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 Peach Bottom Units 2 and 3; the possibility of purchasing electric power from other sources to replace power generated by Units 2 and 3 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 2 and 3. The environmental impacts are 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 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 category of environmental justice.

8.1 No-Action Alternative

The NRC's regulations implementing the National Environmental Policy Act (NEPA) specify that the no-action alternative be discussed in an NRC environmental impact statement (EIS) (10 CFR 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 Peach Bottom Units 2 and 3 OLs, and the Exelon Generation Company (Exelon) would then decommission Peach Bottom Units 2 and 3 when plant operations cease. Replacement of Peach Bottom Units 2 and 3 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.

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 Peach Bottom Units 2 and 3, or (4) some combination of these options.

Exelon will be required to comply with NRC decommissioning requirements whether or not the OLs are renewed. If the Peach Bottom Units 2 and 3 OLs are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the OLs are not renewed, Exelon 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 Supplemental Environmental Impact Statement (SEIS), and the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586 dated August 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 archeological resources, and environmental justice impact categories are summarized in Table 8-1 and discussed in the following paragraphs.

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

Impact Category	Impact	Comment
Socioeconomic	SMALL to MODERATE	Decrease in Peach Bottom Township employment opportunities SMALL to MODERATE due to the general size and availability of other employment opportunities in the region. Impact on government budgets SMALL.
Historic and Archeological Resources	SMALL	Decommissioning would necessitate cultural resource investigations, determinations, and consultation requirements.
Environmental Justice	SMALL	Very few minority/low income persons in the immediate vicinity of the Peach Bottom site. Economic offset due to the general size and availability of other employment opportunities in the region.

(a) The NRC staff is currently 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 (NRC 2001a) for public comment. The staff is currently finalizing the draft supplement for publication as a final document.

- Socioeconomic. When Peach Bottom Units 2 and 3 cease operation, there will be a decrease in employment and tax revenues associated with the closure. These impacts would be most concentrated in York County with smaller impacts in Lancaster County and much smaller impacts in other counties. Most secondary employment impacts and impacts on population would also be concentrated in York and Lancaster counties. Approximately 66 percent of employees who work at Peach Bottom Units 2 and 3 live in York County or Lancaster County, and the remainder live in other locations (Exelon 2001). The extent of impacts on York County, particularly Peach Bottom Township, will depend to some degree on the extent to which economic and population growth projected for Peach Bottom Township materializes (see Section 2.2.8.6).

  The tax revenue losses resulting from closure of Peach Bottom Units 2 and 3 would occur in York County. In 2000, Exelon paid a combined $1.44 million in property taxes in York County to three government units for Peach Bottom Units 2 and 3, or about 0.6 percent of the combined operating budgets for these three government units (Table 2-9). The no-action alternative would result in the loss of these taxes, as well as the loss of plant payrolls 20 years earlier than if the OLs were renewed. Given the relatively low percentage of revenue in the three jurisdictions, the property tax revenue would have a SMALL impact on the ability to provide public services.

  There would be some minor adverse impacts on local housing values, the local economy in Peach Bottom Township, and county employment in York and Lancaster counties if Peach Bottom Units 2 and 3 were to cease operations.

  Exelon employees working at Peach Bottom Units 2 and 3 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, Exelon's community involvement efforts in the region would be lessened.

  If normal economic growth continues in York County and Lancaster County, the socioeconomic consequences of nonrenewal of the OLs could be partially or entirely offset by the new jobs created by such growth. What is not known are the types of jobs, pay scale, and location of the future employment increases. If some of the new jobs are skilled, higher-paying jobs, then the impacts of nonrenewal of the Peach Bottom Units 2 and 3 OLs could be significantly mitigated and the socioeconomic consequence of closure would be SMALL. If not offset by normal growth, impacts would be MODERATE.

- Historic and Archeological Resources. The potential for future adverse impacts to known or unrecorded cultural resources at Peach Bottom Units 2 and 3 following decommissioning will depend on the future use of the site land and on an analysis and determinations of the historic status of the plant (including the units for decommissioning). Following

decommissioning, the site would likely be retained by Exelon. Eventual sale or transfer of the site could result in adverse impacts to cultural resources if the land-use pattern changes dramatically. However, there are no known historic or archeological resources on the Peach Bottom site proper. The impacts of this alternative on historic and archeological resources are considered SMALL.

- Environmental Justice. Current operations at Peach Bottom Units 2 and 3 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 2 and 3 would result in decreased employment opportunities and somewhat reduced tax revenues in York County, with possible SMALL negative and disproportionate impacts on minority or low-income populations. Because the Peach Bottom site is located in a relatively high-population area with extensive employment opportunities, these effects are likely to be offset by projected growth in the local economy, so that the impacts of closure on minority and low-income populations would be mitigated, regardless of whether the created jobs are low- or high-paying jobs. The environmental justice impacts under the no-action alternative are considered SMALL.

Impacts for all other impact categories would be SMALL, as shown in Table 9-1. In some cases, impacts associated with the no-action alternative would be positive. For example, closure of Peach Bottom Units 2 and 3 would eliminate any impingement and entrainment of fish and shellfish and also eliminate any negative impacts resulting from thermal discharges to Conowingo Pond.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electric power to replace the power generated by Peach Bottom Units 2 and 3, assuming that the OLs for Units 2 and 3 are not renewed. The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts. The following generation alternatives are considered in detail:

- coal-fired generation at the Peach Bottom site and at an alternate site (Section 8.2.1) (the Peach Bottom site is not feasible, as described in Section 8.2.1)

- natural gas-fired generation at the Peach Bottom site and at an alternate site (Section 8.2.2)

- nuclear generation at the Peach Bottom site and at an alternate site (Section 8.2.3)

The alternative of purchasing power from other sources to replace power generated at Peach Bottom Units 2 and 3 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 Peach Bottom Units 2 and 3 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. The *Annual Energy Outlook 2002 With Projections to 2020* was issued in December 2001 (DOE/EIA 2001a). In this report, EIA projects that combined-cycle[(a)] or combustion turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electric generating capacity through the year 2020 (DOE/EIA 2001a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(b)] 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. 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 projects that oil-fired plants will account for very little new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). However, oil as a back-up fuel to natural-gas-fired generation (combined cycle) is considered.

EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States through the year 2020 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 Peach Bottom Units 2 and 3 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 52 Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the System 80+ Design (10 CFR 52, Appendix B), and the AP600 Design (10 CFR 52, Appendix C). The submission to the NRC of these three applications for certification indicates continuing interest in the

(a) In the combined-cycle unit, hot combustion gases in a combustion turbine rotates the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

(b) 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.

possibility of licensing new nuclear power plants. NRC has established a New Reactor Licensing Project Office to prepare for and manage future reactor and site licensing applications (NRC 2001).

8.2.1 Coal-Fired Generation

The staff assumes construction of four standard 508-megawatts electric (MW(e)) units[(a)] as potential replacements for Units 2 and 3, which is consistent with Exelon's Environmental Report (ER; Exelon 2001). This assumption understates the environmental impacts of replacing the 2186 MW(e) generated by Peach Bottom Units 2 and 3 by roughly 13 percent.

Unless otherwise indicated, the assumptions and numerical values used in Section 8.2.1 are from the Exelon ER (Exelon 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).

The coal-fired alternative is analyzed for an alternate site on Conowingo Pond using once-through cooling. Although NRC pointed out that siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts (NRC 1996), it is unlikely that the coal-fired unit could fit and be operated efficiently on the Peach Bottom site, since the entire Peach Bottom site is only about 250 ha (620 ac). The land available for disposal of emission control waste (fly ash and scrubber sludge) is wooded and elevated substantially above the location of the operating nuclear reactors (about 91 m [300 ft]) (Exelon 2001). There would be associated environmental impacts and disposal would be quite difficult (e.g., pumping or hauling up steep hills).

Exelon did not identify any specific alternate sites, although if another site were chosen, adding units at other sites with existing Exelon generating units probably would be the least costly and have the least environmental impact. However, for purposes of bounding the environmental impacts, The NRC staff generally uses an unspecified "greenfield" (previously undeveloped) site for possible future generation additions to compare with the existing site. In this case, it is unlikely that a truly remote rural site would be chosen.

Construction at an alternate site would necessitate the construction of a transmission line to connect to existing lines to transmit power to Exelon's customers. Because Exelon does not have specific plans for constructing such a site, site-specific information is not available. For

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

purposes of this analysis, Exelon's ER assumes the alternate site would be near the Peach Bottom site and construction would include approximately 24 km (15 mi) of transmission line in a corridor 106 m (350 ft) wide to tie into the existing transmission lines at the Peach Bottom site (259 ha [640 ac] of easement would be required). Also, the project would require constructing or upgrading an assumed 32 km (20 mile) rail spur in a corridor 30 m (100 ft) wide from an adequate existing rail line. The corridor would take 97 ha (240 ac) of land. The upgrade would include an offloading approach and a turnaround loop at the site (Exelon 2001).

Coal and lime (or limestone) would be delivered by rail via a nearby rail line to a new rail spur leading to the alternate site. The new spur would include an onsite access and turnaround system. Barge delivery is potentially feasible for a site on navigable waters, but not on Conowingo Pond. A coal slurry pipeline is another potential alternative for delivering coal. However, such a pipeline would need to cover a great distance to reach a suitable coal-mining area or the coal would need to be transported by alternative means (e.g., rail) to a site closer to Peach Bottom site for introduction into the pipeline. The coal slurry pipeline alternative for delivering coal is not considered a feasible alternative and is not further evaluated.

The coal-fired plant would consume approximately 6.0 million MT (6.6 million tons) per year of pulverized bituminous coal with an ash content of approximately 11.9 percent (Exelon 2001). The ER assumes a heat rate[(a)] of 3.0 J fuel/J electricity (10,200 Btu/kWh) and a capacity factor[(b)] of 0.85 (Exelon 2001). After combustion, 99.9 percent of the ash (708,000 MT or 784,000 tons) would be collected and disposed of at the plant site. In addition, approximately 658,000 MT (728,000 tons) of scrubber sludge would be disposed of at the plant site based on annual lime usage of approximately 222,000 MT (246,000 tons). Lime would be used in the scrubbing process for control of sulfur dioxide (SO_2) emissions.[(c)]

8.2.1.1 Once-Through Cooling System

For purposes of this SEIS, the staff assumed a coal-fired plant could use either a closed-cycle or a once-through cooling system.

(a) Heat rate is a measure of generating station thermal efficiency. 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.

(b) 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.

(c) 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.

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 coal-fired generation alternative would necessitate converting roughly an additional 728 ha (1800 ac) of the site to industrial use for the plant, coal storage, and ash and scrubber sludge disposal. Additional land-use changes would occur offsite in an undetermined coal-mining area to supply coal for the plant. In the GEIS, the staff estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a coal plant during its operational life (NRC 1996). Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Units 2 and 3. In the GEIS, the staff estimated 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.

  If coal is delivered by rail, an additional approximately 97 ha (240 ac) would be needed for a rail spur, assuming that the alternate site location is within 32 km (20 mi) from the nearest railway connection. Depending particularly on transmission line and rail line routing, this alternative would result in MODERATE to LARGE land-use impacts.

Table 8-2. **Summary of Environmental Impacts of Coal-Fired Generation at an Alternate Site Using Once-Through Cooling**

Impact Category	Impact	Comments
Land Use	MODERATE to LARGE	Uses approximately 1084 ha (2680 ac), for plant infrastructure and waste disposal, transmission line, and rail spur. Additional land impacts for coal and limestone mining.
Ecology	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 to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality (Groundwater)	SMALL to LARGE	Impacts SMALL if only used for potable water; impacts could be MODERATE to LARGE if groundwater is used as make-up water (impacts would be site/aquifer specific).

Table 8-2. (contd)

Impact Category	Impact	Comments
Air Quality	MODERATE	Sulfur oxides • 12,050 MT/yr (13,344 tons/yr) Nitrogen oxides • 11,550 MT/yr (12,794 tons/yr) Particulates • 354 MT/yr (392 tons/yr) of total suspended particulates which would include • 81 MT/yr (90 tons/yr) of PM_{10} Carbon monoxide • 1490 MT/yr (1649 tons/yr) Small amounts of mercury and other hazardous air pollutants and naturally occurring radioactive materials – mainly uranium and thorium.
Waste	MODERATE	Total waste volume would be approximately 708,000 MT/yr (784,000 tons/yr) of ash, spent catalyst,and 658,000 MT/yr (728,000 tons/yr) of scrubber sludge requiring approximately 324 ha (800 ac) for disposal during the 40-year life of the plant.
Human Health	SMALL	Impacts are uncertain, but considered SMALL in the absence of more quantitative data.
Socioeconomics	SMALL to LARGE	During construction, impacts would be MODERATE to LARGE. Up to 2500 workers during the peak of the 5-year construction period at alternate site followed by reduction from current Peach Bottom Units 2 and 3 work force of about 1000 to 300; tax base (which may be in York County) preserved. Impacts during operation would be SMALL. Tax impacts on receiving county could be SMALL to LARGE.

Table 8-2. (contd)

Impact Category	Impact	Comments
	SMALL to LARGE	Transportation impacts during operation would be SMALL to MODERATE. Transportation impacts associated with construction workers could be MODERATE to LARGE. Construction impacts depend on location, but could be LARGE if plant is located in a rural area. For rail transportation of coal and lime/limestone, the impact is considered MODERATE to LARGE.
Aesthetics	MODERATE	Exhaust stacks will be visible from nearby local parks. Power block and stacks would be visible at a moderate distance. Impact would depend on the site selected and the surrounding land features. If needed, a new transmission line or rail spur would add to the aesthetic impact. Rail transportation of coal and lime/limestone would have a MODERATE aesthetic impact.
Historic and Archeological Resources	SMALL	Alternate location would necessitate cultural resource studies, determinations and consultation requirements. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant on undeveloped sites for cultural resources. Any potential impacts can likely be effectively managed.
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities will vary depending on population distribution and makeup at the site. Some impacts on housing may occur during construction; loss of about 700 operating jobs at Peach Bottom Units 2 and 3 could slightly reduce employment prospects for minority and low-income populations in York and Lancaster counties and could be offset by projected economic growth and the ability of affected workers to commute to other jobs.

- **Ecology**

  Locating a coal-fired plant at the alternate site would alter ecological resources because of the need to convert roughly 728 ha (1800 ac) of land at the site to industrial use for plant,

coal storage, and ash and scrubber sludge disposal. However, some of this land might have been previously disturbed.

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 would 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. Ecological impacts associated with transporting coal and lime to the alternate would be significant. The rail option was assumed to involve constructing a rail spur with an assumed length of 32 km (20 mi). Construction and maintenance of an additional transmission line and a rail spur would have ecological impacts. Overall, the ecological impacts at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality**

Exelon has stated a preference for an (unspecified) alternate site on Conowingo Pond, where once-through cooling could be used. An alternate site might use a closed-cycle cooling system with cooling towers. For an alternate site, the impact on the surface water would depend on the volume of water needed, 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 Pennsylvania or another state. The impacts would be SMALL to MODERATE.

No groundwater is currently used for operation of Peach Bottom Units 2 and 3. Use of groundwater for a coal-fired plant sited at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority. The impacts of withdrawal for the coal-fired plant on the aquifer would be site-specific and dependent on aquifer recharge and other withdrawals. The overall implacts would be SMALL to LARGE.

- **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.

A new coal-fired generating plant located in southern Pennsylvania would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for

such plants set forth in 40 CFR 60 Subpart Da. The standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO_2 (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR 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 Clean Air Act. All of south-central Pennsylvania, as defined in 40 CFR 81.105, is classified as attainment or unclassified for criteria pollutants, except that Lancaster County and Franklin County are non-attainment areas for ozone, and Lancaster County and the West York Borough and West Manchester Township in York County do not meet secondary standards for TSP (40 CFR 81.339). With prevailing winds from the west, a coal-fired power plant in York County could cause further deterioration in Lancaster County air quality, which is already marginal.

Section 169A of the Clean Air Act (42 USC 7491) 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. In addition, EPA issued a new regional haze rule in 1999 (64 FR 35714). 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)]. If a new coal-fired power station were located close to a mandatory Class I area, additional air pollution control requirements could be imposed. However, there are no Federal Class I areas in Pennsylvania or near the Peach Bottom site.

In 1998 EPA issued a rule requiring 22 eastern states, including Pennsylvania, to revise their state implementation plans (SIPs) to reduce nitrogen oxide emissions. 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 through September 30) is set out at 40 CFR 51.121(e). For Pennsylvania, the amount is 233,547 MT (257,441 tons). Any new coal-fired plant sited in Pennsylvania would be subject to this limitation.

Effective September 20, 2001, EPA approved a SIP revision for the control of NO_x in Pennsylvania (66 FR 43795). Under the revised SIP, Pennsylvania will implement NO_x Budget Trading Program rules under EPA's NO_x Budget Trading Program (40 CFR Part 96). The revised plan establishes and requires a NO_x allowance and trading program for large electric generation and industrial units beginning in 2003. The rules establish a

fixed statewide electric generating unit emissions budget of 42,840 MT (47,224 tons) of NO_x per ozone season. New units do not receive allowances, but are required to have allowances to cover their NO_X emissions. Owners of new units over 25MW(e) capacity must therefore acquire allowances from owners of other power plants by purchase or reduce NO_x emissions at other power plants they own. Thus, a new coal-fired power plant would not add to net statewide NO_x emissions, although it might do so locally. Regardless, NO_x emissions would be greater for the coal alternative than the OL renewal alternative.

Impacts for particular pollutants are as follows:

Sulfur oxides. Exelon states in its ER that an alternative coal-fired plant located at the Peach Bottom site would use a wet scrubber (Exelon 2001). Lime/limestone would be used for flue gas desulfurization (Exelon 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 SO_2 and 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 SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore acquire allowances from owners of other power plants by purchase or reduce SO_2 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 SO_2 emissions, although it might do so locally. Regardless, SO_2 emissions would be greater for the coal alternative than the OL renewal alternative.

Exelon estimates that by using the best technology to minimize SO_2 emissions, the total annual stack emissions would be approximately 12,050 MT (13,344 tons) of SO_2 (Exelon 2001).

Nitrogen oxides. Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO_2 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 at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453 [EPA 1998]), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_2) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

Exelon estimates that using the best available control technology, the total annual NO_x emissions for a new coal-fired power plant would be approximately 11,550 MT (12,744 tons)

(Exelon 2001). This level of NO_x emissions would be greater than the OL renewal alternative.

Particulates. Exelon estimates that the total annual stack emissions would include 354 MT (392 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 micrometer [μm] up to approximately 45 μm). The 354 MT (392 tons) would include 81 MT (90 tons) of particulate matter having an aerodynamic diameter less than or equal to 10 μm (PM_{10}). Fabric filters or electrostatic precipitators would be used for control. In addition, coal-handling equipment would introduce fugitive particulate emissions (Exelon 2001). Particulate emissions would be greater under the coal alternative than the OL renewal alternative.

During the 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. Exelon estimates that the total carbon monoxide emissions would be approximately 1490 MT (1649 tons) per year (Exelon 2001). This level of emissions is greater than the OL renewal alternative.

Hazardous air pollutants including mercury. In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (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 Clean Air Act 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).

Carbon dioxide. A coal-fired plant would also have unregulated carbon dioxide emissions that could contribute to global warming.

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants, but implied that air impacts would be substantial. The GEIS also mentioned 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 from coal combustion 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.

- **Waste**

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber sludge. Four 508-MW(e) coal-fired units would generate approximately 708,000 MT (784,000 tons) of this waste annually. The waste would be disposed of onsite, accounting for approximately 324 ha (800 ac) of land area over the 40-year plant life (Exelon 2001). 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.

In May 2000, the EPA issued a “Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels” (EPA 2000a). The 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 eleven 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 percent to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (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.

For all of the preceding 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.

- **Human Health**

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risks from coal and lime/limestone transportation, worker and public risks from disposal of coal combustion wastes, and public risks from 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 did 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 of the coal-fired alternative would take approximately 5 years. The staff assumed that construction would take place while Peach Bottom Units 2 and 3 continued operation and would be completed by the time Units 2 and 3 permanently cease operations. The work force would be expected to vary between 1200 and 2500 workers during the 5-year construction period (NRC 1996). If the alternate site were near the Peach Bottom site, then these workers would be in addition to the approximately 1000 workers employed at Units 2 and 3. During construction of the new coal-fired plant, surrounding communities would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered by construction workers commuting to the site from other parts of York County, Lancaster County, Baltimore, Philadelphia, and other

nearby areas. After construction, the nearby communities would be impacted by the loss of the construction jobs.

During the 5-year construction period for the replacement coal-fired units, 2500 construction workers could place significant traffic loads on existing highways near the Peach Bottom site. Such impacts would be MODERATE to LARGE.

Construction of a replacement power plant at an alternate site not near the Peach Bottom site would mean that the communities around the Peach Bottom site would still experience the impact of Peach Bottom Units 2 and 3 operational job loss as in the no-action alternative (although potentially tempered by projected economic growth), and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 300 workers. In the GEIS, the staff stated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work. The Peach Bottom site is within commuting distance of the Philadelphia and Baltimore metropolitan areas and is therefore not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at an isolated rural site could be LARGE.

Transportation-related impacts associated with commuting construction workers at an alternate site would be site dependent, but could be MODERATE to LARGE.

Transportation impacts related to commuting of plant operating personnel would also be site dependent, but can be characterized as SMALL to MODERATE.

At most alternate sites, coal and lime would likely be delivered by rail, although barge delivery is feasible for a location on navigable waters. Transportation impacts would depend upon the site location. Approximately 600 trains per year would be needed to deliver the coal and lime/limestone for the four coal-fired units- because for each full train delivery there would be an empty return train. On several days per week, there could be four trains per day using the rail spur to the alternate site. Socioeconomic impacts associated with rail transportation would likely be MODERATE to LARGE. Barge delivery of coal and lime/limestone would likely have SMALL socioeconomic impacts.

- **Aesthetics**

The four coal-fired power plant units could be as much as 60 m (200 ft) tall and could be visible in daylight hours offsite. The four exhaust stacks would be 120 to 185 m (400 to 600 ft) high. Given the low elevation at the site and of the surrounding land, the stacks would be highly visible in daylight hours for distances up to 16 km (10 mi). If the coal-fired

plant were near the Peach Bottom site, the stacks would be visible from Conowingo Pond and Susqehannock State Park. The plant units and associated stacks would also be visible at night because of outside lighting. The Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 61 m (200 ft) above ground level have markings and/or lighting so as not to impair aviation safety (FAA 2000). Visual impacts of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting, provided the lighting meets FAA requirements, and appropriate use of shielding. Overall, the addition of the coal-fired units and the associated exhaust stacks would likely have a MODERATE aesthetic impact.

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 Peach Bottom Units 2 and 3 operations are considered to be MODERATE.

At an alternate site, there would be an aesthetic impact from the buildings and exhaust stacks. There would be an aesthetic impact associated with construction of an assumed new 32-km (20-mi) rail spur and 25-km (15-mi) transmission line to connect to other lines and enable delivery of electricity to the grid. 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. Nevertheless, given the frequency of train transport and the fact that many people are likely to be within hearing distance of the rail route, the impacts of noise on residents in the vicinity of the facility and the rail line is considered MODERATE. Noise associated with barge transportation of coal and lime/limestone would 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. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as MODERATE.

- **Historic and Archeological Resources**

At 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 archeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction 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 corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archeological 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 Peach Bottom site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. If the replacement plant is in the vicinity of the Peach Bottom site, closure of Peach Bottom Units 2 and 3 would result in a decrease in employment of approximately 1000 operating employees (same as in the No-Action case), offset by other economic growth related to construction and operation of the replacement power plant. Overall, impacts would be SMALL to MODERATE, and would depend on the extent to which projected economic growth is realized and the ability of minority or low-income populations to commute to other jobs outside the area.

Impacts at the alternate site would depend upon the site chosen and the nearby population distribution but are likely to also be SMALL to MODERATE.

8.2.1.2 Closed-Cycle Cooling System

The environmental impacts of constructing a coal-fired generation system at an alternate site using closed-cycle cooling with cooling towers are essentially the same as the impacts for a coal-fired plant using the once-through system. However, there are some environmental 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 Site with Closed-Cycle Cooling System Using Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 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 by the State. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
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 Archeological 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 Peach Bottom site and an alternate site. For the Peach Bottom site, the staff assumed that the plant would use the existing once-through cooling canal system.

Exelon concluded in its ER that the Peach Bottom site would be a reasonable site for location of a natural-gas-fired generating unit. Based on the PECO *Gas Fired Power Plant Guide* (PECO Energy 1999), Exelon chose to evaluate gas-fired generation, using combined-cycle turbines. Exelon determined that the technology is mature, economical, and feasible. The *Gas Fired Power Plant Guide* indicates that standard-sized gas-fired units of 508 MW(e) are readily

available and economical. Therefore, Exelon analyzed 2032 MW of net power, consisting of four 508-MW(e) gas-fired units located on Peach Bottom property (Exelon 2001). Exelon realized that gas availability would be questionable.[(a)]. It would require a new, dedicated high-pressure 61-cm (24-inch) pipeline to tie into the nearby (about 5 km [3 mi] distant) Transco gas pipelines. In the winter, when demand for natural gas is high, it might become necessary for Exelon to operate on fuel oil, which would have higher costs and more emissions than gas.

The staff assumed that a replacement natural-gas-fired plant would use combined-cycle technology (Exelon 2001). In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity. The following additional assumptions are made for the natural-gas-fired plant (Exelon 2001):

- four 508-MW(e) units, each consisting of two 168-MW combustion turbines and a 172-MW heat recovery boiler
- natural gas with an average heating value of 38.6 MJ/m^3 (1035 Btu/ft^3) as the primary fuel
- use of low-sulfur No. 2 fuel oil as backup fuel
- heat rate of 2 J fuel/J electricity (6928 Btu/kWh)
- capacity factor of 0.85

Unless otherwise indicated, the assumptions and numerical values used throughout this section are from the Exelon ER (Exelon 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 natural-gas-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a natural-gas-fired plant).

(a) In November, 2000, Conectiv Energy announced that representatives from York County Economic Development Corporation and Conectiv had been in discussion regarding the company's preliminary interest in locating a state-of-the-art $600 million, 1100 megawatt combustion turbine combined cycle power plant in the southern part of the county near Delta. If built, this plant would be about half of the size of the possible Peach Bottom Units 2 and 3 replacement and would add to any demand for gas and environmental impacts, but would offset negative socioeconomic impacts associated with the no-action alternative.

8.2.2.1 Once-Through Cooling System

The overall impacts of the natural-gas-fired 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**

  Natural-gas-fired generation at the Peach Bottom site and at an alternate location would require converting approximately 45 ha (110 ac) for power block, offices, roads, and parking areas. At the Peach Bottom site, this much previously disturbed land is available. For the Peach Bottom site, there would be an additional land use impact of up to approximately 22 ha (54 ac) for construction of a 3-mile branch gas pipeline to the plant site.

  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). Approximately 259 ha (640 ac) of additional land could be impacted for construction of a transmission line, assuming a 25-km (15-mi) line. Additional land could be required for natural gas wells and collection stations. In the GEIS, the staff estimated that approximately 1500 ha (3600 ac) would be needed for a 1000-MW(e) plant (NRC 1996). Proportionately more land would be needed for a natural-gas-fired plant replacing the 2032 MW(e) from Peach Bottom Units 2 and 3. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Units 2 and 3. In the GEIS (NRC 1996), the staff estimated 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. Overall, land-use impacts at both the Peach Bottom site and the alternate site would be SMALL to MODERATE.

Table 8-4. Summary of Environmental Impacts of Natural Gas-Fired Generation at the Peach Bottom Site and an Alternate Site Using Once-Through Cooling

	Peach Bottom Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	45 ha (110 ac) for power block, offices, roads, and parking areas. Additional impact of up to approximately 22 ha (54 ac) for construction of a 3-mile branch underground gas pipeline.	SMALL to MODERATE	45 ha (110 ac) for power-block, offices, roads, and parking areas. Additional impact for construction and/or upgrade of an underground gas pipeline, if required. Transmission line likely could be placed in existing corridors.
Ecology	SMALL	Uses previously-disturbed areas at current Peach Bottom site. Some effects from 3 miles of gas pipeline construction.	SMALL to MODERATE	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. Likely plant sites already have power generation facilities.
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 characteris-tics of surface water body.
Water Use and Quality (Groundwater)	SMALL	Use of groundwater very unlikely.	SMALL	Groundwater may be used. Impacts SMALL if only used for potable water; impacts could be MODERATE to LARGE if groundwater is used as make-up cooling water (impacts would be site/aquifer specific)

Table 8-4. (contd)

Impact Category	Peach Bottom Site		Alternate Site	
	Impact	Comments	Impact	Comments
Air Quality	MODERATE	Sulfur oxides • 111 MT/yr (123 tons/yr) Nitrogen oxides • 417 MT/yr (462 tons/yr) Carbon monoxide • 548 MT/yr (607 tons/yr) PM_{10} particulates • 62 MT/yr (67 tons/yr) Some hazardous air pollutants	MODERATE	Same emissions as Peach Bottom site.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Minimal waste product from fuel combination.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.
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 Peach Bottom Units 2 and 3 work force of about 1000 to 150; tax base preserved. Impacts during operation would be SMALL. Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.	SMALL to MODERATE	During construction, impacts would be MODERATE. Up to 1200 additional workers during the peak of the 3-year construction period. York County would experience loss of tax base and employment, potentially offset by projected economic growth. Transportation impacts associated with construction workers would be SMALL to MODERATE.
Aesthetics	SMALL	SMALL aesthetic impact due to impact of plant units and stacks. Visual impact would be similar to current Peach Bottom Units 2 and 3.	MODERATE	Impact would depend on location. Greatest impact likely would be from the new 25-km (15-mi) transmission line that would be needed.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any alternate location would necessitate cultural resource studies, determinations and consultation requirements. Potential impacts can likely be effectively managed.

Table 8-4. (contd)

Impact Category	Peach Bottom Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
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; loss of about 850 operating jobs at Peach Bottom Units 2 and 3 could reduce employment prospects for minority and low-income populations. Impacts would be offset by projected economic growth and the ability of affected workers to commute to other jobs.	SMALL to MODERATE	Impacts vary depending on population distribution and characteristics at site.

- **Ecology**

  At the Peach Bottom site, there would be ecological land-related impacts from siting of a gas-fired plant and branch pipeline. 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. If a natural-gas-fired plant were located at an alternate site there is a reasonable likelihood that the plant would be located adjacent to an existing power plant on previously disturbed land, which would tend to mitigate impacts. Construction of a transmission line and construction and/or upgrading of the gas pipeline to serve the plant would be expected to have temporary ecological impacts. Ecological impacts to the site and utility easements could include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. At an alternate site, cooling water intake and discharge could have aquatic resource impacts. Overall, the ecological impacts are considered SMALL at the Peach Bottom site and SMALL to MODERATE at an alternative site.

- **Water Use and Quality**

  Surface Water. Each of the gas-fired units would include a heat-recovery boiler from which steam would turn an electric generator. Steam would be condensed and circulated back to the boiler for reuse. A natural-gas-fired plant sited at Peach Bottom is assumed to use the existing cooling canal system. 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.

A natural-gas-fired plant at an alternate site might use a closed-cycle cooling system with mechanical draft cooling towers. The staff assumed that for alternate sites, the impact on the surface water would depend on the discharge volume and the characteristics of the receiving body of water to be used for cooling makeup water and discharge. Intake and discharge would involve relatively small quantities of water compared to the coal alternative. Intake from and discharge to any surface body of water would be regulated by the Commonwealth of Pennsylvania.

Some erosion and sedimentation probably would occur during construction (NRC 1996). The overall impacts to surface water quality are characterized as SMALL to MODERATE.

Groundwater. No groundwater is currently used for operation of Peach Bottom Units 2 and 3. It is unlikely that groundwater would be used for an alternative natural-gas-fired plant sited at Peach Bottom. The overall impacts would be SMALL.

A natural-gas-fired plant sited at an alternate site may use groundwater. Any groundwater withdrawal may require a permit from the local permitting authority. The impacts of such a withdrawal at an alternate site would be site-specific and dependent on the recharge rate and other withdrawal rates from the aquifer; however, it is unlikely that groundwater would be used for cooling water with once-through cooling. The overall impacts could be 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 type of air quality regulations as a coal-fired plant.

A new gas-fired generating plant located in south-central Pennsylvania would likely need a PSD permit and an operating permit under the Clean Air Act. A new combined-cycle natural-gas-fired generating plant would also be subject to the new source performance standards for such units at 40 CFR Part 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

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

Sulfur oxides - 111 MT/yr (123 tons/yr)
Nitrogen oxides - 417 MT/yr (462 tons/yr)
Carbon monoxide - 548 MT/yr (607 tons/yr)
PM_{10} particulates - 62 MT/yr (69 tons/yr)

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

In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal and oil-fired plants, EPA did not determine that emissions of hazardous air pollutants from natural-gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would result in temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

The preceding emissions would likely be the same at the Peach Bottom site or at an alternate site. Impacts from the above emissions would be clearly noticeable, but would not be sufficient to destabilize air resources as a whole. The overall air-quality impact for a new natural-gas-generating plant sited at Peach Bottom or at an alternate site is considered MODERATE.

- **Waste**

There will be small amounts of solid-waste products (i.e., ash) from burning natural gas fuel. In the GEIS, the staff concluded that waste generation from gas-fired technology would be minimal (NRC 1996). Gas firing results in very few combustion by-products because of the clean nature of the fuel. Waste generation at an operating gas-fired plant would be largely limited to typical office wastes. Construction-related debris would be generated during construction activities. Overall, the waste impacts would be SMALL for a natural-gas-fired plant sited at Peach Bottom or at an alternate site.

- **Human Health**

In the GEIS, the staff identifies 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. For a plant sited in Pennsylvania, NO_x emissions would be regulated by the Pennsylvania Department of Environmental Protection (PDEP). Human health effects are not expected to 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 Peach Bottom or at an alternate site are considered SMALL.

- **Socioeconomics**

Construction of a natural-gas-fired plant would take approximately 3 years. Peak employment would be approximately 1200 workers (NRC 1996). The staff assumed that construction would take place while Peach Bottom Units 2 and 3 continue operation and would be completed by the time Peach Bottom Units 2 and 3 permanently ceases operations. During construction, the communities surrounding the Peach Bottom site 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 other parts of York County or from other counties. After construction, the communities would be impacted by the loss of jobs. The current Peach Bottom Units 2 and 3 work force (about 1000 workers) would decline through a decommissioning period to a minimal maintenance size. The new gas-fired plant would provide a replacement tax base at the Peach Bottom site or an alternate site and approximately 150 new permanent jobs. For siting at an alternate site, impacts in York County resulting from loss of Peach Bottom Units 2 and 3 may be offset by economic growth projected to occur in the county.

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 work force would have the lowest socioeconomic impacts of any nonrenewable technology (NRC 1996). Compared to the coal-fired and nuclear alternatives, the smaller size of the construction work force, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts.

Overall, gas-fired generation socioeconomic impacts associated with construction and operation of a natural gas-fired power plant would be SMALL to MODERATE for siting at Peach Bottom or SMALL to MODERATE at an alternate site. Depending on other growth in the area, socioeconomic effects could be noticed, but they would not destabilize any important socioeconomic attribute.

Transportation impacts associated with construction personnel commuting to the plant site would depend on the population density and transportation infrastructure in the vicinity of the site. Transportation impacts can be classified as SMALL to MODERATE for siting at Peach Bottom. The impacts can be classified as SMALL to MODERATE for siting at an alternate site, depending on the characteristics of the site.

- **Aesthetics**

The turbine buildings (approximately 30 m [100 ft] tall) and exhaust stacks (approximately 38 m [125 ft] tall) would be visible during daylight hours from Conowingo Pond, but depending on placement of the units, might not be visible otherwise offsite because of topography. The gas pipeline compressors would be visible. Noise and light from the plant

would be detectable offsite. At the Peach Bottom site, these impacts would result in SMALL aesthetic impacts.

At an alternate site, the buildings, stacks, and the associated transmission line and gas pipeline compressors would be visible offsite. The impact of noise and light visual impact of a new 25-km (15-mi) transmission line would be MODERATE. Aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Overall, the aesthetic impacts associated with locating at an alternate site can be categorized as MODERATE. The likely greatest contributor to this categorization is the aesthetic impact of the new transmission line needed to connect the plant to the power grid.

- **Historic and Archeological Resources**

At both the Peach Bottom site 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 archeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Peach Bottom site or 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 corridors where new construction would occur (e.g., roads, transmission and pipeline corridors, or other rights-of-way). Impacts to cultural resources can be effectively managed under current laws and regulations and kept 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 natural-gas-fired plant were built at the Peach Bottom site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect minority and low-income populations. Closure of Peach Bottom Units 2 and 3 would result in a decrease in employment of approximately 850 operating employees, possibly offset by general growth in the York County area. Following construction, it is possible that the ability of the local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for minority or low-income populations in York County. Overall, however, impacts are expected to be SMALL. Projected economic growth in York and Lancaster counties and the ability of minority and low-income populations to commute to other jobs outside the area could mitigate any adverse effects.

Impacts at an alternate site would depend upon the site chosen and the nearby population distribution, but are likely to also be SMALL to MODERATE.

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 site using closed-cycle cooling with cooling towers. The impacts 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 Site with Closed-Cycle Cooling Towers

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 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 by the State. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
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 plumes. Possible noise impact from operation of cooling towers.
Historic and Archeological 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 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the System 80+ Design (10 CFR 52, Appendix B), and the AP600 Design (10 CFR 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 volatility of natural gas and electricity have made new nuclear power plant construction more attractive from a cost standpoint. Consequently, construction of a new nuclear power plant at the Peach Bottom site using the existing cooling canal 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 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 Peach Bottom 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 2 and 3, which have a net capacity of 1093 MW(e). 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 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 using closed-cycle cooling 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.

Table 8-6. Summary of Environmental Impacts of New Nuclear Power Generation at Peach Bottom Site and an Alternate Site Using Once-Through Cooling

	Peach Bottom Site		Alternate Site	
Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Requires approximately 200 to 400 ha (500 to 1000 ac) for the plant and 400 ha (1000 ac) for uranium mining.	MODERATE to LARGE	Same as Peach Bottom site, plus land for transmission line (259 ha [640 ac] assuming a 25 km [15 mi] line)
Ecology	MODERATE	Uses undeveloped areas at current Peach Bottom site.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line routes; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality (Surface water)	SMALL	Uses existing cooling canal system.	SMALL to MODERATE	Impact will depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality (Groundwater)	SMALL	No groundwater used at the Peach Bottom site.	SMALL to LARGE	Groundwater may be used. Impacts SMALL if only used for potable water; impacts could be MODERATE to LARGE if groundwater is used as make-up cooling water (impacts would be site/aquifer specific)
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. Emissions are similar as current releases at Peach Bottom Units 2 and 3.	SMALL	Same impacts as at Peach Bottom site.

	Peach Bottom Site		Alternate Site	
Category	**Impact**	**Comments**	**Impact**	**Comments**
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 Peach Bottom 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 Peach Bottom site.
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 2500 workers during peak period of the 5-year construction period. Operating work force assumed to be similar to Peach Bottom Units 2 and 3; tax base preserved. Impacts during operation would be SMALL.	MODERATE to LARGE	Construction impacts depend on location. Impacts at a rural location could be LARGE. York County would experience loss of tax base and employment with MODERATE impacts, potentially offset by projected economic growth.
	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of commuting workers during operations would be SMALL.	SMALL to LARGE	Transportation impacts associated with construction workers could be MODERATE to LARGE. Transportation impacts of commuting workers during operations would be SMALL.
Aesthetics	SMALL to MODERATE	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 is located adjacent to an industrial area. New transmission lines would add to the impacts and could be MODERATE. If a greenfield site is selected, the impacts could be LARGE.
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Any potential impacts can likely be effectively managed.

Category	Peach Bottom Site		Alternate Site	
	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.	SMALL to LARGE	Impacts will vary depending on population distribution and makeup at the site. Impacts to minority and low-income residents of south York County associated with closure of Peach Bottom Units 2 and 3 could be MODERATE, but could also be mitigated by projected economic growth for the area. Impacts to receiving county are site-specific and could range from SMALL to LARGE.

Land Use

The existing facilities and infrastructure at the Peach Bottom site 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 canal system, switchyard, offices, and transmission line right-of-way. A replacement nuclear power plant at the Peach Bottom site would require approximately 200 to 400 ha (500 to 1000 ac) of new land, some of which may be previously undeveloped land. It is not clear whether there is enough usable land for replacement units at the Peach Bottom site. Additional land beyond the current Peach Bottom site boundary may be needed to construct a new nuclear power plant while the existing Units 2 and 3 continue to operate.

There would be no net change in land needed for uranium mining because land needed to supply the new nuclear plant would offset land needed to supply uranium for fueling the existing Peach Bottom Units 2 and 3 reactors.

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

Land-use requirements at an alternate site would be 200 to 400 ha (500 to 1000 ac) plus the possible need for land for a new transmission line. Assuming a 25-km (15-mi) transmission line, an additional 259 ha (640 ac) would be needed. 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, siting a new nuclear

plant at an alternate site would result in MODERATE to LARGE land-use impacts, and probably would be LARGE for a greenfield site.

- **Ecology**

Locating a replacement nuclear power plant at the Peach Bottom site would alter ecological resources because of the need to convert additional land to industrial use. Some of this land, however, would have been previously disturbed.

Siting at Peach Bottom would have a MODERATE ecological impact that would be greater than renewal of the Unit 2 and 3 OLs.

At an alternate site, there would be construction impacts and new incremental operational impacts. 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. Construction and maintenance of the transmission line would have ecological impacts. Overall, the ecological impacts at an alternate site would be MODERATE to LARGE.

- **Water Use and Quality**

Surface water. A replacement nuclear power plant located at the Peach Bottom site is assumed to use the existing once-through cooling system. It would obtain potable, process, and fire-protection water from the Susquehanna River in a manner similar to the current practice for Peach Bottom Units 2 and 3. Thus, the environmental impacts would be similar to the existing Peach Bottom Units 2 and 3 nuclear plant. 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 replacement reactor located at an alternate site, the staff assumed that a closed-cycle cooling system would be employed. New intake structures would need to be constructed to provide water needs for the facility. Impacts would depend on the volume of water withdrawn for makeup, relative to the amount available from the intake source and the characteristics of the surface water. Plant discharges would be regulated by the Commonwealth of Pennsylvania or other jurisdiction. Some erosion and sedimentation would likely occur during construction. The impacts would be SMALL.

Groundwater. No groundwater is currently used for operation of Peach Bottom Units 2 and 3. It is unlikely that groundwater would be used for an alternative nuclear power plant sited at Peach Bottom, so the impacts would be SMALL. A nuclear power plant sited at an alternate site may use groundwater. Groundwater withdrawal would require a permit from

the local permitting authority. The impacts of such a withdrawal rate on an aquifer would be site specific and dependent on aquifer recharge and other withdrawal rates from the aquifer; however, it is unlikely that groundwater would be used in a once-through cooling system. The overall impacts likely would be SMALL.

- **Air Quality**

  Construction of a new nuclear plant at the Peach Bottom site or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with diesel generators. These emissions would be regulated. Emissions for a plant sited in Pennsylvania would be regulated by the Pennsylvania Department of Environmental Protection. 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 51 Subpart A, Appendix B. 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 Peach Bottom 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 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 Peach Bottom would not alter human health impacts. Therefore, the impacts would be SMALL.

- **Socioeconomics**

  The construction period and the peak work force 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 work force of 2500. The staff assumed that construction would take place while the existing nuclear units continue operation and would be completed by the time Peach Bottom Units 2 and 3 permanently cease operations. During construction, the communities surrounding the

Peach Bottom site 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 other counties. After construction, the communities would be impacted by the loss of the construction jobs, although this loss could be offset by other growth currently being projected for York and Lancaster counties.

The replacement nuclear units are assumed to have an operating work force comparable to the approximately 1000 workers currently working at Peach Bottom Units 2 and 3. The replacement nuclear units would provide a new tax base to offset the loss of tax base associated with decommissioning of Peach Bottom Units 2 and 3. The appropriate characterization of non-transportation socioeconomic impacts for operating replacement nuclear units constructed at the Peach Bottom site would be SMALL to MODERATE.

During the 5-year construction period, up to 2500 construction workers would be working at the Peach Bottom site in addition to the approximately 1000 workers at Units 2 and 3. The addition of the construction workers could place significant traffic loads on existing highways, particularly those leading to the Peach Bottom site. Such impacts would be MODERATE to LARGE. Transportation impacts related to commuting of plant operating personnel would be similar to current impacts associated with operation of Units 2 and 3 and are considered SMALL.

Construction of a replacement nuclear power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. The communities around the Peach Bottom site would still experience the impact of Peach Bottom Units 2 and 3 operational job loss (although potentially tempered by projected economic growth), and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2500 workers at the peak of construction) and a permanent work force of approximately 1000 workers. In the GEIS (NRC 1996), the staff noted that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work. The Peach Bottom site is within commuting distance of the Baltimore and Philadelphia metropolitan areas and is therefore not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Socioeconomic impacts at rural sites could be LARGE.

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

- **Aesthetics**

Depending upon how they were placed on the site (on the river or on the bluff above the river), the containment buildings for a replacement nuclear power plant sited at Peach

Bottom and other associated buildings could be visible in daylight hours over many miles. The nuclear units would also likely be visible at night because of outside lighting. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. No cooling towers would be needed, assuming use of the existing once-through cooling system.

A replacement nuclear plant sited at Peach Bottom would be visible from Conowingo Pond. However, with appropriate mitigation, the visual impact can be kept SMALL to MODERATE.

Noise from operation of a replacement nuclear power plant would potentially be audible by visitors to Conowingo Pond. Mitigation measures, such as reduced or no use of outside loudspeakers, can be employed to reduce noise level and keep the impact SMALL.

At an alternate site, depending on placement, there would be an aesthetic impact from the buildings. There would also be a significant aesthetic impact associated with construction of a new 25-km (15-mi) transmission line to connect to other lines to enable delivery of electricity. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants, in which case the impact could be SMALL. The impact could be MODERATE if a transmission line needs to be built to the alternate site. The impact could be LARGE if a greenfield site is selected.

- **Historic and Archeological Resources**

At both the Peach Bottom site and an alternate site, a cultural resources 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 archeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Peach Bottom site or another site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construc-tion 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 corridors, rail lines, or other rights-of-way). Historic and archeological 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 nuclear plant were built at the Peach Bottom site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority and low-income populations. After completion of construction, it is possible that the ability of the local government to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for the minority and low-income populations. Overall, impacts are expected to be SMALL to MODERATE. Projected economic growth in York County and the ability of minority and low-income populations to commute to other jobs outside the York County area could mitigate any adverse effects.

  Impacts at an alternate site would depend upon the site chosen and the nearby population distribution. If a replacement nuclear plant were constructed at an alternate site, York County, Delta, and South Eastern School District could experience a loss of property tax revenue, which could affect their ability to provide services and programs. However, because the tax revenue attributable to Peach Bottom Units 2 and 3 is a relatively small percentage of total tax revenue for each jurisdiction, the impacts to minority and low-income populations are expected to be SMALL to MODERATE. Impacts to minority and low-income residents of York County associated with closure of Peach Bottom Units 2 and 3 could be MODERATE, but could also be mitigated by projected economic growth for the area. Impacts to the receiving county could be SMALL to LARGE, depending on the relative increase to the tax base resulting from the new plant's construction, and its siting.

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. The impacts of this option are essentially the same as the impacts for a nuclear power plant using once-through cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8.7 summarizes the incremental differences.

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

Impact Category	Change in Impacts from Once-Through Cooling System
Land Use	10 to 12 additional ha (25 to 30 ac) required for cooling towers and associated infrastructure.
Ecology	Impacts 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 by the Commonwealth of Pennsylvania. Decreased water withdrawal and less thermal load on receiving body of water. Consumptive use of water due to evaporation from cooling towers.
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 have an associated noise impact.
Historic and Archeological Resources	No change
Environmental Justice	No change

8.2.4 Purchased Electrical Power

If available, purchased power from other sources could potentially obviate the need to renew the Peach Bottom Units 2 and 3 OLs. It is unlikely, however, that sufficient baseload power supply would be available to replace the Units 2 and 3 capacity.

Exelon has evaluated conventional and prospective power supply options that could be reasonably implemented before the current Peach Bottom Units 2 and 3 licenses expire (in 2013 for Unit 2 and in 2014 for Unit 3). Because Pennsylvania is a net exporter of power and would be fully deregulated, Exelon assumes that in-state power could be purchased. For example, in 1997 Pennsylvania exported 137 million kilowatt hours (kWh) (DOE/EIA 2000b). This is less than 1 percent of what Peach Bottom Units 2 and 3 generates annually

(approximately 16,400 gigawatt hours). It would probably require new construction to provide replacement capacity for Peach Bottom Units 2 and 3 (2186 MW(e) net). Power is exported from Pennsylvania because it has been purchased by consumers and is not excess power available to replace existing capacity. The NRC staff evaluated the environmental impacts of thirteen alternative energy sources in Section 8.3 of the GEIS. Exelon assumed that the generating technology producing purchased power would be one of the alternatives that the NRC staff analyzed. For this reason, Exelon adopted by reference, as representative of the purchased power alternative, the GEIS description of the alternative generating technologies. Of these technologies, simple-cycle combustion turbines or combined-cycle facilities fueled by natural gas were found to be the most cost-effective. There has been a corresponding decreased incentive for boilers fired by coal or residual oil. Although purchased power could provide replacement power for Peach Bottom Units 2 and 3, Exelon identified drawbacks to this alternative. They include the following:

- Utility generators providing power to Exelon would need to increase their capacity with new power units. For the reasons discussed in Sections 8.2.1 - 8.2.3, and 8.2.5, construction of a new generating station is not a preferable alternative to license renewal of Peach Bottom Units 2 and 3.

- Deregulation in Pennsylvania was expected to be fully in place by 2001. Under deregulation, non-utility generators could compete directly with utility companies for the generation market. This is expected to decrease non-utility generators' incentives to provide wholesale power to utility companies.

To replace Peach Bottom Units 2 and 3 capacity with imported power, Exelon might need to construct a new 500 kV transmission line which, assuming a 106 m (350 ft) easement width, the transmission line would impact approximately 10.6 ha per km (16.1 ac/mi).

Imported power from Canada or Mexico is unlikely to be available for replacement of Peach Bottom Units 2 and 3 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 in Canada 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 year 2000 to 66.1 billion kWh in year 2005, and then gradually decrease to 47.4 billion kWh in year 2020 (DOE/EIA 2001a). On balance, it is unlikely that electricity imported from Canada or Mexico would be able to replace Peach Bottom Units 2 and 3 capacity.

If power to replace Peach Bottom Units 2 and 3 capacity were to be purchased from sources within the United States or a foreign country, the generating technology likely would 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 the Peach Bottom Units 2 and 3 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 considered by NRC are discussed in the following subsections.

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 through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Nevertheless, an oil-fired generating alternative at the Peach Bottom site for replacement of power generated by Peach Bottom Units 2 and 3 is considered in this section.

Exelon has several oil-fired units; however, they produce only about 2 percent of Exelon's power generation. The cost of oil-fired operation is more expensive than nuclear or coal-fired operation. In addition, 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. From 1997 to 1998, production of electricity by oil-fired plants dropped by about 11 percent in Pennsylvania (DOE/EIA 1998). For these reasons, oil-fired generation is not an economically feasible alternative to Peach Bottom Units 2 and 3 license renewal.

Also, construction and operation of an oil-fired plant would have environmental impacts. In Section 8.3.11 of the GEIS, the staff estimated that construction of a 1,000-MWe oil-fired plant would require about 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

According to the Wind Energy Resource Atlas of the United States (National Renewable Energy Laboratory 2000) areas suitable for wind energy applications must be wind power class 3 or higher. Approximately 50 percent of the land area in Pennsylvania has a wind power classification of 3 or higher and, therefore, may be suitable for wind energy applications. However, many of the wind power class 3 areas are located in the Appalachian Mountains along sharp ridge lines at the highest elevations, making them unsuitable for wind turbines. 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 2001]). Aside from the coastal areas and exposed

mountains and ridges of the Appalachians, there is little wind energy potential in the East Central region of the U.S. for current wind turbine applications (Elliott et al. 1986). Wind turbines typically operate at a 30-35 percent capacity factor compared to 90 - 95 percent for a baseload plant (NWPPC 2000). Consequently, the staff concluded that locating a wind energy facility on or near the Peach Bottom site would not be economically feasible given the current state of wind energy generation technology.

8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. Solar power technologies, photovoltaic and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent (NRC 1996), and the capacity factor for solar thermal systems is about 25 percent to 40 percent (NRC 1996). Energy storage requirements limit the use of solar-energy systems as 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 5700 ha (14,000 ac) per 1000 MW(e) for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the Peach Bottom site, and both would have large environmental impacts at a greenfield site.

Furthermore, Exelon noted that solar power is not a technically feasible alternative in Exelon's service area. Southeastern Pennsylvania receives about 3.3 kWh of solar radiation per square meter per day, compared with 5 to 7.2 kWh/m^2 per day in areas of the West, such as California, which are most promising for solar technologies (NRC 1996). Because of the area's low rate of solar radiation and high technology costs, solar power in Pennsylvania is limited to niche applications and is not a feasible base-load alternative to Peach Bottom Units 2 and 3 license renewal.

Some solar power may substitute for electric power in rooftop and building applications. Implementation of non-rooftop solar generation on a scale large enough to replace Peach Bottom Units 2 and 3 would likely result in LARGE environmental impacts.

8.2.5.4 Hydropower

Approximately 6 percent (about 2000 MW) of Pennsylvania electric generating capacity (but less than 1 percent of power production) is hydroelectric. As stated in Section 8.3.4 of the GEIS, hydropower's percentage of the country's generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over

flooding, destruction of natural habitat, and alteration of natural river courses. According to the U.S. Hydropower Resource Assessment for Pennsylvania (Conner and Francfort 1997), there are no remaining sites in Pennsylvania that would be environmentally suitable for a large hydroelectric facility.

The staff estimated in the GEIS that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac or about 1600 mi^2) per 1000 MW(e). Based on this estimate, replacement of Peach Bottom Units 2 and 3 generating capacity would require flooding about 850,000 ha (3300 mi^2). This would result in a large impact on land use. Further, operation of a hydroelectric facility would alter aquatic habitats above and below the dam, which would impact existing aquatic species. Due to the relatively low amount of undeveloped hydropower resource in Pennsylvania and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Peach Bottom Units 2 and 3, the staff concludes that local hydropower is not a feasible alternative to Peach Bottom Units 2 and 3 OL renewal. Any attempts to site hydroelectric facilities large enough to replace Peach Bottom Units 2 and 3 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 Peach Bottom Units 2 and 3. The staff concludes geothermal energy is not a feasible alternative to renewal of the Peach Bottom Units 2 and 3 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 baseload 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 Peach Bottom Units 2 and 3 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. Because of the need for specialized waste-separation and processing equipment for municipal solid waste, the initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities (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 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), much smaller than needed to replace the 2186 MW(e) baseload capacity of Peach Bottom Units 2 and 3. Therefore, the staff concludes that municipal solid waste would not be a feasible alternative to renewal of the Peach Bottom Units 2 and 3 OLs, particularly at the scale required.

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 of being reliable enough to replace a baseload plant such as Peach Bottom Units 2 and 3 (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the Peach Bottom Units 2 and 3 OLs.

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 the most mature fuel cell technology, but they are only in the initial stages of commercialization. Phosphoric acid fuel cells are generally considered first-generation technology. These are commercially available today at a cost of approximately $4500 per kW of installed capacity (DOE 2002). 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 has a performance target that by 2003, two second-generation fuel cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes of approximately 3 MW at a cost of $1000 to $1500 per kW of installed capacity (DOE 2002). 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 2002). At the present time, however, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Fuels cells are, consequently, not a feasible alternative to renewal of the Peach Bottom Units 2 and 3 OLs.

8.2.5.10 Delayed Retirement

Peach Bottom Units 2 and 3 provide about 23 percent of Exelon's operating group generating capacity and approximately 35 percent of its energy requirements to its mid-Atlantic service area. Even without retiring any generating units, Exelon expects to require additional capacity in the near future. Thus, even if substantial capacity were scheduled for retirement and could be delayed, some of the delayed retirement would be needed just to meet load growth. Peach

Bottom Units 2 and 3 will be required, in part, to offset any actual retirements that occur. Delayed retirement of other Exelon generating units could not provide a replacement of the power supplied by Peach Bottom Units 2 and 3 and could not be a feasible alternative to Peach Bottom Units 2 and 3 license renewal.

8.2.5.11 Utility-Sponsored Conservation

In the past, Exelon (formerly PECO) has offered the demand-side management (DSM) programs, which either conserve energy or allow PECO to reduce customers' load requirements during periods of peak demands. The programs, as described by Exelon, are:

Conservation Program

Homeowner agreements to limit peaking power in specific areas

Load Management Programs

- Change status of currently operating units to standby generation
- Curtailable service (e.g., industry agreements)
- Interruptible service (e.g., electric water heaters)

Exelon annually projects both the summer and winter peak power (MW) and annual energy requirements (gigawatt-hours [GWH]) impacts of DSM. Projections for future DSM programs represent substantial decreases in DSM initiatives that were in effect during past years.

Market and regulatory conditions are undergoing dramatic changes that have significantly impacted the cost-effectiveness of utility-sponsored DSM and can be described as follows:

(1) A decline in generation costs, due primarily to technological advances that have reduced the cost of constructing new generating units (e.g., combustion turbines); and

(2) National energy legislation that has encouraged wholesale competition through open access to the transmission grid, as well as state legislation designed to facilitate retail competition.

Consistent with (1) and (2) above, the utility planning environment features lower capacity and lower energy prices than during earlier periods, shorter planning horizons, lower reserve margins, and increased reliance on market prices to direct utility resource planning. These have greatly reduced the number of cost-effective DSM alternatives.

Other significant changes include:

- Rate design programs that enable customers to make energy choices based on their unique needs and energy costs. An example is Exelon's eight percent reduction in electricity rates and caps on future generation and transmission and distribution rates. Such rate designs will increasingly replace incentive-driven direct load-control programs.

- The adoption of increasingly stringent national appliance standards for most major energy-using equipment and the adoption of energy efficiency requirements in state building codes. These mandates have further reduced the potential for cost-effective utility-sponsored measures.

- Third parties are increasingly providing energy services and products in competitive markets at prices that reflect their value to the customer. Market conditions can be expected to continue this shift among providers of cost-effective load management.

For these reasons, Exelon determined that the remaining DSM programs, which are primarily directed toward load management, are not an effective substitute for any of its large base-load units operating at high-capacity factors, including Peach Bottom Units 2 and 3.

Deregulation and Reducing Demand

In November 1996, the General Assembly of Pennsylvania enacted the Electricity Generation Customer Choice and Competition Act. The Act would enable all customers of electric distribution companies in the Commonwealth to purchase electricity from their choice of electric generation suppliers by January 1, 2001 (General Assembly of Pennsylvania 1996). As such, electric generation supply would be based on the customers' needs and preferences, the lowest price, or the best combination of prices, services, and incentives (Pennsylvania Public Utility Commission 2000).

In response, Exelon (as PECO) submitted its restructuring plan and received final approval from the Pennsylvania Public Utility Commission. The restructuring plan allowed all customers to choose among competing power suppliers by January 1, 2000 (PECO 1998). With more than 50 suppliers licensed to sell electricity in Pennsylvania, Exelon will not be able to control demand and offering extensive conservation and load modification incentives would not be effective in a competitive market. As a result, in a deregulated market for generation of electrical power in which the market price of power is a function of supply and demand, Exelon will not be able to offer competitively priced power if it subsidizes demand reduction alternatives. Furthermore, as discussed in this section, there is limited potential to reduce loads using unsubsidized demand reduction alternatives. As a result, demand reduction is not a reasonable alternative to license renewal of Peach Bottom Units 2 and 3. The Public Utility Commission will ensure that the operation of generating units of incumbent utilities will not

inhibit the development of competition within the Commonwealth. Therefore, it is not clear whether Exelon or another competitive supplier would construct new generating units to replace Peach Bottom Units 2 and 3, if its licenses were not renewed. However, regardless of the entity that constructed and operated the replacement power sources, certain environmental parameters would be constant among replacement power sources. Therefore, this DSEIS discusses the impacts of reasonable alternatives to Peach Bottom Untis 2 and 3, without regard to whether they would be owned by Exelon.

The staff concludes that additional DSM, by itself, would not be sufficient to replace the 2186 MW(e) capacity of Peach Bottom Units 2 and 3 and that it is not a reasonable replacement for the OL renewal alternative.

8.2.6 Combination of Alternatives

Even though individual alternatives to Peach Bottom Units 2 and 3 might not be sufficient on their own to replace Peach Bottom Units 2 and 3 capacity due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a combination of alternatives might be cost-effective.

As discussed in Section 8.2, Peach Bottom Units 2 and 3 have a combined net summer rating of 2186 MW(e). For the coal- and natural-gas-fired alternatives, the Exelon ER assumes four standard units that generate a net 508-MW(e) apiece as potential replacements for Units 2 and 3, leaving 154 MW(e) to be supplied.

There are many possible combinations of alternatives. One combination of alternatives that might be assumed as replacements for Peach Bottom Units 2 and 3 would consist of combined cycle natural-gas-fired generation using closed-cycle cooling and additional DSM measures or purchased power. However, Sections 8.2.4 and 8.2.5.11 show that neither additional purchased power nor DSM programs are very practical large-scale alternatives under current regulatory conditions. In addition, Table 8-8 shows that the associated environmental impacts of the combination option still would be at least as large as those of renewing the Peach Bottom Unit 2 and Unit 3 OLs. The impacts 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 associated with power purchased from other generators would still occur but would be located elsewhere within the region, nation, or another country as discussed in Section 8.2.4. The impacts of 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 the Peach Bottom Units 2 and 3 OLs.

Table 8-8. Summary of Environmental Impacts of 1060 MW(e) of Natural Gas-Fired Generation and 1126 MW(e) from Demand-Side Management Measures

Impact Category	Peach Bottom Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	23 ha (55 ac) for power block, offices, roads, and parking areas. Additional impact of up to approximately 22 ha (54 ac) for construction and/or upgrade of an underground gas pipeline.	SMALL to MODERATE	23 ha (55 ac) for power-block, offices, roads, and parking areas. Approximately 259 ha (640 ac) for transmission line. Additional impact for construction and/or upgrade of an underground gas pipeline.
Ecology	SMALL	Uses previously disturbed areas at current Peach Bottom site, plus gas pipeline route.	SMALL to MODERATE	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. Impacts to terrestrial ecology from cooling tower drift. Likely plant sites already have power generation facilities.
Water Use and Quality (Surface Water)	SMALL	Uses existing cooling canal system.	SMALL to MODERATE	Impact depends on volume of water withdrawal and discharge and characteristics of surface water body.
Water Use and Quality (Groundwater)	SMALL	Use of groundwater very unlikely.	SMALL to LARGE	Impacts SMALL if used only for potable purposes; could be MODERATE to LARGE if groundwater is employed as makeup cooling water. Impacts would be site/aquifer specific.
Air Quality	MODERATE	Sulfur oxides • 56 MT/yr (62 tons/yr) Nitrogen oxides • 209 MT/yr (231 tons/yr) Carbon monoxide • 274 MT/yr (304 tons/yr) PM_{10} particulates • 31 MT/yr (35 tons/yr) Some hazardous air pollutants	MODERATE	Potentially same impacts as at the Peach Bottom site.

Table 8-8. (contd)

Impact Category	Peach Bottom Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Waste	SMALL	Minimal waste products from fuel combustion.	SMALL	Minimal waste products from fuel combustion.
Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts considered to be minor.
Socioeconomics	SMALL to MODERATE	During construction, impacts would be MODERATE. Up to 750 additional workers during the peak of the 3-year construction period, followed by reduction from current Peach Bottom Units 2 and 3 work force of 975 to 75; tax base preserved. Impacts during operation would be SMALL.	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Tax impacts on receiving county could be small to MODERATE. Up to 750 additional workers during the peak of the 3-year construction period. Impacts significant if location is in a more rural area than the Peach Bottom site. York County would experience loss of tax base and employment, potentially offset by projected economic growth.
	SMALL to MODERATE	Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.	SMALL to MODERATE	Transportation impacts associated with construction workers would be SMALL to MODERATE and would depend on population density and road infrastructure at alternate site. Impacts during operation would be SMALL due to the smaller workforce.
Aesthetics	SMALL	SMALL impact due to plant units and stacks. Visual impact would be similar to current Peach Bottom site.	SMALL to MODERATE	SMALL if previously developed site is used and site disturbance is minimal. MODERATE with construction of a transmission line to a previously developed site. MODERATE if greenfield site is developed.

Table 8-8. (contd)

Impact Category	Peach Bottom Site		Alternate Site	
	Impact	Comments	Impact	Comments
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed.	SMALL	Same as at the Peach Bottom site. Any potential impacts can likely be effectively managed.
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; loss of 900 operating jobs at Peach Bottom Untis 2 and 3 could reduce employment prospects for minority and low-income populations. Impacts could be offset by projected economic growth and the ability of affected workers to commute to other jobs.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup at site—could be SMALL to MODERATE.

8.3 Summary of Alternatives Considered

The environmental impacts of the proposed action, renewal of the Peach Bottom Units 2 and 3 OLs, 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 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 require replacing electrical generating capacity by (1) demand-side management and energy conservation, (2) power purchased from other electricity providers, (3) generating alternatives other than Peach Bottom Units 2 and 3, or (4) some combination of these options, and would result in decommissioning Peach Bottom Units 2 and 3. 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 Peach Bottom Units 2 and 3. The impacts of purchased electrical 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 Peach Bottom Units 2 and 3.

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

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

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

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

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

40 CFR 96. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 96, "NOx Budget Trading Program for State Implementation Plans."

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