considerable length with the station managers and with other appropriate representatives from VEPCo, and are confident they share our concern for these cultural resources. Station procedures provide for the protection of cultural resources during future site activities.

Dr. Eaton, our reviewers, and the cultural resources assessment reports are in agreement that there is little likelihood that intact cultural resources exist in the presently developed portions of the Surry and North Anna Power Stations.

Because there are current operating procedures that take into account the inadvertent discovery of historic and archaeological remains at both stations, and because the license renewal is not expected to result in major refurbishment nor the need to expand operations into the currently undeveloped portions of the stations, we believe that license renewal is unlikely to

C. Metz

- 2 -

affect cultural resources. We therefore also consider it unnecessary at this time to enter into a programmatic agreement pursuant to the license renewal. However, should conditions specific to either of the stations change, or should the NRC license renewal process change in general, we would be prepared to reconsider this decision.

Please let us know if you have any other questions or concerns about the license renewal process. We will send you copies of the completed draft Supplemental Environmental Impact Statements for both the Surry and North Anna Power Stations as soon as they become available for review. Also, if you do not yet have a copy of the Berger Group cultural resource assessment reports for the two stations and wish to obtain copies for your files, we would be happy to provide you with copies.

Sincerely,
Original Signed By: CIGrimes
 Christopher I. Grimes, Program Director
 License Renewal and Environmental Impacts
 Division of Regulatory Improvement Programs
 Office of Nuclear Reactor Regulation

Docket Nos. 50-280, 50-281, 50-338, and 50-339

Enclosure: As stated

cc w/end: see next page

DISTRIBUTION

Environmental r/f
 DMatthews/FGillespie
 JTappert
 AKugler
 RPrato
 CGrimes
 OGC
 EHickey (PNNL)

Accession no.: ML020070569

*See previous concurrence

Document Name: G:\Rgeb\North Anna-Surry\Common Items\Historic Preservation\NRC ltr to VDHR.wpd

OFFICE	PM:RGEB	SC:RGEB	C:RGEB	PD:RLEP	OGC (NLO)
NAME	AKugler*	BZalcman*	CCarpenter*	CGrimes*	RWeisman*
DATE	12/13/01	12/13/01	12/14/01	01/04/02	01/03/02

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Appendix E

January 24, 2002

Ms. Karen Mayne, Supervisor
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER
EVALUATION FOR THE SURRY AND NORTH ANNA POWER STATIONS
LICENSE RENEWAL

Dear Ms. Mayne:

The Nuclear Regulatory Commission (NRC) is evaluating an application submitted by Virginia Electric and Power Company for the renewal of the operating licenses for its Surry and North Anna Power Stations, Units 1 and 2. The NRC is preparing station-specific supplements to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NUREG-1437) for this proposed license renewal, for which we are required to evaluate potential impacts to threatened and endangered species.

The proposed action would include use and continued maintenance of existing facilities and transmission lines and would not result in new construction or disturbance. The Surry Power Station is located on the James River in Surry County, Virginia. The transmission line corridors for this station pass through portions of Surry, Isle of Wight, Prince George, and Charles City counties, and the corporate limits of the cities of Suffolk, Chesapeake, Newport News, and Hopewell, Virginia. In total, the corridors include about 5000 acres (170 miles in length).

The North Anna Power Station is located on the south side of Lake Anna in Louisa County, Virginia. The transmission line corridors for this station pass through portions of Louisa, Hanover, Goochland, Powhatan, Henrico, Chesterfield, Spotsylvania, Caroline, Orange, Culpeper, and Fauquier counties, Virginia. In total, the corridors include about 2900 acres (120 miles in length). In addition, Lake Anna, which is fed by the North Anna River and impounded by the North Anna Dam, is used as part of the cooling system for North Anna Power Station. Therefore, the lake and the Lower North Anna River are considered part of the aquatic environment of interest.

To support the environmental impact statement preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on threatened, endangered, proposed, and candidate species and critical habitat that may be in the vicinity of the Surry and North Anna Power Stations and their associated transmission lines. We have enclosed figures showing the location of the stations and their associated transmission lines.

Also, we would like confirmation that the Chesapeake Bay Field Office will serve as the U.S. Fish and Wildlife Service's point of contact for Endangered Species Act compliance, including any Section 7 consultation that may be needed, for the Surry and North Anna Power Stations.

K. Mayne

- 2 -

If you have any comments or questions, please contact Andrew J. Kugler, Senior Project Manager, at (301) 415-2828.

Sincerely,
CI Grimes
 Christopher I. Grimes, Program Director
 License Renewal and Environmental Impacts
 Division of Regulatory Improvement Programs
 Office of Nuclear Reactor Regulation

Docket Nos. 50-280, 50-281, 50-338 and 50-339

Enclosure: As stated

cc: John P. Wolflin, Supervisor
 Chesapeake Bay Field Office
 U.S. Fish and Wildlife Service
 177 Admiral Cochrane Drive
 Annapolis, Maryland 21401

cc: See next page

Accession nos.:

1. Cover letter: ML020250603
2. Enclosure: Figures Depicting the Location of the
 Surry and North Anna Power Stations and Their
 Associated Transmission Lines - ML020100388
3. Package: ML020250611

DISTRIBUTION:

DMatthews/FGillespie	GE Edison
CGrimes	SMonarque
JTappert	RPrato
AKugler	Environmental R/F
EHickey (PNNL)	

*See previous concurrence

DOCUMENT NAME: G:\RGEB\North Anna-Surry\Surry\Consult\Ltr to FWS-E&T spec.wpd

OFFICE	PM:RLEP	SC:RLEP	RLEP:DRIP
NAME	AKugler*	JTappert*	CGrimes*
DATE	01/22/02	01/22/02	01/24/02

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FEB-27-2002 12:29

NRC/NRR/DSSA/SPLB

P.07/11



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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February 21, 2002

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RE: North Anna Power Station License Renewal: Application by Dominion Virginia Power Company to U.S. Nuclear Regulatory Commission for Renewed Operating License
Federal Consistency Certification under the Coastal Zone Management Act
DEQ-01-187F

Dear Dr. White:

This letter responds to your September 27, 2001 letter (and subsequent information received on October 30, 2001) requesting the Department of Environmental Quality's concurrence with the federal consistency certification for renewal of the Dominion Virginia Power Company's operating license for the North Anna Power station. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal consistency certifications and responding to applicants for federal approval on behalf of the Commonwealth. The following agencies took part in this review:

Department of Environmental Quality
Department of Conservation
Department of Health
Marine Resources Commission
Chesapeake Bay Local Assistance Department

In addition, the Department of Game and Inland Fisheries, the Thomas Jefferson Planning District Commission, and Louisa County were invited to comment.

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Project Description

Dominion Virginia Power submitted information for this review in the form of two documents. One, submitted with the initial letter, is called "Appendix E, Environmental Report" (cited hereinafter as "Appendix E"). The other is entitled "Federal Consistency Certification for North Anna Power Station License Renewal" and is dated October 26, 2001 (cited hereinafter as "Certification").

Dominion Virginia Power owns and operates the North Anna Power Station, a nuclear electric generating station located on the southern shore of Lake Anna in Louisa County. As the Certification and the Environmental Report, Appendix E indicate, Louisa County is not included in Virginia's designated coastal management area. However, the proximity of the North Anna Power Station to Spotsylvania County, across the lake, and the presence of power lines in Spotsylvania and other counties within the coastal management area warrant consistency review because these facilities and their operation may have reasonably foreseeable effects upon coastal uses or resources (Certification, page 1; Appendix E, page E-2). See 15 CFR Part 930, subpart D, sections 930.50 and 930.54. The plant consists of two nuclear reactors and associated steam turbines that generate approximately 1,800 megawatts of electricity. The Unit 1 license is to expire on April 1, 2018, while the Unit 2 license will expire on August 21, 2020. Both licenses have terms of 20 years, and are to be renewed for new 20-year terms. (Appendix E, page E-3). The Company expects North Anna Power Station operations during the new license term to be a continuation of present operations (Appendix E, page E-2).

Federal Consistency Analysis

The Virginia Coastal Resources Management Program (VCP) is comprised of a network of programs administered by several agencies. In order to be consistent with the VCP, the applicant for federal licensing must obtain all the applicable permits and approvals listed under the Enforceable Programs of the VCP prior to commencing the project. Based on the commitments provided in the Consistency Certification that Dominion Virginia Power will obtain and comply with all approvals from agencies administering the applicable Enforceable Programs (Certification, page 1; Appendix E, page E-2) and the comments submitted by agencies administering the Enforceable Programs, the Department of Environmental Quality concurs with the finding that the license renewal and continued operation of the North Anna Power Station is consistent with Virginia's Coastal Resources Management Program.

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This discussion analyzes the continued operation of the project under the license renewal in light of the Enforceable Programs of the Virginia Coastal Management Program.

1. Subaqueous Lands Management. According to the Certification, the applicant has no plans for any activity under the license renewal that would require a permit from the Commission (page 12, Table 2, item b). The Marine Resources Commission indicates that there are no activities, present or prospective, at the North Anna Power Station that would require a Marine Resources Commission permit.

2. Coastal Lands Management. According to the Chesapeake Bay Local Assistance Department, the proposed license renewal is not subject to any requirements under the Chesapeake Bay Preservation Act because Louisa County is outside the geographic region subject to the Chesapeake Bay Preservation Act (*Virginia Code* sections 10.1-2100 et seq.). The Certification indicates that there is no new development applied for under the license renewal. Transmission lines are conditionally exempt from the Act.

3. Wetlands Management. According to the Certification, Dominion Virginia Power does not now conduct, and does not intend to conduct, any alteration of wetlands in the vicinity of the North Anna Power Station (page 12, Table 2, items c.1 and c.2). DEQ's Virginia Water Protection Program indicates that the license renewal will not result in any impacts to wetlands.

4. Point Source Water Pollution Control. DEQ's Virginia Water Protection Program indicates that the license renewal will not result in any impacts to surface waters. The Power Station is subject to an existing Virginia Pollutant Discharge Elimination System permit (No. VA 0052451) (Certification, page 15, Table E-1). According to DEQ's Northern Virginia Regional Office, the Power Station is in compliance with that permit.

5. Non-point Source Water Pollution Control. As with wetlands (item 3 above), the current operation of the North Anna Power Station does not involve any land-disturbing activity, and will not involve it in the future, according to the Certification (page 13, Table 2, item e.1). Accordingly, Virginia's non-point source water pollution control program, the Erosion and Sediment Control Plan requirement, does not apply to this project.

6. Air Pollution Control. According to DEQ's Northern Virginia Regional Office, the North Anna Power Station is in full compliance with its air permits.

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Accordingly, the project is consistent with the Air Pollution Control Program of the Virginia Coastal Resources Management Program.

7. Other Enforceable Programs. As the Certification indicates, the remaining Enforceable Programs of the Virginia Coastal Resources Management Program do not apply to the renewal of the NRC license for the North Anna Power Station. Specifically, the Fisheries Management Program, including the State Tributyltin Regulatory Program, is not applicable to continued operation of the North Anna Power Station. Neither is the Dunes Management Program or the Shoreline Sanitation Program.

Environmental Impacts and Mitigation

1. Natural Heritage and Wildlife Resources. "Natural heritage resources" are defined as the habitat of rare, threatened, or endangered species of plants and animals, unique or exemplary natural communities, and significant geologic formations, according to the Department of Conservation and Recreation. That Department indicates that natural heritage resources have not been documented as present in the vicinity of the project. In addition, the Department of Conservation and Recreation represents the Department of Agriculture and Consumer Services in commenting on state-listed endangered plant and insect species that might be affected by a project. The continued operation of the North Anna Power Station will not affect protected plant or insect species.

The Department of Conservation and Recreation's Division of Natural Heritage (Christopher Ludwig, telephone 371-6206) should be contacted for an update if a significant amount of time passes before this information is used.

2. Recreation Resources. Continued operation of the North Anna Power Station will not adversely affect any existing or planned recreational facilities. Nor will it affect streams on the National Park Service Nationwide Inventory, Final List of Rivers or potential Virginia Scenic Rivers. The project will not affect any Virginia Byways.

3. Solid and Hazardous Waste Management. The DEQ's Waste Division, Office of Remedial Programs did a cursory review of its data files and found that the North Anna Power Station is listed as a small-quantity generator of hazardous waste, subject to the provisions of Title 40, Code of Federal Regulations, Part 262 (and related provisions in Parts 264, 265, and 268), which are adopted by reference in the Virginia Hazardous Waste Management Regulations. The most recent DEQ inspection of the North Anna Power Station took place in August 1999, according to the DEQ's Northern Virginia

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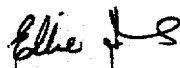
Regional Office; the inspection revealed that the Station was in compliance with all the requirements applicable to small-quantity generators.

4. Radiological Health Considerations. According to the Department of Health's Radiological Health Program, the Department of Health provides independent verification of this facility's environmental monitoring program for radiological releases. The Department of Health implemented its environmental monitoring program during the pre-operational stage of the facility; the program continues to the present day. There is no indication, in the published annual reports of the monitoring program, of any releases of radiation affecting the environment in the history of the program.

In addition, the applicant has been supportive of the efforts of state and local governments in maintaining an effective State Emergency Response Plan in case of radiological emergencies at the power plant. The Nuclear Regulatory Commission license includes a condition requiring certification of the Plan by the Federal Emergency Management Agency (FEMA); FEMA has certified the Plan.

Thank you for the opportunity to comment on this federal consistency certification.

Sincerely,



Ellie L. Irons
Program Manager
Office of Environmental Impact Review

Enclosures

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Appendix F

GEIS Environmental Issues Not Applicable to North Anna Power Station, Units 1 and 2

Appendix F

GEIS Environmental Issues Not Applicable to North Anna Power Station, Units 1 and 2

The following table lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996; 1999)^(a) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to North Anna Power Station, Units 1 and 2 because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to North Anna Power Station, Units 1 and 2

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 salinity gradients	1	4.2.1.2.2 4.4.2.2	Issue applies to a saltwater receiving water body, that North Anna does not have.
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	North Anna cooling systems do not use makeup water from a small river with low flow.
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING TOWER BASED HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	1	4.3.3	North Anna does not dissipate heat using cooling towers.
Impingement of fish and shellfish	1	4.3.3	North Anna does not dissipate heat using cooling towers.

(a) 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.

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ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
Heat shock	1	4.3.3	North Anna does not dissipate heat using cooling towers.
GROUNDWATER USE AND QUALITY			
Groundwater use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1 4.8.2.1	NAPS uses <100 gpm of groundwater.
Groundwater-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.8.1.3 4.4.2.1	North Anna does not dissipate heat using cooling towers.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	North Anna does not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	North Anna does not have or use Ranney wells.
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	North Anna is located inland.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	North Anna does not have cooling ponds in salt marshes.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	North Anna does not use cooling ponds.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	North Anna does not dissipate heat using cooling towers.
Cooling tower impacts on native plants	1	4.3.5.1	Issue applies to a heat dissipation system feature, cooling towers, that NAPS does not have.

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
Bird collisions with cooling towers	1	4.3.5.2	Issue applies to a heat dissipation system feature, cooling towers, that NAPS does not have.
Cooling pond impacts on terrestrial resources	1	4.4.4	North Anna does not use cooling ponds.

F.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. 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, Final Report'." NUREG-1437, Volume 1, Addendum 1, NRC, Washington, D.C.

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev.,
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Supplement 7
Regarding North Anna Power Station, Units 1 and 2
Draft Report for Comment

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Division of Regulatory Improvement Programs
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 Numbers 50-338, 50-339

11. ABSTRACT (200 words or less)

This draft supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC on May 29, 2001, by the Virginia Electric and Power Company (VEPCo) to renew the operating licenses for North Anna Power Station, Units 1 and 2, for an additional 20 years under 10 CFR Part 54. This SEIS includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental effects of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse effects. It also includes the staff's preliminary recommendation regarding the proposed action.

The NRC staff's preliminary recommendation is that the Commission determine that the adverse environmental impacts of license renewal for North Anna Power Station, Units 1 and 2, are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by VEPCo; (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

North Anna Power Station, Units 1 and 2
North Anna
Supplement to the Generic Environmental Impact Statement
GEIS
National Environmental Policy Act
NEPA
License Renewal

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

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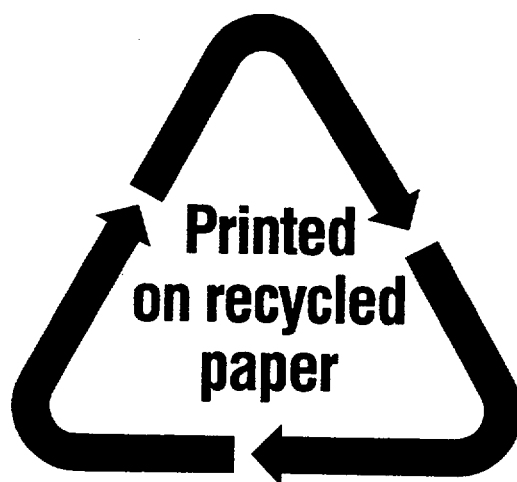
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