

4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).^(a) The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

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

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Peach Bottom Units 2 and 3. Section 4.1 addresses issues applicable to the cooling system. Section 4.2 addresses issues related to transmission lines and on-site land use. Section 4.3 addresses the radiological impacts of normal operation. Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses new information that was raised during the scoping period. The results of the evaluation of environmental issues related to operation during the renewal term are summarized in

(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.

1 Section 4.8. Finally, Section 4.9 lists the references for Chapter 4. Category 1 and Category 2
 2 issues that are not applicable to Peach Bottom Units 2 and 3 because they are related to plant
 3 design features or site characteristics not found at the Peach Bottom site are listed in
 4 Appendix F.
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6 **4.1 Cooling System**

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 8 Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable
 9 to Peach Bottom Units 2 and 3 cooling system operation during the renewal term are listed in
 10 Table 4-1. Exelon stated in its Environmental Report (ER; Exelon 2001) that it is not aware of
 11 any new and significant information associated with the renewal of the Peach Bottom Units 2
 12 and 3 operating licenses (OLs). The staff has not identified any significant new information
 13 during its independent review of the Exelon ER (Exelon 2001), the staff's site visit, scoping
 14 process, or its evaluation of other available information. Therefore, the staff concludes that
 15 there are no impacts related to these issues beyond those discussed in the GEIS. For all of the
 16 issues, the GEIS concluded that the impacts are SMALL, and additional plant-specific mitigation
 17 measures beyond those already in place at Peach Bottom Units 2 and 3 are not likely to be
 18 sufficiently beneficial to be warranted.
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21 **Table 4-1.** Category 1 Issues Applicable to the Operation of the Peach Bottom Units 2
 22 and 3 Cooling System During the Renewal Term
 23

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1
Altered thermal stratification of lakes	4.2.1.2.3; 4.3.2.2
Temperature effects on sediment transport capacity	4.2.4.2.3; 4.3.2.2
Scouring caused by discharged cooling water	4.2.1.2.3
Eutrophication	4.2.1.2.3
Discharge of chlorine or other biocides	4.2.1.2.4; 4.3.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.3.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3; 4.3.2.1

Table 4-1. (contd)

AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
TERRESTRIAL RESOURCES	
Cooling tower impacts on crops and ornamental vegetation	4.3.4
Cooling tower impacts on native plants	4.3.5.1
Bird collisions with cooling towers	4.3.5.2
HUMAN HEALTH	
Microbiological organisms (occupational health)	4.3.6
Noise	4.3.7

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

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1 The staff has not identified any significant new information during its independent review of
2 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
3 information. Therefore, the staff concludes that there are no impacts of altered current
4 patterns at intake and discharge structures during the renewal term beyond those discussed
5 in the GEIS.

- 6
7 • Altered thermal stratification of lakes. Based on information in the GEIS, the Commission
8 found that

9
10 Generally, lake stratification has not been found to be a problem at operating
11 nuclear power plants and is not expected to be a problem during the license renewal
12 term.

13
14 The staff has not identified any significant new information during its independent review of
15 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
16 information. Therefore, the staff concludes that there are no impacts of altered thermal
17 stratification of lakes during the renewal term beyond those discussed in the GEIS.

- 18
19 • Temperature effects on sediment transport capacity. Based on information in the GEIS, the
20 Commission found that

21
22 These effects have not been found to be a problem at operating nuclear power
23 plants and are not expected to be a problem during the license renewal term.

24
25 The staff has not identified any significant new information during its independent review of
26 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
27 information. Therefore, the staff concludes that there are no impacts of temperature effects
28 on sediment transport capacity during the renewal term beyond those discussed in the
29 GEIS.

- 30
31 • Scouring caused by discharged cooling water. Based on information in the GEIS, the
32 Commission found that

33
34 Scouring has not been found to be a problem at most operating nuclear power
35 plants and has caused only localized effects at a few plants. It is not expected to be
36 a problem during the license renewal term.

37

1 The staff has not identified any significant new information during its independent review of
2 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
3 information. Therefore, the staff concludes that there are no impacts of scouring caused by
4 discharged cooling water during the renewal term beyond those discussed in the GEIS.

- 5
6 • Eutrophication. Based on information in the GEIS, the Commission found that

7
8 Eutrophication has not been found to be a problem at operating nuclear power
9 plants and is not expected to be a problem during the license renewal term.

10
11 The staff has not identified any significant new information during its independent review of
12 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
13 information including plant monitoring data and technical reports. Therefore, the staff
14 concludes that there are no impacts of eutrophication during the renewal term beyond those
15 discussed in the GEIS.

- 16
17 • Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission
18 found that

19
20 Effects are not a concern among regulatory and resource agencies, and are not
21 expected to be a problem during the license renewal term.

22
23 The staff has not identified any significant new information during its independent review of
24 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
25 information including the National Pollutant Discharge Elimination System (NPDES) permit
26 for the Peach Bottom site, plant monitoring data and technical reports. Therefore, the staff
27 concludes that there are no impacts of discharge of chlorine or other biocides during the
28 renewal term beyond those discussed in the GEIS.

- 29
30 • Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS,
31 the Commission found that

32
33 Effects are readily controlled through NPDES permit and periodic modifications, if
34 needed, and are not expected to be a problem during the license renewal term.

35
36 The staff has not identified any significant new information during its independent review of
37 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available

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1 information including the NPDES permit for the Peach Bottom site, plant monitoring data
2 and technical reports. Therefore, the staff concludes that there are no impacts of
3 discharges of sanitary wastes and minor chemical spills during the renewal term beyond
4 those discussed in the GEIS.

- 5
6 • Discharge of other metals in wastewater. Based on information in the GEIS, the
7 Commission found that

8
9 These discharges have not been found to be a problem at operating nuclear power
10 plants with cooling-tower-based heat dissipation systems and have been
11 satisfactorily mitigated at other plants. They are not expected to be a problem
12 during the license renewal term.

13
14 The staff has not identified any significant new information during its independent review of
15 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
16 information including the NPDES permit for the Peach Bottom site, plant monitoring data
17 and technical reports. Therefore, the staff concludes that there are no impacts of
18 discharges of other metals in wastewater during the renewal term beyond those discussed
19 in the GEIS.

- 20
21 • Water-use conflicts (plants with once-through cooling systems). Based on information in
22 the GEIS, the Commission found that

23
24 These conflicts have not been found to be a problem at operating nuclear power
25 plants with once-through heat dissipation systems.

26
27 The staff has not identified any significant new information during its independent review of
28 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
29 information. Therefore, the staff concludes that there are no impacts of water use conflicts
30 associated with the once-through cooling system during the renewal term beyond those
31 discussed in the GEIS.

- 32
33 • Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the
34 Commission found that

35
36 Accumulation of contaminants has been a concern at a few nuclear power plants but
37 has been satisfactorily mitigated by replacing copper alloy condenser tubes with

1 those of another metal. It is not expected to be a problem during the license
2 renewal term.

3
4 The staff has not identified any significant new information during its independent review of
5 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of available
6 information. Therefore, the staff concludes that there are no impacts of accumulation of
7 contaminants in sediments or biota during the renewal term beyond those discussed in the
8 GEIS.

- 9
10 • Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the
11 Commission found that

12
13 Entrainment of phytoplankton and zooplankton has not been found to be a problem
14 at operating nuclear power plants and is not expected to be a problem during the
15 license renewal term.

16
17 The staff has not identified any significant new information during its independent review of
18 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
19 information. Therefore, the staff concludes that there are no impacts of entrainment of
20 phytoplankton and zooplankton during the renewal term beyond those discussed in the
21 GEIS.

- 22
23 • Cold shock. Based on information in the GEIS, the Commission found that

24
25 Cold shock has been satisfactorily mitigated at operating nuclear plants with once-
26 through cooling systems, has not endangered fish populations or been found to be a
27 problem at operating nuclear power plants with cooling towers or cooling ponds, and
28 is not expected to be a problem during the license renewal term.

29
30 The staff has not identified any significant new information during its independent review of
31 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
32 information. Therefore, the staff concludes that there are no impacts of cold shock during
33 the renewal term beyond those discussed in the GEIS.

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- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on the distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- 1 • Gas supersaturation (gas bubble disease). Based on information in the GEIS, the
2 Commission found that

3
4 Gas supersaturation was a concern at a small number of operating nuclear power
5 plants with once-through cooling systems but has been satisfactorily mitigated. It
6 has not been found to be a problem at operating nuclear power plants with cooling
7 towers or cooling ponds and is not expected to be a problem during the license
8 renewal term.

9
10 The staff has not identified any significant new information during its independent review of
11 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
12 information. Therefore, the staff concludes that there are no impacts of gas supersaturation
13 during the renewal term beyond those discussed in the GEIS.

- 14
15 • Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission
16 found that

17
18 Low dissolved oxygen has been a concern at one nuclear power plant with a once-
19 through cooling system but has been effectively mitigated. It has not been found to
20 be a problem at operating nuclear power plants with cooling towers or cooling ponds
21 and is not expected to be a problem during the license renewal term.

22
23 The staff has not identified any significant new information during its independent review of
24 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
25 information. Therefore, the staff concludes that there are no impacts of low dissolved
26 oxygen during the renewal term beyond those discussed in the GEIS.

- 27
28 • Losses from predation, parasitism, and disease among organisms exposed to sublethal
29 stresses. Based on information in the GEIS, the Commission found that

30
31 These types of losses have not been found to be a problem at operating nuclear
32 power plants and are not expected to be a problem during the license renewal term.

33
34 The staff has not identified any significant new information during its independent review of
35 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
36 information. Therefore, the staff concludes that there are no impacts of losses from

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1 predation, parasitism, and disease among organisms exposed to sublethal stresses during
2 the renewal term beyond those discussed in the GEIS.

- 3
4 • Stimulation of nuisance organisms. Based on information in the GEIS, the Commission
5 found that

6
7 Stimulation of nuisance organisms has been satisfactorily mitigated at the single
8 nuclear power plant with a once-through cooling system where previously it was a
9 problem. It has not been found to be a problem at operating nuclear power plants
10 with cooling towers or cooling ponds and is not expected to be a problem during the
11 license renewal term.

12
13 The staff has not identified any significant new information during its independent review of
14 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
15 information. Therefore, the staff concludes that there are no impacts of stimulation of
16 nuisance organisms during the renewal term beyond those discussed in the GEIS.

- 17
18 • Cooling tower impacts on crops and ornamental vegetation. Based on information in the
19 GEIS, the Commission found that

20
21 Impacts from salt drift, icing, fogging, or increased humidity associated with cooling
22 tower operation have not been found to be a problem at operating nuclear power
23 plants and are not expected to be a problem during the renewal term.

24
25 The staff has not identified any significant new information during its independent review of
26 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
27 information. Therefore, the staff concludes that there are no cooling tower impacts on crops
28 and ornamental vegetation during the renewal term beyond those discussed in the GEIS.

- 29
30 • Cooling tower impacts on native plants. Based on information in the GEIS, the Commission
31 found that

32
33 Impacts from salt drift, icing, fogging, or increased humidity associated with cooling
34 tower operation have not been found to be a problem at operating nuclear power
35 plants and are not expected to be a problem during the license renewal term.

1 The staff has not identified any significant new information during its independent review of
2 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
3 information. Therefore, the staff concludes that there are no cooling tower impacts on
4 native plants during the renewal term beyond those discussed in the GEIS.

- 5
6 • Bird collisions with cooling towers. Based on information in the GEIS, the Commission
7 found that

8
9 These collisions have not been found to be a problem at operating nuclear power
10 plants and are not expected to be a problem during the license renewal term.

11
12 The staff has not identified any significant new information during its independent review of
13 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
14 information. Therefore, the staff concludes that there are no impacts of bird collisions with
15 cooling towers during the renewal term beyond those discussed in the GEIS.

- 16
17 • Microbiological organisms (occupational health). Based on information in the GEIS, the
18 Commission found that

19
20 Occupational health impacts are expected to be controlled by continued application
21 of accepted industrial hygiene practices to minimize worker exposures.

22
23 The staff has not identified any significant new information during its independent review of
24 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
25 information. Therefore, the staff concludes that there are no impacts of microbiological
26 organisms on occupational health during the renewal term beyond those discussed in the
27 GEIS.

- 28
29 • Noise. Based on information in the GEIS, the Commission found that

30
31 Noise has not been found to be a problem at operating plants and is not expected to
32 be a problem at any plant during the license renewal term.

33
34 The staff has not identified any significant new information during its independent review of
35 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
36 information. Therefore, the staff concludes that there are no impacts of noise during the
37 renewal term beyond those discussed in the GEIS.

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The Category 2 issues related to cooling system operation during the renewal term that are applicable to Peach Bottom Units 2 and 3 are discussed in the section that follows, and are listed in Table 4-2.

4.1.1 Water Use Conflicts (Plants With Cooling Ponds or Cooling Towers Using Make-Up Water From a Small River With Low Flow)

Water use conflicts for plants with cooling ponds or cooling towers using make-up water from a small river with low flow is a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff independently reviewed the Peach Bottom Atomic Power Station ER (Exelon 2001), visited the site, and reviewed the applicant’s NPDES Permit issued by the Commonwealth of Pennsylvania (PA0009733, that expires on December 1, 2005).

Table 4-2. Category 2 Issues Applicable to the Operation of the Peach Bottom Units 2 and 3 Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	4.3.2.1	A	4.1.1
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.3.3	B	4.1.2
Impingement of fish and shellfish	4.2.2.1.3; 4.3.3	B	4.1.3
Heat shock	4.2.2.1.4; 4.3.3	B	4.1.4
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers or cooling ponds that discharge into a small river)	4.3.6	G	4.1.5

1 Surface water withdrawals may impact riparian and in-stream habitat. Section 2.2.2 describes
2 Peach Bottom site surface water withdrawals from Conowingo Pond.

3
4 The impact of consumptive loss on the downstream riparian communities is associated with the
5 difference it could potentially cause in river surface elevation. As described in Section 2.1.3,
6 Peach Bottom Units 2 and 3 normally operate as once-through plants. As necessary,
7 60 percent of the circulating water can also be diverted to three mechanical-draft helper cooling
8 towers for additional cooling before discharging to the discharge canal. If the three helper
9 cooling towers were operated, approximately 0.16 to 0.62 m³/s (5.5 to 22 cfs) would be lost to
10 evaporation (Section 316(a) Demonstration Report, July 1975). During a 50-year period, the
11 minimum monthly average flow was 42.5 m³/s (1500 cfs). The consumptive loss incurred by
12 plant operation of the helper cooling towers has the greatest effect on surface elevation during
13 low-flow periods. At the minimum monthly average flow, evaporative loss due to operation of
14 the helper cooling towers would represent less than 2 percent of the river's flow.

15
16 The staff reviewed the Clean Water Act 316(a) demonstration for Peach Bottom Units 2 and 3
17 and the ER relative to potential water-use conflicts due to consumptive loss of stream flow from
18 the helper cooling towers usage. Based on this review, the staff has concluded that the
19 potential impacts are SMALL, and further mitigation is not warranted.

20 21 **4.1.2 Entrainment of Fish and Shellfish in Early Life Stages**

22
23 For plants with once-through cooling systems, entrainment of fish and shellfish in early life
24 stages into cooling water systems associated with nuclear power plants is considered a
25 Category 2 issue, requiring a site-specific assessment before license renewal.

26
27 The staff independently reviewed the Peach Bottom Atomic Power Station ER (Exelon 2001),
28 visited the site, and reviewed the applicant's NPDES Permit.

29
30 Section 316(b) of the Clean Water Act (CWA) requires that any standard established pursuant
31 to Sections 301 or 306 of the CWA shall require that the location, design, construction, and
32 capacity of cooling water intake structures reflect the best technology available for minimizing
33 adverse environmental impacts (33 USC 1326). Entrainment through the condenser cooling
34 system of fish and shellfish in the early life stages is a potential adverse environmental impact
35 that can be minimized by the best available technology. Exelon (as PECO) submitted a
36 comprehensive CWA Section 316(b) Demonstration to the U.S. Environmental Protection
37 Agency (EPA) in June 1977 in accordance with the "Special Conditions: Environmental Studies"
38 provision of NPDES Permit PA00097733, issued December 31, 1976, and revised April 11,

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1 1977 (PECO 1977). The 316(b) Demonstration noted that no significant detrimental effects had
2 occurred in the population of organisms in Conowingo Pond between the pre- and the post-
3 operational periods of study as a result of Peach Bottom Units 2 and 3 operation. The 316(b)
4 Demonstration concluded that: "the intake structure at Peach Bottom reflects the best
5 technology available for minimizing adverse environmental effects" (PECO 1977). Subsequent
6 NPDES permits have required no further entrainment studies. In compliance with the
7 provisions of the Clean Water Act and Pennsylvania's Clean Streams Law, Pennsylvania issued
8 the current NPDES permit.

9
10 Section 2.2.5 discusses the efforts of State and Federal agencies to restore anadromous fish
11 populations in the Susquehanna River. Exelon and other operators of hydroelectric facilities on
12 the lower Susquehanna fund this activity. As a result of these efforts, numbers of adult
13 anadromous fish (particularly American shad and blueback herring) ascending the river in the
14 spring to spawn have increased dramatically. Numbers of post-spawning adults and juveniles
15 (young-of-the-year) moving downstream in the fall have also increased substantially.

16
17 Exelon has not evaluated entrainment of anadromous fishes specifically because most
18 (excluding one stretch of river between the Safe Harbor and York Haven dams) shad and
19 herring spawning and nursery areas are upstream of the Holtwood, Safe Harbor, and York
20 Haven hydroelectric dams and the Peach Bottom site (Figure 2-1). Larval shad grow quickly
21 and develop into 10- to 15-cm (4- to 6-in.) juveniles by early fall. They begin to leave nursery
22 areas and migrate downstream in September or October, depending on water temperatures,
23 and pass through the turbines (and, less frequently, the spillway) of hydroelectric facilities en
24 route to the Chesapeake Bay. These juvenile shad and herring are too large to be entrained in
25 the condenser cooling water at Peach Bottom Units 2 and 3 (Susquehanna River Anadromous
26 Fish Restoration Cooperative 1997, 1998, 1999, 2000).

27
28 The staff has reviewed the available information and based on the results of entrainment
29 studies and the operating history of the Peach Bottom Units 2 and 3 intake structure, concludes
30 that the potential impacts of entrainment of fish and shellfish in the early life stages in the
31 cooling water intake system are SMALL. During the course of the SEIS preparation, the staff
32 considered mitigation measures for the continued operation of Peach Bottom Units 2 and 3.
33 When continued operation for an additional 20 years is considered as a whole, all of the
34 specific effects on the environment (whether or not "significant") were considered. Based on
35 the assessment to date, the staff expects that the measures in place at Peach Bottom Units 2
36 and 3 (e.g., intake screens) provide mitigation for all impacts related to entrainment and no
37 further mitigation measures are warranted.

1 **4.1.3 Impingement of Fish and Shellfish**

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3 For plants with once-through cooling systems, impingement of fish and shellfish on debris
4 screens of cooling water systems associated with nuclear power plants is considered a
5 Category 2 issue, requiring a site-specific assessment before license renewal.

6
7 The staff independently reviewed the Peach Bottom Units 2 and 3 ER (Exelon 2001), visited the
8 site, and reviewed the applicant's NPDES Permit.

9
10 Section 316(b) of the Clean Water Act (CWA) requires that any standard established pursuant
11 to Sections 301 or 306 of the CWA shall require that the location, design, construction, and
12 capacity of cooling water intake structures reflect the best technology available for minimizing
13 adverse environmental impacts (33 USC 1326). The designed operation criteria are maintained
14 in part by removal of sediments that are deposited in the canal. Maintenance of the designed
15 depth for the intake canal helps ensure that approach velocities at the screens meet criteria.
16 Impingement on debris screens of the cooling system of fish and shellfish is a potential adverse
17 environmental impact that can be minimized by the best available technology. Exelon (as
18 PECO) submitted a 316(b) Demonstration to the EPA in June 1977 in accordance with the
19 "Special Conditions: Environmental Studies" provision of NPDES Permit PA00097733, issued
20 December 31, 1976, and revised April 11, 1977 (PECO 1977). The 316(b) Demonstration
21 noted that no significant detrimental effects had occurred in the population of organisms in
22 Conowingo Pond between the pre- and the post-operational periods of study as a result of
23 Peach Bottom Units 2 and 3 operation. The 316(b) Demonstration concluded that: "the intake
24 structure at Peach Bottom reflects the best technology available for minimizing adverse
25 environmental effects" (Philadelphia Electric Company 1977). Subsequent NPDES permits
26 have required no further impingement studies. In compliance with the provisions of the Clean
27 Water Act and Pennsylvania's Clean Streams Law, Pennsylvania issued the current NPDES
28 permit.

29
30 Since 1985, Exelon has conducted studies at the Peach Bottom site in the fall of the year to
31 assess the impingement of outmigrating juvenile American shad and river herring. Juvenile
32 American shad in the Susquehanna River upstream of Conowingo Dam are from two sources:
33 natural reproduction of adult spawners and hatchery stockings of larvae (fry) produced in
34 Pennsylvania Fish and Boat Commission or U.S. Fish and Wildlife Service facilities
35 (Pennsylvania Fish & Boat Commission 2000). During 1999, approximately 95 percent of the
36 juveniles examined at the Peach Bottom site were produced in hatcheries (Susquehanna River
37 Anadromous Fish Restoration Cooperative 2000). During 1999, intake screens at Peach
38 Bottom Units 2 and 3 were examined three times weekly from October 18 through
39 December 20 (23 sample dates). More than 5000 fish were impinged, including 285 juvenile

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1 (young-of-the-year) American shad, 112 juvenile blueback herring, and 2 adult blueback herring
2 (Susquehanna River Anadromous Fish Restoration Cooperative 2000).

3
4 Numbers of American shad impinged during the fall of 1999 were very small compared to the
5 number of American shad fry and fingerlings stocked in the Susquehanna River and its
6 tributaries during the previous summer (14.4 million fry were stocked during May and June
7 1999). Numbers of American shad and blueback herring impinged were very small compared
8 to the numbers of spawning adults captured and passed at the Conowingo Dam during the
9 spring of 1999 (69,712 American shad and 130,625 blueback herring), particularly when the
10 reproductive potential of these species is taken into consideration (Susquehanna River
11 Anadromous Fish Restoration Cooperative 2000). Depending on size, age, and condition, each
12 American shad female produces an average of 250,000 eggs. Each blueback herring female
13 produces an average of 80,000 eggs. Based on 1999 studies, numbers of American shad and
14 blueback herring impinged at Peach Bottom Units 2 and 3 represent a very small percentage of
15 the total number of outmigrating juvenile and adult fish. These losses are not sufficiently high
16 to adversely affect Susquehanna River shad and river herring populations and do not represent
17 a threat to ongoing anadromous fish restoration efforts. In recent years, 82 (1999) to 98 (1997)
18 percent of all fish impinged at Peach Bottom Units 2 and 3 have been gizzard shad. Because
19 this is a fast-growing species with high reproductive potential, impingement losses would have
20 no discernible effect on the Conowingo Pond gizzard shad population.

21
22 The staff has reviewed the available information and based on the results of impingement
23 studies and the operating history of the Peach Bottom Units 2 and 3 intake structure, concludes
24 that the potential impacts of impingement of fish and shellfish the on debris screens of the
25 cooling water intake system are SMALL. During the course of the SEIS preparation, the staff
26 considered mitigation measures for the continued operation of Peach Bottom Units 2 and 3.
27 When continued operation for an additional 20 years is considered as a whole, all of the
28 specific effects on the environment (whether or not "significant") were considered. Based on
29 the assessment to date, the staff expects that the measures in place at Peach Bottom Units 2
30 and 3 (e.g., intake screens and the waste heat treatment facility) provide mitigation for all
31 impacts related to impingement and no further mitigation measures are warranted.

32 33 **4.1.4 Heat Shock**

34
35 For plants with once-through cooling systems, the effects of heat shock are listed as a
36 Category 2 issue and require plant-specific evaluation before license renewal. NRC made
37 impacts on fish and shellfish resources resulting from heat shock a Category 2 issue, because
38 of continuing concerns about thermal discharge effects and the possible need to modify thermal
39 discharges in the future in response to changing environmental conditions (NRC 1996).

1 Information to be ascertained includes: (1) type of cooling system (whether once-through or
2 cooling pond), and (2) evidence of a CWA Section 316(a) variance or equivalent state
3 documentation.

4
5 The staff independently reviewed the Peach Bottom Peach Bottom Units 2 and 3 ER (Exelon
6 2001), visited the site, and reviewed the applicant's NPDES Permit.

7
8 Peach Bottom Units 2 and 3 use a once-through heat dissipation system. Exelon also has
9 Section 316(a) alternative thermal effluent limits. Five mechanical draft ("helper") cooling
10 towers were built on berms adjacent to the discharge canal to supply additional cooling capacity
11 in summer months, but in recent years these cooling towers have not been necessary.
12 Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can
13 demonstrate that thermal discharge limitations are more stringent than necessary to protect a
14 balanced indigenous population of fish and wildlife, and obtain alternative facility-specific
15 thermal discharge limits (33 USC 1326). Exelon (as PECO) submitted a CWA Section 316(a)
16 demonstration for Peach Bottom Units 2 and 3 in July 1975, which was accepted by the
17 Pennsylvania Department of Environmental Protection and has been periodically reviewed and
18 accepted by that State agency since the initial submittal. Because Peach Bottom Units 2 and 3
19 have a 316(a) alternative thermal effluent limit, no further assessment is required.

20
21 The staff has reviewed the available information and, on the basis of the conditions of the
22 NPDES permit and the operating history of the Peach Bottom Units 2 and 3 discharge,
23 concludes that the potential impacts of discharging heated water from the cooling water intake
24 system are SMALL. During the course of the SEIS preparation, the staff considered mitigation
25 measures for the continued operation of Peach Bottom Units 2 and 3. When continued
26 operation for an additional 20 years is considered as a whole, all of the specific effects on the
27 environment (whether or not "significant") were considered. Based on the assessment to date,
28 the staff expects that the measures in place at Peach Bottom Units 2 and 3 (e.g., intake
29 screens) provide mitigation for all impacts related to heat shock and no further mitigation
30 measures are warranted.

31 32 **4.1.5 Microbiological Organisms (Public Health)**

33
34 For plants discharging cooling water to cooling ponds, lakes, canals, or small rivers, the effects
35 of microbiological organisms on human health are listed as a Category 2 issue and require
36 plant-specific evaluation before license renewal. The Category 2 designation is based on the
37 magnitude of the potential public health impacts associated with thermal enhancement of
38 *Naegleria fowleri* (a pathogenic amoeba) that could not be determined generically. NRC noted
39 that impacts of nuclear plant cooling towers and thermal discharges are considered to be of

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1 small significance if they do not enhance the presence of microorganisms that are detrimental
2 to water quality and public health (NRC 1999). The assessment criteria relate to thermal
3 discharge temperature, thermal characteristics, thermal conditions for the enhancement of
4 *N. fowleri*, and impact to public health.

5
6 The staff independently reviewed the Peach Bottom Units 2 and 3 ER (Exelon 2001), visited the
7 site, and reviewed the applicant's NPDES Permit.

8
9 Peach Bottom Units 2 and 3 use a once-through cooling water system that withdraws from and
10 discharges to Conowingo Pond. Five mechanical draft ("helper") cooling towers were built on
11 berms adjacent to the discharge canal to supply additional cooling capacity in summer months,
12 but in recent years these cooling towers have not been necessary. Discharge limits and
13 monitoring requirements for Peach Bottom Units 2 and 3 are set forth in the applicant's NPDES
14 Permit. The NPDES permit states that "the permittee shall provide for effective disinfection of
15 this discharge to control disease-producing organisms during the swimming season (May 1
16 through September 30) to achieve a fecal coliform concentration not greater than 200/100 ml
17 geometric average, and not greater than 1000/100 ml in more than 10% of the samples tested"
18 [Part C(I)(E)].

19
20 The discharge temperatures from Peach Bottom Units 2 and 3, which do not exceed 43.3 °C
21 (110 °F) in late summer, are below those known to be conducive to growth and survival of
22 thermophilic pathogens. Further, disinfection of the sewage effluent from the Peach Bottom
23 site reduces the likelihood that a seed source or inoculants would be introduced to the station's
24 heated discharge or Conowingo Pond.

25
26 The staff has reviewed the thermal characteristics of the Conowingo Pond and the Peach
27 Bottom Units 2 and 3 discharge. The staff does not expect power plant operations to stimulate
28 growth and reproduction of pathogenic microbiological organisms in Conowingo Pond
29 downstream of the plant. Under certain circumstances, the organisms might be present in the
30 immediate area of the discharge outfall but would not be expected in sufficient concentrations
31 to pose a threat to downstream water users. Many of these pathogenic microbiological
32 organisms are ubiquitous in nature, occurring in the digestive tracts of wild mammals and birds,
33 but are usually only a problem when the host is immunologically compromised. The thermal
34 characteristics of the Peach Bottom Units 2 and 3 discharge would not promote the growth of
35 microbiological organisms that are detrimental to water and public health. The staff does not
36 expect operations of Peach Bottom Units 2 and 3 or cooling systems to change significantly
37 over the license renewal term, and there is no reason to believe that discharge temperatures
38 will increase or that disinfection would cease. Thus, the staff concludes that potential effects of
39 microbiological organisms on human health resulting from the operation of the plant's cooling

1 water discharge to the aquatic environment on or in the vicinity of the site are SMALL. The staff
 2 also concludes that the mitigation in place at the Peach Bottom site, that is management of the
 3 discharge temperatures into Conowingo Pond and sewage treatment, will control any potential
 4 growth of thermophilic microbiological organisms and further mitigation is not warranted.
 5

6 **4.2 Transmission Lines**

7
 8 Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to
 9 the transmission line from Peach Bottom Units 2 and 3 are listed in Table 4-3. Exelon stated in
 10 its ER that it is not aware of any new and significant information associated with the renewal of
 11 the Peach Bottom Units 2 and 3 OLS. The staff has not identified any significant new
 12 information during its independent review of the Exelon ER (Exelon 2001), the staff's site visit,
 13 the scoping process, or its evaluation of other available information. Therefore, the staff
 14 concludes that there are no impacts related to these issues beyond those discussed in the
 15 GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and
 16 additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be
 17 warranted.
 18

19 **Table 4-3.** Category 1 Issues Applicable to Transmission Lines During the Renewal Term

20

21 ISSUE -- 10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
22 TERRESTRIAL RESOURCES	
23 Power line right-of-way management (cutting and herbicide application)	4.5.6.1
24 Bird collisions with power lines	4.5.6.2
25 Impacts of electromagnetic fields on flora and fauna (plants, agricultural 26 crops, honeybees, wildlife, livestock)	4.5.6.3
27 Floodplains and wetland on power line right-of-way	4.5.7
28 AIR QUALITY	
29 Air quality effects of transmission lines	4.5.2
30 LAND USE	
31 Onsite land use	4.5.3
32 Power line right-of-way	4.5.3

33
34

35 A brief description of the staff's review and GEIS conclusions, as codified in Table B-1 of the
 36 GEIS, for each of these issues follows:

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- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, and consultation with the U.S. Fish and Wildlife Service (FWS), or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line right-of-way management during the renewal term beyond those discussed in the GEIS.

- Bird collisions with power lines. Based on information in the GEIS, the Commission found that

Impacts are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, consultation with FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

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- Flood plains and wetlands on power line right-of-way. Based on information in the GEIS, the Commission found that

Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff’s site visit, the scoping process, consultation with FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on floodplains and wetlands during the renewal term beyond those discussed in the GEIS.

- Air-quality effects of transmission lines. Based on the information in the GEIS, the Commission found that

Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff’s site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

Projected onsite land use changes required during the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff’s site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no onsite land use impacts during the renewal term beyond those discussed in the GEIS.

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- Power line right-of-way (land use). Based on information in the GEIS, the Commission found that

Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line rights-of-way on land use during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue and one uncategorized issue related to transmission lines. These issues are listed in Table 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-4. Category 2 and Uncategorized Issues Applicable to Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

In the GEIS (NRC 1996), the staff found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC 1997) criteria, it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents. In the case

1 of Peach Bottom, there have been no previous NRC or NEPA analyses of transmission-line
2 induced current hazards. Therefore, this section provides an analysis of the Peach Bottom
3 transmission line's conformance with the NESC standard. The analysis is based on data
4 generated for the design and construction of a non-Peach Bottom transmission line that runs
5 parallel to the Peach Bottom line.

6
7 There is one 500-kV transmission line that connects the Peach Bottom switchyard to the
8 Keeney substation. This line was constructed before the current (1997) NESC standard was
9 adopted. Another line, a 230-kV line, shares the corridor for approximately 19 km (12 miles),
10 from Colora to the Cecil substations. Exelon performed an analysis to confirm that the
11 transmission lines conform to the current NESC clearance requirements for limiting electric
12 shock hazard. The NESC requires that transmission lines be designed to limit the steady-state
13 current due to electrostatic effects to 5 mA root mean square (rms).

14
15 Calculations were performed to estimate the electrostatic effects (induced effects) based on the
16 strength of the electrostatic field, which, in turn, depends on the voltage of the transmission
17 line. The calculations were based on scaling factors from other induced current calculations,
18 which were applied to the electric field strengths to obtain the current (Tetra Tech NUS 2000).
19 It was assumed that a large tractor-trailer (55-ft long by 8-ft wide and 11.8 ft average height) is
20 located directly under the transmission line. Scaling factors for tractor-trailers in the other
21 induced current calculations ranged from 0.65 to 0.92 (mA-m/kV). An average scaling factor of
22 0.80 mA-m/kV was used. For comparison the scaling factor in the EPRI Handbook, Table
23 8.8.3, for a truck (52-ft-long by 8-ft-wide by 12-ft-tall) is 0.64. Hence the analysis is
24 conservative. The maximum line voltage for the 500-kV line is 525 kV, and for the 230-kV line
25 is 241.5 kV. Based on these maximum field strengths the tractor-trailer would experience a
26 field-strength of 6.22 kV/m, resulting in an induced current of 4.98 mA.

27
28 The maximum steady state short-circuit currents determined by Exelon both onsite and offsite
29 are within the NESC limit of 5 mA. Therefore, the staff concludes that the impact of the
30 potential for electric shock is SMALL, and further mitigation is not warranted.

31 32 **4.2.2 Electromagnetic Fields—Chronic Effects**

33
34 In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not
35 designated as Category 1 or 2, and will not be until a scientific consensus is reached on the
36 health implications of these fields.

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1 The potential for chronic effects from these fields continues to be studied and is not known at
2 this time. The National Institute of Environmental Health Sciences (NIEHS) directs related
3 research through the U.S. Department of Energy (DOE). A recent report (NIEHS 1999)
4 contains the following conclusion:

5
6 The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field]
7 exposure cannot be recognized as entirely safe because of weak scientific evidence that
8 exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to
9 warrant aggressive regulatory concern. However, because virtually everyone in the
10 United States uses electricity and therefore is routinely exposed to ELF-EMF, passive
11 regulatory action is warranted such as a continued emphasis on educating both the
12 public and the regulated community on means aimed at reducing exposures. The
13 NIEHS does not believe that other cancers or non-cancer health outcomes provide
14 sufficient evidence of a risk to currently warrant concern.

15
16 This statement is not sufficient to cause the staff to change its position with respect to the
17 chronic effects of electromagnetic fields. The staff considers the GEIS finding of “not
18 applicable” still appropriate and will continue to follow developments on this issue.

20 **4.3 Radiological Impacts of Normal Operations**

21
22 Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to
23 Peach Bottom Units 2 and 3 in regard to radiological impacts are listed in Table 4-5. Exelon
24 stated in its ER (Exelon 2001) that it is not aware of any new and significant information
25 associated with the renewal of the Peach Bottom Units 2 and 3 OLS.

26
27 **Table 4-5.** Category 1 Issues Applicable to Radiological Impacts of Normal Operations
28 During the Renewal Term

29

30 ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	31 GEIS Section
32 HUMAN HEALTH	
33 Radiation exposures to public (license renewal term)	34 4.6.2
35 Occupational radiation exposures (license renewal term)	36 4.6.3

37

38 The staff has not identified any significant new information during its independent review of the
39 Exelon ER, the staff’s site visit, the scoping process, or its evaluation of other information.
40 Therefore, the staff concludes that there are no impacts related to these issues beyond those

1
2 discussed in the GEIS. For all of those issues, the the staff concluded in the GEIS that the
3 impacts are SMALL, and additional plant-specific mitigation measures are not likely to be
4 sufficiently beneficial to be warranted.

5
6 A brief description of the staffs review and the GEIS conclusions, as codified in Table B-1, for
7 each of these issues follows:

- 8
9 • Radiation exposures to public (license renewal term). Based on information in the GEIS,
10 the Commission found that

11
12 Radiation doses to the public will continue at current levels associated with
13 normal operations.

14
15 The staff has not identified any significant new information during its independent review of
16 the Exelon ER, the staff’s site visit, the scoping process, or its evaluation of other available
17 information. Therefore, the staff concludes that there are no impacts of radiation exposures
18 to the public during the renewal term beyond those discussed in the GEIS.

- 19
20 • Occupational radiation exposures (license renewal term). Based on information in the
21 GEIS, the Commission found that

22
23 Projected maximum occupational doses during the license renewal term are
24 within the range of doses experienced during normal operations and normal
25 maintenance outages, and would be well below regulatory limits.

26
27 The staff has not identified any significant new information during its independent review of
28 the Exelon ER, the staff’s site visit, the scoping process, or its evaluation of other available
29 information. Therefore, the staff concludes that there are no impacts of occupational
30 radiation exposures during the renewal term beyond those discussed in the GEIS.

31
32 There are no Category 2 issues related to radiological impacts of routine operations.

33
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4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. Exelon (formerly PECO) stated in its ER (Exelon 2001) that it is not aware of any new and significant information associated with the renewal of Peach Bottom Units 2 and 3 OLs. The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety,

1 social services, and tourism and recreation during the renewal term beyond those discussed
2 in the GEIS.

- 3
4 • Public services: education (license renewal term). Based on information in the GEIS, the
5 Commission found that

6
7 Only impacts of small significance are expected.

8
9 The staff has not identified any significant new information during its independent review of
10 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
11 information. Therefore, the staff concludes that there are no impacts on education during
12 the renewal term beyond those discussed in the GEIS.

- 13
14 • Aesthetic impacts (license renewal term). Based on information in the GEIS, the
15 Commission found that

16
17 No significant impacts are expected during the license renewal term.

18
19 The staff has not identified any significant new information during its independent review of
20 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
21 information. Therefore, the staff concludes that there are no aesthetic impacts during the
22 renewal term beyond those discussed in the GEIS.

- 23
24 • Aesthetic impacts of transmission lines (license renewal term). Based on information in the
25 GEIS, the Commission found that

26
27 No significant impacts are expected during the license renewal term.

28
29 The staff has not identified any significant new information during its independent review of
30 the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available
31 information. Therefore, the staff concludes that there are no aesthetic impacts of
32 transmission lines during the renewal term beyond those discussed in the GEIS.

33
34 Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis and
35 environmental justice, which was not addressed in the GEIS.

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Table 4-7. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SOCIOECONOMICS			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public Services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental Justice	Not addressed ^(a)	Not addressed ^(a)	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice must be addressed in the licensee's environmental report and the staff's environmental impact statement.

4.4.1 Housing Impacts During Operations

In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NRC 1996), which presents a population characterization method that is based on two factors, "sparseness" and "proximity" (GEIS Section C.1.4 [NRC 1996; 1999]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

In 1990, the population living within 32 km (20 mi) of Peach Bottom Units 2 and 3 was estimated to be approximately 481,900 (Exelon 2001, Table G.2-2). This translates to around 150 persons/km² (383 persons/mi²) living on the land area present within a 32-km (20-mi) radius of the Peach Bottom site. This concentration falls into the GEIS sparseness Category 4 (i.e., having greater than or equal to 46 persons/km² [120 persons/mi²]). These calculations were redone using the 2000 Census of Population, finer geographic detail, and a more conservative rule, which counted only those Census block groups contained entirely within the 32-km (20-mi) circle. This produced an estimate of at least 452,400, or 139 persons/km² (360 persons/mi²), still GEIS sparseness category 4.

1 The proximity score also was recalculated by the NRC staff using the 2000 Census. The
2 conservative estimate using the 2000 Census was about 5.3 million, or 260 persons/km²
3 (670 persons/mi²), well within proximity Category 4. Applying the GEIS proximity measures
4 (NRC 1996; 1999), Peach Bottom Units 2 and 3 are classified as Category 4 (i.e., having
5 greater than or equal to 73 persons/km² [190 persons/mi²]) within 80 km (50 mi) of the site.
6 According to the GEIS, these sparseness and proximity scores identify the nuclear units as
7 being located in a high-population area.

8
9 In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts on housing
10 availability are expected to be of small significance at plants located in a high-population area
11 where growth-control measures are not in effect. The Peach Bottom site is located in a high-
12 population area, and although both York County and Lancaster County and their municipal and
13 township governmental units attempt to direct growth to maintain the rural character of the
14 southern parts of the counties (Lancaster County Planning Commission 1997, Lancaster
15 County [PA] Planning Commission 1999, York County Planning Commission 1997, York County
16 Department of Planning and Zoning 2000), these growth-control measures would not limit the
17 relatively small amount of additional housing that might be required. Based on the NRC criteria,
18 Exelon expects housing impacts to be SMALL during continued operations (Exelon 2001).

19
20 SMALL impacts result when no discernible change in housing availability occurs, changes in
21 rental rates and housing values are similar to those occurring statewide, and no housing
22 construction or conversion is required to meet new demand (NRC 1996). The GEIS assumes
23 that no more than a total additional staff of 60 permanent workers might be needed at both
24 units together during the license renewal period to perform routine maintenance and other
25 activities. Although Exelon expects to perform these routine activities during scheduled
26 outages, they assumed they would not add more than 60 total employees to their permanent
27 staff during license renewal (Exelon 2001). This addition of 60 permanent workers, plus 81
28 indirect jobs (Exelon 2001), would result in an increased demand for a total of 141 housing units
29 around the Peach Bottom site (or 93 housing units for York and Lancaster Counties).^(a) The
30 demand for the existing housing units could be met with the construction of new housing or use
31 of existing, unoccupied housing. In York and Lancaster Counties, nonagricultural employment
32 was approximately 398,000 in 2000 (Commonwealth of Pennsylvania Department of Labor and
33 Industry Center for Workforce Information and Analysis 2001) and the population at around
34 870,000 in 2000 (Exelon 2001). Even if the increase in projected housing units were
35 concentrated in the rural southern parts of York and Lancaster counties, it would not create a
36 discernible change in housing availability, change in rental rates or housing values, or spur

(a) This assumes 66 percent of the new hires reside in the two counties (see Section 2.2.8.1).

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1 much new construction or conversion. As a result, Exelon concludes that the impacts would be
2 SMALL and mitigation measures would not be necessary (Exelon 2001).^(a)

3
4 The staff reviewed the available information relative to housing impacts and Exelon's
5 conclusions. Based on this review, the staff concludes that the impact on housing during the
6 license renewal period would be SMALL, and further mitigation is not warranted.

7 8 **4.4.2 Public Services: Public Utility Impacts During Operations**

9
10 Impacts on public utility services are considered SMALL if there is little or no change in the
11 ability of the system to respond to the level of demand, and thus there is no need to add capital
12 facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs
13 during periods of peak demand. Impacts are considered LARGE if existing levels of service
14 (e.g., water or sewer services) are substantially degraded and additional capacity is needed to
15 meet ongoing demands for services. The GEIS indicates that, in the absence of new and
16 significant information to the contrary, the only impacts on public utilities that could be
17 significant are impacts on public water supplies (NRC 1996).

18
19 Analysis of impacts on the public water supply system considered both plant demand and plant-
20 related population growth. Section 2.2.2 describes the Peach Bottom Units 2 and 3 permitted
21 withdrawal rate and actual use of water. Exelon plans no refurbishment in conjunction with this
22 license renewal, so plant demand would not change beyond current demands (Exelon 2001).

23
24 Exelon assumed an increase of 60 license renewal employees during license renewal, the
25 generation of 141 new jobs, and a net overall population increase of approximately 375 persons
26 and 93 households as a result of those jobs,^(b) all of which would create SMALL impacts. The
27 plant-related population increase would require an additional 115 m³/day (30,000 gal/day) of
28 potable water (Exelon 2001).^(c) This amount is within the residual capacity of the existing water
29 systems that service York and Lancaster counties. The current approximate average daily
30 demand for both counties combined is 371,000 m³/day (98 million gpd), and the projected
31 expected demand in 2010 is 503,500 m³/day (133 million gpd). The additional 115 m³/day is
32 0.03 percent of the current demand and 0.02 percent of the projected demand. The staff finds

(a) The Exelon estimate of 93 housing units is likely to be an extreme "upper bound" estimate. Most of the potentially new jobs would most likely be filled by existing area residents, thus creating no, or little, net demand for housing.

(b) Calculated by assuming that the average number of households 1 per new job and household size is 2.66 persons per household (Exelon 2001).

(c) Calculated assuming that the average American uses between 50 and 80 gallons of water for personal use per day; 500 people x 80 gallons per person/day = 40,000 gallons/day (151 m³/day).

1 that the impact of increased water use on area water systems is SMALL and that further
2 mitigation is not warranted.

4 **4.4.3 Offsite Land Use During Operations**

5
6 Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A,
7 Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B notes that "significant
8 changes in land use may be associated with population and tax revenue changes resulting from
9 license renewal."

10
11 Section 4.7.4 of the GEIS defines the magnitude of land-use changes as small if very little new
12 development and minimal changes to an area's land-use pattern result. Moderate change
13 results if considerable new development and some changes to the land-use pattern occur. The
14 magnitude of change is large if large-scale new development and major changes in the land-
15 use pattern occur.

16
17 Exelon has identified a maximum of 60 additional employees during the license renewal term
18 plus an additional 81 indirect jobs (total 141) in the surrounding community (Exelon 2001).
19 Section 3.7.5 of the GEIS (NRC 1996) states that if plant-related population growth is less than
20 5 percent of the study area's total population, offsite land-use changes would be small,
21 especially if the study area has established patterns of residential and commercial
22 development, a population density of at least 23 persons/km² (60 persons/mi²), and at least one
23 urban area with a population of 100,000 or more within 80 km (50 mi). In this case, population
24 growth will be less than 5 percent of the area's total population, the area has established
25 patterns of residential and commercial development, a population density of well over 23
26 persons/km² (60 persons/mi²), and at least one metropolitan area (Baltimore Metropolitan
27 Statistical Area) with a population of 100,000 or more within 80 km (50 mi). Consequently, the
28 staff concludes that population changes resulting from license renewal are likely to result in
29 small offsite land-use impacts.

30
31 Tax revenue can affect land use because it enables local jurisdictions to be able to provide
32 the public services (e.g., transportation and utilities) necessary to support development.
33 Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during
34 the license renewal term should consider (1) the size of the plant's payments relative to the
35 community's total revenues, (2) the nature of the community's existing land-use pattern, and
36 (3) the extent to which the community already has public services in place to support and guide
37 development. If the plant's tax payments are projected to be small relative to the community's
38 total revenue, tax-driven land-use changes during the plant's license renewal term would be
39 small, especially where the community has pre-established patterns of development and has

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1 provided adequate public services to support and guide development. Section 4.7.2.1 of the
2 GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing
3 jurisdiction's revenue, the significance level would be small. If the plant's tax payments are
4 projected to be medium to large relative to the community's total revenue, new tax-driven land-
5 use changes would be moderate.

6
7 As discussed in Section 2.2.8.6, the amounts of property taxes to be paid by Exelon for Peach
8 Bottom Units 2 and 3 to York County, Peach Bottom Township, and the South Eastern School
9 District had not yet been determined. Until a determination is made, Exelon has agreed to pay
10 non-refundable payments to the following beginning in 2000: York County, \$151,000 per year;
11 Peach Bottom Township, \$30,000 per year; and the South Eastern School District, \$840,000
12 per year. The size of the plant's payments relative to the community's total revenues is York
13 County, 0.07 percent; Peach Bottom Township, 1.8 percent; and South Eastern School District,
14 3.6 percent.

15
16 Exelon has determined that major refurbishment activities are not necessary at Peach Bottom
17 Units 2 and 3 in conjunction with license renewal. Thus, there will be no increase in
18 employment at the Peach Bottom site as a result of license renewal activities. Exelon has also
19 stated that the permanent workforce at Peach Bottom Units 2 and 3 will remain stable during
20 the license renewal period of 20 years (Exelon 2001). The plant's tax payments are projected
21 to be less than 10 percent of the community's total revenue. Additional mitigation for land-use
22 impacts during the license renewal period does not appear to be warranted. For these reasons,
23 the staff concludes that the net impact of plant-related population increases is likely to be small.
24 The staff also concludes that tax-related land-use impacts are likely to be small.

25 26 **4.4.4 Public Services: Transportation Impacts During Operations**

27
28 On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B,
29 Table B-1 were revised to clearly state that "Public Services: Transportation Impacts During
30 Operations" is a Category 2 issue (see NRC 1999 for more discussion of this clarification). The
31 issue is treated as such in this supplemental environmental impact statement (SEIS).

32
33 However, expected growth is not due directly to increases in employment at the Peach Bottom
34 site. The permanent employment associated with Peach Bottoms Units 2 and 3 is currently
35 about 1000 employees (Exelon and contractors [Exelon 2001]). During refueling outages,
36 which occur about once a year, as many as 800 additional workers are hired on a temporary
37 basis. The Pennsylvania Department of Transportation does not maintain level-of-service
38 designations for roadways in the Commonwealth; however, the local residents do not regard
39 the associated annual traffic increase as a problem (Section 2.1.1.2). The "upper bound"
40 potential increase in permanent staff during the license renewal term is 60 additional workers,

1 or approximately 6 percent of the current permanent and contract work force of approximately
2 1000. Access to the Peach Bottom site is on State routes. Based on these facts, Exelon
3 concluded that the impacts on transportation during the license renewal term would be SMALL,
4 and further mitigation measures would not be warranted.

5
6 The staff reviewed Exelon's assumptions and resulting conclusions. The staff concludes that
7 any impact of Exelon on transportation service degradation is likely to be SMALL and not
8 require further mitigation.

9 10 **4.4.5 Historic and Archaeological Resources**

11
12 There are no known historic or archaeological resources at the Peach Bottom site. One
13 feature, which the State of Delaware considers an historic property, a feeder canal for the
14 Chesapeake and Delaware Canal system, crosses the Peach Bottom-to-Kenney, Delaware
15 transmission line. The Peach Bottom Units 2 and 3 license renewal application for continued
16 operations does not include proposals for future land-disturbing activities or structural
17 modifications beyond routine maintenance at the plant.

18
19 Exelon (as PECO) initiated communication with the Pennsylvania, Delaware and Maryland
20 State Historic Preservation Offices by letters dated July and August of 2000 (Hutton 2000a,
21 2000b, 2000c). The letters express a desire to assess the effects of the license renewal on
22 historic properties, as required by the Nuclear Regulatory Commission of applicants for
23 operating license renewal. The letters specifically include the power station and a single related
24 transmission line (Peach Bottom-to-Keeney, Delaware) within the purview of the undertaking.
25 Exelon indicated that there were no known historic properties in the area of potential effect of
26 the undertaking. Exelon requested State concurrence with a determination that the license
27 renewal process would have "...no effect on any historic or archaeological properties."

28
29 Both the Pennsylvania and Maryland State Historic Preservation Offices responded to Exelon's
30 letters: they concurred that the operation and management of the Peach Bottom facility would
31 not affect historic properties. The Delaware State Historic Preservation Office made no written
32 response to the applicant but informed NRC staff of the presence of a property in Delaware in
33 the vicinity of the transmission line that it considers historic.

34
35 The Pennsylvania State Historic Preservation Office wrote on December 14, 2000, that it had
36 reviewed the undertaking in accordance with Section 106 of the National Historic Preservation
37 Act. As long as the renewed license to operate the Peach Bottom facility involved only
38 operational and maintenance activities, they agreed that the undertaking would not affect
39 historic and archaeological resources (Carr 2000).

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1 The Maryland State Historic Preservation Office responded similarly on September 22, 2000.
2 The Administrator of Project Review and Compliance wrote it is "...the opinion of the Maryland
3 Historical Trust that the license renewal application will have no effect on historic properties
4 eligible for or listed in National Register of Historic Places, including standing structures and
5 archeological sites." (Cole 2000). She said that no additional archaeological investigations are
6 warranted because of prior disturbance in the project area, and that no additional architectural
7 investigations are necessary (Cole 2000).

8
9 Although the Delaware State Historic Preservation Office did not respond in writing to the letter
10 from the applicant, they have expressed concerns to the NRC (Griffith 2001). Its written
11 communication was triggered by the NRC's Federal Register notice of intent to develop an EIS
12 for the proposed action to consider the renewal of the applicant's Peach Bottom Units 2 and 3
13 operating license for an additional 20 years.

14
15 A representative of the Delaware State Historic Preservation Office had made earlier informal
16 contact with NRC staff and participated in an onsite examination in the State of Delaware where
17 the transmission line crosses remnants of a feeder canal for the old Chesapeake and Delaware
18 Canal. The letter from the Delaware State Historic Preservation Office followed-up on the
19 October visit and confirmed statements made by the representative during the trip and in
20 subsequent conversation (Griffith 2001):

- 21
22 (1) The Delaware State Historic Preservation Office considers the re-licensing a Federal
23 undertaking with the potential to affect historic properties.
24
25 (2) The official finds in a preliminary evaluation that a feeder canal crossed by the Peach
26 Bottom-to-Keeney, Delaware transmission line is a historic resource that meets standards
27 for its listing on the National Register of Historic Places.
28
29 (3) The Delaware State Historic Preservation Office believes that operation of Peach Bottom
30 under the previous license has caused adverse effects on the feeder canal at the
31 transmission line crossing.
32
33 (4) Finally, the Delaware State Hisroric Preservation Office official anticipates that grant of a
34 license renewal by Nuclear Regulatory Commission for operation of Peach Bottom would
35 allow continuation of adverse effects on the feeder canal's key historical features (the
36 canal, its towpath, and an associated back borrow area).

37
38 The NRC staff has considered the position expressed by the Delaware State Historic
39 Preservation Office and provides the following discussion to put the issue into context. The

1 original operating licenses were granted after full compliance with the provisions of the National
2 Historic Preservation Act. Exelon, its predecessors, and associated agents for operation of the
3 Peach Bottom-to-Keeney, Delaware transmission line, performed work without knowledge of
4 the existence and historic value of the Chesapeake and Delaware feeder canal that traverses
5 the transmission line corridor.

6
7 In 1966, seven years or more before the Federal government granted the initial operating
8 licenses for Peach Bottom Units 2 and 3, Congress passed the National Historic Preservation
9 Act. Section 106 (16 USC § 470j(a)), the provision of that Act most relevant to the current
10 consideration, set out the requirements for Federal agencies to consider the impact of their
11 Federally funded or Federally assisted undertakings on historic preservation. Under the
12 Section, Federal agencies had to

13
14 ...prior to the issuance of any license, ...take into account the effect of the
15 undertaking on any district, site, building, structure, or object that is included in or
16 eligible for inclusion in the National Register. The head of any such Federal agency
17 shall afford the Advisory Council on Historic Preservation ... a reasonable
18 opportunity to comment with regard to such undertaking. (16 USC § 470j(a))

19
20 The original regulations to implement Section 106 of the Act (36 CFR 800) took effect in 1979,
21 five years after the Federal government granted the initial operating licenses for Peach Bottom
22 Units 2 and 3. Until 1979, the Advisory Council on Historic Preservation had no established
23 regulatory process for Federal agencies to use to fulfill National Historic Preservation Act
24 Section 106 responsibilities.

25
26 In 1972, with a request for comment, the U.S. Atomic Energy Commission sent information on
27 the proposed license action for Peach Bottom Units 2 and 3, including information on historic
28 and archaeological resources and determinations, to the Advisory Council on Historic
29 Preservation (Giambusso 1972). Although the Advisory Council on Historic Preservation made
30 no reply (AEC 1973), the U.S. Atomic Energy Commission met the then current standard for
31 National Historic Preservation Act compliance.

32
33 The feeder canal identified as a historic property by the State of Delaware was first documented
34 in September 1974 (Guider). That is, it was identified after the Federal government granted the
35 license and two years after the U.S. Atomic Energy Commission sent its Draft Environmental
36 Statement on the original license decision to the Advisory Council on Historic Preservation with
37 a request for comment (AEC 1973, Giambusso 1972).

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1 In his letter of October 29, 2001, the Delaware State Historic Preservation Office official made a
2 request that the Nuclear Regulatory Commission should consider three specific tasks to take
3 into account effects of the proposed action to grant the license renewal (Griffith 2001):
4

- 5 (1) "the restoration of the depth and width of the Feeder Canal across the transmission line;
6
- 7 (2) the construction of a simple bridge to permit vehicular access across the Feeder Canal for
8 routine transmission line right-of-way maintenance; and,
9
- 10 (3) monitoring of the transmission line right-of-way to prevent uncontrolled crossing of the
11 Feeder Canal by dirt bikes and ATVs and the repair of damage resulting from such
12 uncontrolled crossings, if they do occur."
13

14 These requests fall into two categories. First, an action to correct a perceived negative result of
15 past operations (Number 1, above). Second, specific actions to prevent future deterioration of
16 the feeder canal (Numbers 2 and 3, above). The NRC staff provided the recommendations
17 provided them to the applicant, however, the staff has determined that these actions do not
18 relate to the current Federal undertaking, a decision under consideration by the Nuclear
19 Regulatory Commission to extend operating licenses.
20

21 The applicant stated that, for the license renewal period, (1) "No major structural modifications
22 have been identified..." (2) "Any maintenance activities necessary to support license renewal
23 would be limited to previously disturbed areas;" and, (3) "No additional land disturbance is
24 anticipated in support of license renewal." (Hutton 2000a, 2000b, and 2000c). The applicant
25 should reflect the aforementioned in its licensing basis commitments and, under such
26 conditions, staff believes continued operation of Peach Bottom would not have an effect effect
27 on any known or on potential unknown or undiscovered historic or archaeological resources
28 located in areas of potential effect.
29

30 The historically important Chesapeake and Delaware Feeder Canal occurs within the Delaware
31 portion of its Peach Bottom-to-Keeney, Delaware transmission line. However, since the
32 applicant does not own and does not perform operational or maintenance work on the part of
33 the transmission line that contains the feeder canal (Gallagher 2002), it has no opportunity to
34 take the value of this resource into account during operation and maintenance work. Given the
35 commitments of the applicant to avoid future disturbance and to control access to lands it
36 manages, the staff concludes that the impact of operation and maintenance of the Peach
37 Bottom site during the license renewal period are SMALL. It requires no further mitigation.
38
39

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy in which Federal actions should not result in disproportionately high and adverse impacts on minority^(a) or low-income populations. Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although it is not subject to the Executive Order, the Commission has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2001).

For the purpose of the staff's review, a minority population is defined to exist if the percentage of minorities within the Census block groups^(b) in each state within the 80 km (50-mile) potentially affected by the license renewal of Peach Bottom Units 2 and 3 exceeds the corresponding percentage of minorities in the state of which it is a part by 20 percent, or if the corresponding percentage of minorities within the Census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds the corresponding percentage of low-income population in the state of which it is a part by 20 percent, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For census block groups within York and Lancaster counties, for example, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in Pennsylvania. Exelon conducted its analysis using 1990 census tracts rather than the smaller block groups. Staff used the 2000 Census block groups for identifying minority populations, but used the 1990 Census block groups to identify low-income populations because the 2000 Census data on incomes were not yet available for small geographic areas.

The scope of the review as defined in NRC Guidance (NRC 2001) should include an analysis of impacts on minority and low-income populations, the location and significance of any environmental impacts during operations on populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review

-
- (a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Black races; or Hispanic ethnicity. "Other" races and multi-racial individuals may be considered as separate minorities (NRC 2001).
- (b) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USBC 2001b).

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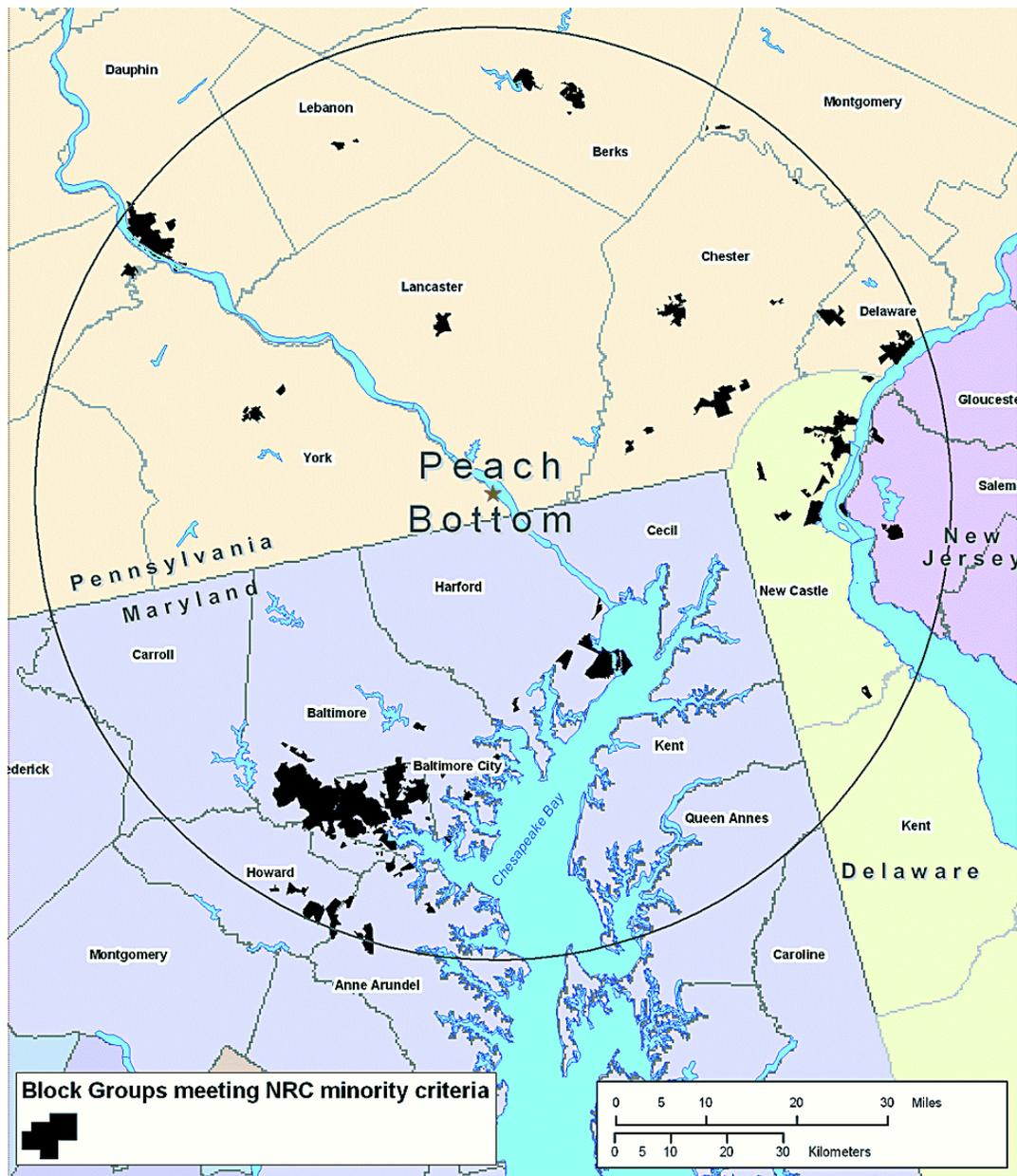
1 should state whether these impacts are likely to be disproportionately high and adverse, and to
2 evaluate the significance of such impacts.

3
4 The staff examined the geographic distribution of minority and low-income populations recorded
5 during the 2000 Census (USBC 2001) within 80 km (50 mi) of Peach Bottom Units 2 and 3,
6 encompassing all of York, Lancaster, and Chester counties in Pennsylvania; Baltimore City and
7 County, Harford and Cecil counties in Maryland; Kent County in Delaware; parts of Adams,
8 Cumberland, Dauphin, Lebanon, Montgomery, Delaware, and Berks counties in Pennsylvania;
9 Queen Anne, Anne Arundel, Howard, Caroline, Frederick, and Carroll counties in Maryland; New
10 Castle County, Delaware; and Salem and Gloucester counties in New Jersey. The analysis was
11 also supplemented by field inquiries to the planning department and social service agencies in
12 York and Lancaster counties.^(a)

13
14 Exelon conducted its analysis for minority and low income populations using the convention of
15 including the census tracts if at least 50 percent of their area lay within 80-km (50-mi) of Peach
16 Bottom Units 2 and 3 (Exelon 2001). Using this convention, the 80-km radius included 1201
17 census tracts. The NRC staff used the more detailed Census block groups, which resulted in a
18 universe of 3962 block groups, and followed the latest guidance in NRC 2001 for designating
19 minority categories, including “other” races and multiple-race individuals. Exelon used the “more
20 than 20 percent” criterion to determine whether a census tract should be counted as containing a
21 minority or low-income population (Exelon 2001). Staff found that the “50%” criterion was also
22 applicable at the block group level. Following these criteria, Table 4-8 indicates how many
23 census block groups within the 80-km area exceed the threshold for determining minority and
24 low-income populations. Figures 4-1 and 4-2 show the distribution of census block groups for
25 the minority and low-income populations, respectively (shaded areas).

26
27 Based on the “more than 20 percent greater” criterion, Exelon determined that Black minority
28 populations exist in 209 census tracts: 21 in Delaware, 136 in Maryland, 4 in New Jersey, and
29 48 in Pennsylvania. Hispanic minorities exist in 22 tracts: 2 in Delaware, 1 in Maryland, 1 in
30 New Jersey, and 18 in Pennsylvania. Two tracts contain Native American minority populations,
31 one located in Baltimore and the other in West Chester in eastern Pennsylvania. Staff analysis
32 using the 2000 Census confirmed the relative numbers and locations of minority populations in
33 the Exelon analysis, although the number of block groups in the staff’s analysis is larger than
34 the number of tracts used by Exelon. Figure 4-1 shows the locations of minority populations.

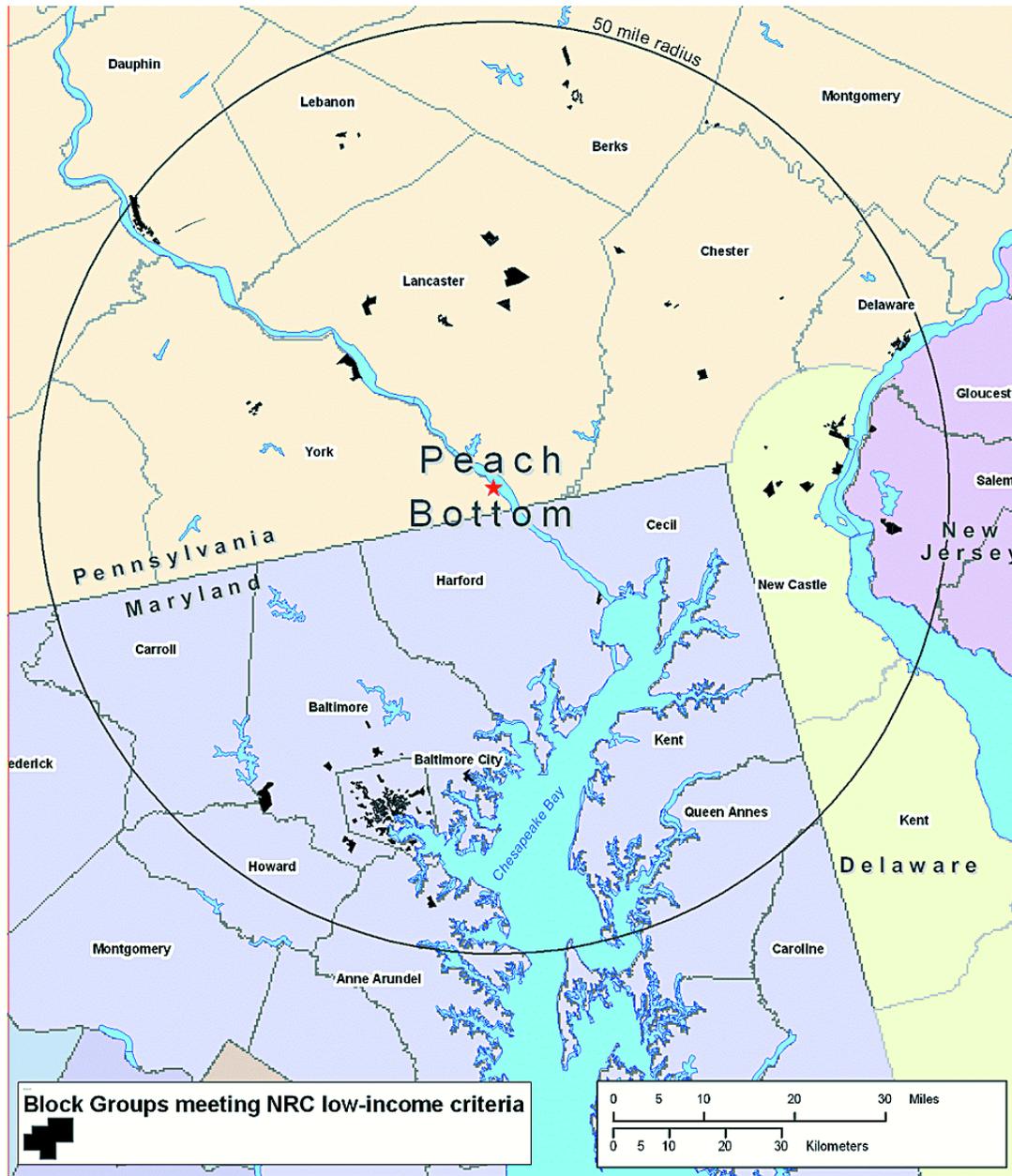
(a) York and Lancaster counties were the focus of this inquiry because all of both counties lie within the 80-km (50-mi) radius and are nearest the Peach Bottom site. The staff concluded that any findings of environmental justice issues in these counties would warrant further field inquiries in more distant counties. For reasons stated later in this section, further investigation was not warranted.



1
2 **Figure 4-1.** Geographic Distribution of Minority Populations (shown in shaded areas) Within
3 80-km (50-mi) of Peach Bottom Site Based on 2000 Census Block Group Data ^(a)

(a) Note: Some of the census block groups extend into open water.

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1
2
3
4

Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80-km (50-mi) of the Peach Bottom Site Based on 1990 Census Block Group Data^(a)

(a) Note: Some of the census block groups extend into open water.

1 Black minority populations tend to be concentrated in urban areas, especially in metropolitan
2 Baltimore and Philadelphia. Hispanic minority populations, with the exception of a few block
3 groups, are concentrated in the Cities of Lancaster and Reading.

4
5 By the NRC criteria (50% of population, or at least 20 percent greater than state), 420 of the
6 total 4271 1990 census block groups within 80 km (50 mi) of the site contain low-income
7 populations. The majority of census block groups containing low-income populations are
8 located in the Baltimore metropolitan area. The remaining census block groups also tend to be
9 located in urban areas. In Pennsylvania, low income block groups are concentrated in the
10 Philadelphia metropolitan area, Harrisburg, Reading, Lancaster, York. In New Jersey, most are
11 in Salem. In Delaware, they are concentrated in Newark and Wilmington. Figure 4-2 shows
12 the locations of the low-income populations.

13
14 With the locations of minority and low-income populations identified, the staff proceeded to
15 evaluate whether any of the environmental impacts of the proposed action could affect these
16 populations in a disproportionate manner. Based on staff guidance (NRC 2001), air, land, and
17 water resources within about 80 km (50 mi) of the Peach Bottom site were examined. Within
18 that area, a few potential environmental impacts could affect human populations; all of these
19 were considered SMALL for the general population. These include:

- 20
- 21 • groundwater-use conflicts (discussed in Section 4.5)
- 22
- 23 • electric shock (discussed in Section 4.2.1)
- 24
- 25 • microbiological organisms (discussed in Section 4.1.5)
- 26
- 27 • postulated accidents (discussed in Chapter 5 of this SEIS and Chapter 5 of the GEIS)
- 28

29 The pathways through which the environmental impacts associated with Peach Bottom Units 2
30 and 3 license renewal can affect human populations are discussed in each associated section.
31 The staff then evaluated whether minority and low-income populations could be
32 disproportionately affected by these impacts. The staff found no unusual resource
33 dependencies or practices, such as subsistence agriculture, hunting, or fishing through which
34 the populations could be disproportionately affected. In addition, the staff did not identify any
35 location-dependent disproportionate impacts affecting these minority and low-income
36 populations. The staff concludes that offsite impacts from Peach Bottom Units 2 and 3 to
37 minority and low-income populations would be SMALL, and no additional mitigation actions are
38 warranted.

4.5 Groundwater Use and Quality

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 applicable to Peach Bottom Units 2 and 3 groundwater use and quality is identified in Table 4-8. Exelon stated in its ER (Exelon 2001) that it is not aware of any new and significant information associated with the renewal of the Peach Bottom Units 2 and 3 operating licenses (OLs). The staff has not identified any significant new information during its independent review of the ER (Exelon 2001), the staff's site visit, scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the staff concluded that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-8. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Ground-water-use conflicts (potable and service water; plants that use <100 gpm).	4.8.1.1

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, follows:

- Ground-water-use conflicts (potable and service water; plants that use <100 gpm). Based on information in the GEIS, the Commission found that

Plants using less than 100 gpm are not expected to cause any groundwater use conflicts.

As discussed in Section 2.2.2, Peach Bottom site groundwater use is less than 0.07 m³/s (100 gpm). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to groundwater use and quality that is applicable to Peach Bottom Units 2 and 3. This issue is listed in Table 4-9 and discussed in Section 4.5.1.

Table 4-9. Category 2 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
GROUNDWATER USE AND QUALITY			
Ground-water-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	4.8.1.3 4.4.2.1	A	4.5.1

4.5.1 Ground-water-Use Conflicts (Plants Using Cooling Towers Withdrawing Makeup Water From a Small River)

Groundwater use conflicts for plants that have cooling towers withdrawing makeup water from a small river is a Category 2 issue, requiring a site-specific assessment before license renewal.

Surface water withdrawals from small water bodies during low-flow conditions may result in groundwater use conflicts with nearby groundwater users.

The impact of consumptive loss on nearby groundwater users is associated with the difference it could potentially cause in aquifer recharge, especially if other new groundwater or upstream surface water users begin withdrawals. Section 2.2.2 describes Peach Bottom site surface water withdrawals from Conowingo Pond. As described in Section 2.1.3, Peach Bottom Units 2 and 3 normally operate with a once-through cooling system. However, since groundwater flows towards Conowingo Pond, groundwater withdrawals would not be impacted by changes in river flow.

The staff reviewed the CWA Section 316(a) Demonstration for Peach Bottom Units 2 and 3 and the ER relative to potential groundwater-use conflicts due to consumptive loss of aquifer recharge. Based on this review, the staff has concluded that the potential impacts are SMALL, and additional mitigation is not warranted.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected. Exelon initiated consultation under Section 7 of the Endangered Species Act during June 2000 with a request for information to the National Marine Fisheries Service (NMFS) concerning species potentially occurring near the Peach Bottom site. The presence of threatened or endangered species in the vicinity of the Peach Bottom site is discussed in Sections 2.2.5 and 2.2.6.

Exelon has no plans to conduct refurbishment or construction at the Peach Bottom site during the license renewal period. Therefore, there would be no refurbishment-related impacts to special status species, and no further analysis of refurbishment-related impacts is applicable.

4.6.1 Aquatic Species

During more than 30 years of monitoring the fish populations of Conowingo Pond, no Federally listed fish species have been collected. The Atlantic sturgeon (*Acipenser oxyrinchus*), a candidate for federal listing has been captured by anglers in the lower Susquehanna River below the Conowingo Dam in Maryland (Normandeau Associates, Inc. 1998), but apparently has not been collected upstream of the Dam in Pennsylvania since the Conowingo Dam was built. The Atlantic sturgeon is listed as endangered by Pennsylvania. Based on a review of Philadelphia Electric Company and PECO impact assessment documents (AEC 1973; PECO 1975), Exelon (as PECO)-funded research and monitoring studies (Normandeau 1998, 1999,

1 2000), standard fisheries references, journal articles, and government web sites (Normandeau
2 1999), two State-listed fish species (in addition to the Atlantic sturgeon) could be found in
3 Conowingo Pond. One, the anadromous hickory shad (*Alosa mediocris*), is found seasonally
4 below Conowingo Dam, as adults ascend the river to spawn in spring (Normandeau 1998).
5 Occasionally, small numbers of hickory shad (32 in 1999) are collected at the Conowingo West
6 Lift (Susquehanna River Anadromous Fish Restoration Cooperative 2000). Another State-listed
7 species, the cisco (*Coregonus artedii*) has been introduced to the upper Susquehanna River
8 (Harvey's Lake in Luzerne County, Pennsylvania) (Normandeau 2000) and the lower
9 Susquehanna River (downstream of the Conowingo Dam in Maryland) (Normandeau 1998) and
10 has been reported from Conowingo "Reservoir" (Normandeau 1999). However, the cisco has
11 not been collected from Conowingo Pond and is not believed to be present. State- or Federal-
12 listed molluscs have not been found in Conowingo Pond.

13 14 **4.6.2 Terrestrial Species**

15
16 Exelon initiated consultation with the U.S. Fish and Wildlife Service (FWS) in October 2000 with
17 a letter requesting information and describing recently completed bog turtle surveys. The FWS
18 responded with an indication that there were likely to only be transient species in the vicinity of
19 the plant and that adverse effects were unlikely (Exelon 2001a). The staff chose to further
20 evaluate the potential impacts of continued operation of Peach Bottom Units 2 and 3 on the
21 bald eagle and other Federally listed species that may occur near the plant or the transmission
22 line (see Section 2.2.6). The staff evaluated the available information concerning these species
23 and determined that continued operation of Peach Bottom Units 2 and 3 during the license
24 renewal term was not likely to adversely affect the bald eagle and likely to have no effect on any
25 other Federally listed endangered or threatened species. This conclusion was forwarded to the
26 FWS on January 17, 2002 (resubmitted on March 13, 2002). The FWS concurred with these
27 conclusions in a letter dated April 17, 2002. Copies of these correspondence are provided in
28 Appendix E.

29
30 Based on its review of the applicant's report and its independent analysis, and pending the
31 outcome of consultation with the FWS, it is the staff's conclusion that continued operation of
32 the plant under license renewal is not likely to adversely affect bald eagles, and will have no
33 effect on other listed or proposed endangered or threatened species within the immediate
34 vicinity of the Peach Bottom site or the associated transmission line. Therefore, it is the staff's
35 preliminary determination that the impact on threatened or endangered species of an additional
36 20 years operation of the Peach Bottom Units 2 and 3 plant and of continued maintenance
37 activities of the transmission corridor would be SMALL, and further mitigation is not warranted.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

4.7.1 Evaluation of Potential New and Significant Radiological Impacts on Human Health

During the public scoping period for the Peach Bottom Units 2 and 3 SEIS, there were comments about the studies related to strontium-90 radiation levels in deciduous (baby) teeth and use of these studies as “in-body” measurements of radioactive materials. The commenters suggested that the source of this material was the Peach Bottom plant and that this is new and significant information and, therefore, should be considered in the environmental impact evaluation for Peach Bottom Units 2 and 3, specifically with respect to public health. This section (1) summarizes the comments related to strontium-90 in deciduous teeth obtained during the public scoping period and (2) discusses why the staff determined that “in-body” measurements of strontium-90 in deciduous teeth as a means to evaluate public health impacts from releases from nuclear power plants is not new and significant information.

The staff has evaluated whether any of the comments related to strontium-90 in the environment could be new and significant with respect to the conclusions in the GEIS. In 2000, a report titled *Strontium-90 in Deciduous Teeth as a Factor in Early Childhood Cancer* was published (Gould et al. 2000) that alleges there was an increase in cancer incidence due to strontium-90 released from nuclear power facilities. The evidence claimed in the report was elevated levels of strontium-90 in deciduous teeth. The staff has determined that the report does not represent new information with regard to the Category 1 issues as evaluated in the GEIS, nor does it identify a significant departure from what was specifically documented in the GEIS with regard to public dose. This section addresses the claims by the Radiation and Public Health Project (RPHP) staff, which were the authors of the Gould report. The staff has determined that the strontium-90 found in deciduous teeth in the vicinity of Peach Bottom Units 2 and 3 is not due to releases from the plant and that the operation of Peach Bottom Units 2 and 3 would not be responsible if there were to be an increased incidence of cancer in the area.

4.7.1.1 Summary of Comments

During the scoping process, there were comments both written and verbal at the public meeting related to the work by Gould et al. and the RPHP (Mangano et al. 2001). The comments focused on several issues identified by the Gould study. The first issue was use of “in-body” measurement of radionuclides to determine public health effects. The second issue was use of

1 strontium-90 to perform “in-body” measurement to evaluate the potential health risks from
2 release of radioactive materials from Peach Bottom Units 2 and 3. The third major issue
3 described was an apparent increase in cancer incidence in the communities near Peach Bottom
4 Units 2 and 3. Finally, commentors suggested that a cause-and-effect relationship exists
5 between reactor operation, catastrophic events, and perceived increase in cancer rates.

6
7 The discussion that follows explains the basis for the staff’s conclusion that the public scoping
8 comments do not provide new and significant information related to the Category 1 radiological
9 human health issues. The discussion (1) explains the source and amount of strontium-90 in the
10 environment, (2) describes the consensus standards of national and international organizations
11 that form the basis of NRC’s regulations related to protecting public health, (3) addresses the
12 radiological monitoring programs at nuclear power reactors and specifically the program at
13 Peach Bottom Units 2 and 3, (4) explains why “in-body” measurement of radioactive materials is
14 not used to determine public health impacts, (5) addresses the statements regarding cancer
15 incidence discussed in the Gould report and public comment, and (6) addresses the implication
16 that radioactive effluents from nuclear reactors are the cause of perceived increases in cancer
17 incidence near Peach Bottom Units 2 and 3. Finally, the rationale for assigning radiological
18 issues as Category 1 in the GEIS and the staff’s evaluation of these issues for Peach Bottom
19 Units 2 and 3 are briefly discussed.

21 **4.7.1.2 Strontium-90 in the Environment**

22
23 There are three sources of strontium-90 in the environment: fallout from nuclear weapons
24 testing, releases from the Chernobyl accident in the Ukraine, and potential releases from
25 nuclear power reactors. By far the largest source of strontium-90 in the environment is from
26 weapons testing fallout.

27
28 Both strontium-89 and strontium-90 were released to the atmosphere by aboveground
29 explosions of nuclear weapons (UNSCEAR 2001). Although the United States performed its
30 last atmospheric test of a nuclear weapon in 1963, other countries continued to perform
31 atmospheric testing of nuclear weapons until 1980 (UNSCEAR 2001). Strontium-89 has a half-
32 life of 50.5 days, while the half-life of strontium-90 is 28.8 years. Consequently, virtually no
33 strontium-89 currently remains in the soil from nuclear weapons testing (Eisenbud 1987). In
34 contrast, strontium-90 remains in soils of the Northern Hemisphere at more than 50% of its
35 peak levels in the 1960s (UNSCEAR 2000). Approximately 622 PBq (16.8 million Ci) of
36 strontium-90 were produced and globally dispersed in atmospheric nuclear weapons testing.

37
38 Numerous measurements of the global disposition on strontium-90 and the occurrence of these
39 and other fallout radionuclides in foodstuffs and the human body were made at the time the

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1 atmospheric tests were taking place. The worldwide average effective dose from ingesting
2 strontium-90 (1945 to date) is 97 μSv (9.7 mrem). The worldwide average effective dose from
3 inhaling strontium-90 (1945 to 1985) is 9.2 μSv (0.92 mrem). No statistically significant excess
4 of biological effects due to strontium-90 exposures at levels characteristic of worldwide fallout
5 has been demonstrated (NCRP 1991).

6
7 The other two sources of strontium-90 in the environment are the Chernobyl accident in April
8 1986 when approximately 8 PBq (216,000 Ci) of strontium-90 were released into the
9 atmosphere, and releases from nuclear power reactor operations. The total annual release of
10 strontium-90 into the atmosphere from all U.S. nuclear power plants is typically 37 MBq (0.001
11 Ci). The amount of strontium-90 released into the environment from a nuclear facility is so low
12 that the only chance of detecting strontium-90 is sampling the nuclear power plant effluents
13 themselves. In addition to strontium-90, power reactors also release very small quantities of
14 strontium-89.

15
16 Because of the extremely small amount of strontium-90 released from nuclear power plant
17 effluents, it is unlikely that strontium-90 found in deciduous teeth would be from nuclear power
18 plants. Without determining that there is strontium-89 in the teeth, it is impossible to tell where
19 the strontium-90 is from. If there is no strontium-89 in the teeth, then it is unlikely that the
20 strontium-90 is from a recent release from a nuclear reactor. The fact that the RPHP has failed
21 to measure the strontium-89 to strontium-90 ratio in any deciduous teeth collected limits
22 conclusions regarding the source of the internal contamination.

23 24 **4.7.1.3 Regulatory Basis and Discussion of Risk**

25
26 The evaluation of health effects from exposure to radiation, both natural and man-made, is an
27 ongoing activity involving public, private, and international institutions. International and
28 national organizations such as the International Commission on Radiological Protection (ICRP)
29 and National Council on Radiation Protection and Measurements (NCRP) provide consensus
30 standards developed from recent and ongoing research. NRC's regulatory limits for effluent
31 releases and subsequent dose to the public are based on the radiation protection
32 recommendations of these organizations. NRC provides oversight of all licensed commercial
33 nuclear reactors to ensure that regulatory limits for radiological effluent releases and the
34 resulting dose to the public from these releases are within the established limits. The
35 regulations related to radiological effluents and dose to the public can be found in 10 CFR
36 Part 20 and 10 CFR Part 50, Appendix I.

37
38 The National Academy of Sciences' Committee on the BEIR published its fifth report (BEIR V)
39 just over a decade ago (National Research Council 1990). That report contains mathematical

1 models that predict risk of radiation-induced cancers in human populations over and above the
2 incidence of cancer that occurs in the absence of radiation exposure. The BEIR V committee
3 chose a linear, nonthreshold (LNT) dose-response model for solid cancers and a linear-
4 quadratic (LQ) model for leukemia.

5
6 The BEIR V report does not address what is safe or not safe; it merely evaluates excess cancer
7 risk in terms of probabilities. ICRP Publication 60 (1991), however, does define safe in the
8 sense of “acceptable risk,” and this and similar definitions have been reaffirmed by the NCRP
9 (NCRP 1993) and the U.S. Environmental Protection Agency (EPA 1987). These implicit
10 definitions of “safe” are embodied in all U.S. radiation protection regulations, including those of
11 the NRC.

12
13 There is no human activity without some risk, however slight, so “safe” does not mean “with no
14 risk,” but rather “safe” means “with an acceptably tiny risk.” What risk is acceptable from
15 society’s standpoint is determined by the political process in the United States as spelled out
16 recently, for example, by the U.S. Presidential/Congressional Commission on Risk Assessment
17 and Risk Management^(a) (Omenn et al. 1997).

18 19 **4.7.1.4 Effluent Monitoring at Peach Bottom**

20
21 Regulatory Guide 1.21 recommends that “a quarterly analysis for strontium-89 and strontium-90
22 should be made on a composite of all filters from each sampling location collected during the
23 quarter.” The sensitivity is such that the analysis for radioactive material in particulate form
24 should be sufficient to permit measurement of a small fraction of the activity, which would result
25 in annual exposures of 200 μ Sv (20 mrem) to any organ of an individual, or 60 μ Sv (6 mrem) to
26 the whole body, in an unrestricted area (see Section 2.1.4). Nuclear power plants, including
27 Peach Bottom Units 2 and 3, routinely release small amounts of radioactive material in their
28 effluents. To demonstrate that the plant is within the regulatory limits, the plants monitor the
29 radiological materials released to the environment and take frequent radiological samples
30 around the plant site as well as analyze their effluent discharge. Both strontium-89 and
31 strontium-90 can be found in power plant effluents in very small quantities. Each nuclear power
32 plant in the United States is required to submit an annual report on effluent releases to NRC.
33 The report contains information about the types and quantities of radionuclides that are
34 released to the environment, as well as the dose impact on the environment.

35
(a) Internet <http://www.riskworld.com>.

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1 Gaseous and liquid effluent releases are monitored at Peach Bottom Units 2 and 3 to
2 demonstrate that they are within regulatory limits. The licensee also has a Radioactive
3 Effluents Control Program, including the Offsite Dose Calculation Manual that provides the
4 procedures for monitoring releases to the environment. The results of this monitoring are
5 provided to NRC in annual reports titled *Annual Radioactive Effluent Release Report* (Exelon
6 2001a) and *Annual Radiological Environmental Operating Report* (Exelon 2001b). The effluent
7 control program was reviewed for the preparation of this SEIS. The releases of radionuclides to
8 the environment, including strontium-90, are monitored as prescribed by Peach Bottom Units 2
9 and 3 *Offsite Dose Calculation Manual* (PECO 2001) and have been maintained well below
10 regulatory limits. During 2000, Peach Bottom Units 2 and 3 did not release detectable levels of
11 strontium-90 or strontium-89 in the gaseous effluents. Liquid effluents containing radioactive
12 materials, including strontium-90 and strontium-89, were released into the discharge canal.
13 The only time radioactive strontium was released in detectable levels in the liquid effluents was
14 during the third and fourth quarters of 2000. In the third quarter a total of 0.54 MBq (1.46×10^{-5}
15 Ci) of strontium-89 was released. In the fourth quarter the effluents were 4.3×10^{-3} MBq
16 (1.16×10^{-7} Ci) of strontium-89 and 4.48×10^{-4} MBq (1.21×10^{-8} Ci) of strontium-90 (Exelon 2001c).
17 These total amounts of radioactive effluents released from Peach Bottom Units 2 and 3 were
18 only a small fraction of the NRC regulatory limits. The quantities of materials released to the
19 atmosphere and liquid for 2000 are comparable to the quantities released in the past 5 years
20 and the expected quantities released in years to come, including the license renewal period.

21 22 **4.7.1.5 Use of “In-Body” Radionuclide Measurements to Assess Public** 23 **Risk from Radiological Effluents from Peach Bottom Units 2 and 3**

24
25 Scoping comments have stated or implied that the NRC should measure radioactive
26 substances in persons living near nuclear power plants. Such measurements would be
27 misleading and unwarranted for a variety of reasons:

- 28
29
- 30 • Radioactive substances may come from a variety of sources. In the case of strontium-90,
31 the primary source has always been fallout from atmospheric weapons tests (UNSCEAR
32 2001). The scoping comments that imply that strontium-90 measured in people near
33 nuclear plants must have come from nuclear plants has no basis.
 - 34 • Interpreting measurements of radioactive materials in people is difficult unless one knows
35 what each individual was exposed to, when the exposures occurred, and by what routes
36 they occurred (ingestion, inhalation, etc.). In particular for strontium-90, dietary
37 contributions from foodstuffs produced out of the region must be considered. Finally,

1 human migration must be considered, because people may have lived and acquired
2 radionuclides elsewhere than near a nuclear power plant.

- 3
- 4 • Substances in the human body are dynamic, not static. This includes radioactive and
5 nonradioactive substances. The dynamic processes include intake of material; uptake to
6 systemic circulation from the gastrointestinal tract, respiratory tract, or skin; translocation
7 throughout the body system; retention over time; and elimination via excretion and
8 radioactive decay. Thus, even in deciduous teeth, the time course of exposure leading to
9 intake and all other dynamic processes must be considered to interpret measurements.

10

11 **4.7.1.6 Ability for Strontium-90 to Cause Cancer**

12

13 Scoping comments emphasized the adverse health effects of strontium-90. This isotope is
14 produced in roughly 5.8% of nuclear fissions in a reactor's fuel elements and undergoes
15 radioactive decay with a half-life of almost 29 years. Strontium-90, and its radioactive decay
16 product yttrium-90, are not harmful unless they are near or inside the body. They are easily
17 shielded if outside the body, resulting in no radiation exposure.

18

19 If ingested, strontium-90 tends to mimic calcium when it is in the body and therefore becomes
20 concentrated in calcified tissues such as bones and teeth. If ingested in quantities that produce
21 very large radiological dose rates (about one thousand times higher than dose rates we all
22 receive from natural background [Raabe 1994]), strontium-90 is known to increase the risk of
23 bone cancer and leukemia in animals, and is presumed to do so in people. Below these dose
24 rates, there is no evidence of any excess cancer.

25

26 Compared to other radionuclides, both natural and human-made, strontium-90 is not the most
27 toxic. For example, naturally occurring thorium 230 is 700 times more radiotoxic when inhaled.

28

29 **4.7.1.7 Cause-and-Effect Relationship Between Radiological Releases** 30 **from Peach Bottom Units 2 and 3 and Increased Incidence in** 31 **Cancers in the Area**

32

33 Scoping comments on the Peach Bottom SEIS have stated or implied that claimed statistical
34 associations between cancer rates and reactor operations are cause-and-effect relationships.
35 Considerable of technical literature has addressed causal association, that is, when two things
36 that appear to be associated over time can lead one to deduce that one causes the other.

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1 A simple counterexample helps illustrate this point. A college professor gives the following
2 example of a causal inference: “In the winter I wear galoshes. In the winter I get colds.
3 Therefore, galoshes cause colds.” There’s no argument that a strong statistical association
4 exists between wearing galoshes and the health effect of colds. However, there is an argument
5 about whether galoshes *cause* colds. So, how does one go about addressing whether this
6 association is really causation?

7
8 Here are some of the major factors to consider before inferring that a statistical association is a
9 causal one (Hill 1965):

- 10
11 (1) Strength: Is a large effect observed, e.g., 32-fold lung cancer increase in heavy
12 smokers?
- 13
14 (2) Consistency: Is the effect consistently observed across studies?
- 15
16 (3) Specificity: Does the effect occur in specific persons, for particular sites and types of
17 disease.
- 18
19 (4) Temporality: Does exposure precede disease? Is there a suitable latent period between
20 exposure and clinical symptoms?
- 21
22 (5) Biological Gradient: Is there a dose-response curve in which increasing dose leads to
23 increasing response?
- 24
25 (6) Biological Plausibility: Is there a plausible biological mechanism for the observed
26 association?
- 27
28 (7) Coherence: Does the cause-and-effect inference seriously conflict with generally known
29 facts of the natural history and biology of the disease?
- 30
31 (8) Experiment: Does intervention reduce or prevent the association?
- 32
33 (9) Analogy: Do other, similar agents produce the effects?
- 34

1 Statistical association alone does not prove causation. The RPHP work fails to meet many of
2 these criteria, even if the strontium-90 measurements were the result of the nuclear power plant
3 operations. In particular, they fail to meet criteria 1, 2, 3, 4, and 6.

4
5 Epidemiology is the study of patterns of health and disease in human populations. In 1995, an
6 international group of experts assembled to help determine how to use epidemiology studies for
7 risk assessments. Their work has been published (Federal Focus Inc. 1996) and a non-
8 copyrighted summary is on the internet at <http://www.pnl.gov/berc/epub/risk/index.html>.

9
10 A disease cluster is a group of cases of a disease that appear around the same time in a limited
11 geographic or occupational area. A non-technical analysis of “the cancer-cluster myth” has
12 been published in a popular magazine (Gawande 1999). Gawande explains why infectious
13 disease clusters can and should spur immediate investigations and perhaps intervention by
14 public health officials, and yet why non-infectious disease clusters rarely, if ever, are verified
15 (see, for example, Neutra 1990 and Reynolds et al. 1996). For cancer, which has a significant
16 latency between exposure and appearance of clinical symptoms, apparent clusters are very
17 misleading because of migration and confounding sources of exposure.

18 19 **4.7.1.8 Additional Discussion on Cancer**

20
21 Information regarding the relationships between environmental exposure to radiation and
22 cancer as stated in the Gould report were not substantiated. One form of cancer the Gould
23 report linked to strontium-90 exposure is “the extremely rare form of childhood cancer known as
24 rhabdomyosarcoma” (Gould et al. 2000). Rhabdomyosarcoma is not rare; indeed it is the most
25 common soft tissue sarcoma in children (ACS 2001a), and is the fifth most common form of
26 pediatric cancer (St. Jude Children’s Research Hospital 2001). Furthermore, no association
27 has been documented between the incidence of rhabdomyosarcoma and any environmental
28 condition, including toxic substances, air or water pollution, or radiation exposure (ACS 2001a).

29
30 While the Gould report is correct with regard to the general increase in cancer incidence in the
31 United States (Gould et al. 2000), this increase does not appear to be due to environmental
32 causes other than cigarette smoking. The National Cancer Institute (NCI 2001) states that

33
34 It is true that a person’s chance of developing cancer within his or her lifetime is almost
35 twice as great today as it was half a century ago, which means that doctors are seeing
36 more cases of cancer than they did in the past. However, this increase is caused
37 largely by the facts that people are living longer and cancer is more prevalent in older

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1 people. When corrected for the increasing average age of the population, cancer rates
2 in the United States have actually been stable or even falling slightly in the past several
3 years. Much of the rise prior to that was due to cigarette smoking, a well established
4 and avoidable cause of cancer.

5
6 The American Cancer Society (ACS) (ACS 2001b) acknowledges that a dramatic increase in
7 prostate cancer was noted between 1989 and 1992, but notes that this increase was apparent
8 rather than real. They suggest that it was due to earlier diagnosis in men without any
9 symptoms by increased use of prostate-specific antigen (PSA) blood test screening. They note
10 that prostate cancer incidence rates have declined significantly since 1992 (ACS 2001b).

11
12 With regard to cancer clusters, especially breast cancer deaths, that are identified by the Gould
13 report (Gould et al. 2000), detailed studies of this phenomenon have yet to substantiate
14 relationships with environmental exposures, especially from nuclear power plants. Scientists
15 from the NCI conducted and are conducting studies of breast cancer death clusters in the
16 northeastern United States, the Washington D.C. area, and San Francisco. Primary factors
17 driving the observed differences appear to be regional differences in the ages of mothers at first
18 birth and mammography screening (Sturgeon et al. 1995).

19
20 At the request of Congress, the NCI conducted a study of cancer mortality rates around
21 52 nuclear power plants, 9 DOE facilities, and 1 former commercial fuel reprocessing facility.
22 The study covered the period from 1950 to 1984 and evaluated the change in mortality rates
23 before and during facility operations. The study (Jablon, Hrubec, and Boice 1991) concluded
24 the following:

25
26 From the evidence available, this study has found no suggestion that nuclear facilities
27 may be linked causally with excess deaths from leukemia or from other cancers in
28 populations living nearby.

29
30 Additionally, the ACS (ACS 2001c) has concluded that although reports about cancer case
31 clusters in such communities have raised public concern, studies show that clusters do not
32 occur more often near nuclear plants than they do by chance elsewhere in the population.
33 Likewise, there is no new evidence that links strontium-90 with increases in breast cancer,
34 prostate cancer, or childhood cancer rates. The ACS recognizes that public concern about
35 environmental cancer risks often focuses on risks for which no carcinogenicity has been proven
36 or on situations where known carcinogen exposures are at such low levels that risks are
37 negligible. "Ionizing radiation emissions from nuclear facilities are closely controlled and involve
38 negligible levels of exposure for communities near such plants." (ACS 2001c).

4.7.1.9 Conclusion

In the GEIS, radiation exposure to the public during the license renewal term was considered a Category 1 issue (see Chapter 1 and Section 4.3 for discussions of Category 1 issues and radiological impacts from normal operations). The GEIS determined that the risk to the public from continued operation of a nuclear plant would not increase during the license renewal term. Doses to members of the public from Peach Bottom Units 2 and 3 emissions were specifically evaluated in Section 4.3 of the GEIS, using data from monitored emissions and ambient monitoring, and were found to be well within regulatory limits.

The staff extensively reviewed the Gould report, the comments received during the public scoping period, and the written comments provided by the RPHP. The staff has concluded that the claims of elevated levels of childhood cancer in the vicinity of the plant caused by the release of strontium-90 during routine operations is unfounded and without scientific merit. In-plant monitoring of effluent streams has established that there are no significant releases of strontium-90 from the plant. No causal relationship has been established between the levels of strontium-90 being reported by the RPHP in deciduous teeth and childhood cancer. Furthermore, there is near unanimous consensus among the scientific community on the adequacy of current radiation protection standards.

The staff concludes that the information provided from the Gould report and subsequent scoping comments do not provide any information that can be considered new and significant with respect to the findings of the GEIS on the health effects to the public from radiological effluent releases due to the Peach Bottom Units 2 and 3.

4.8 Summary of Impacts of Operations During the Renewal Term

Neither Exelon nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with Peach Bottom Units 2 and 3 operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 14 Category 2 issues applicable to Peach Bottom operation during the renewal term and for environmental justice and chronic

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1 effects of electromagnetic fields. For 14 issues and environmental justice, the staff concluded
2 that the potential environmental impact of renewal term operations of Peach Bottom Units 2
3 and 3 would be of SMALL significance in the context of the standards set forth in the GEIS and
4 that further mitigation would not be warranted. In addition, the staff determined that a
5 consensus has not been reached by appropriate Federal health agencies regarding chronic
6 adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.
7

8 **4.9 References**

9
10 10 CFR 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for Protection
11 Against Radiation."

12
13 10 CFR 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of
14 Production and Utilization Facilities."

15
16 10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection
17 Regulations for Domestic Licensing and Related Regulatory Functions."

18
19 36 CFR 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property*,
20 Part 800, "Protection of Historic Properties."

21
22 59 FR 7629. Executive Order 12898, "Federal Actions to Address Environmental Justice in
23 Minority and Low-Income Populations." *Federal Register*. Vol. 59, No. 32. February 16, 1994.
24

25 American Cancer Society (ACS). 2001a. "Rhabdomyosarcoma." Revised 1/18/2001. Available
26 at http://www3.cancer.org/cancerinfo/load_cont.asp?ct=53&language=English.

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