

RECORD OF DECISION
U.S. NUCLEAR REGULATORY COMMISSION
DOCKET NOS. 50-277 AND 50-278
SUBSEQUENT LICENSE RENEWAL APPLICATION FOR
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

BACKGROUND

The U.S. Nuclear Regulatory Commission (NRC) received an application dated July 10, 2018 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. [ML18193A689](#)), from Exelon Generation Company, LLC (Exelon) filed pursuant to Section 103 of the Atomic Energy Act of 1954, as amended, Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, "Environmental Protection Regulations For Domestic Licensing And Related Regulatory Functions," and 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," to renew the operating licenses for Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom). Exelon submitted the application for itself and acting as agent for PSEG Nuclear, LLC (PSEG), the co-owner of Peach Bottom.

The Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.) (AEA), specifies that licenses for commercial power reactors can be granted for an initial period of up to 40 years. The NRC regulations permit these licenses to be renewed beyond the initial 40-year term for an additional period, limited to 20-year increments per renewal, based on the results of an assessment to determine whether the nuclear facility can continue to operate safely during the proposed period of extended operation. There are no limitations in the AEA or NRC regulations restricting the number of times a license may be renewed.

The NRC granted initial renewed licenses to Exelon and PSEG for Peach Bottom, Units 2 and 3 on May 7, 2003. The renewed facility operating licenses for Peach Bottom, Unit 2 (License No. DPR-44) and for Peach Bottom, Unit 3 (License No. DPR-56) expire on August 8, 2033, and July 2, 2034, respectively. The subsequent renewed operating licenses would authorize Exelon to operate Peach Bottom, Units 2 and 3, until August 8, 2053, and July 2, 2054, respectively.

Peach Bottom, Units 2 and 3, are two General Electric boiling-water nuclear reactors located on approximately 769 acres (ac) (311 hectares (ha)) of Exelon-owned land in York County, PA. Each reactor is designed to produce a core thermal power output of 4,016 megawatts-thermal (MWt) with a corresponding gross electric output of approximately 1,300 megawatts-electric (MWe).

In addition to nuclear-generating Units 2 and 3, the Peach Bottom site also houses Unit 1, which was an experimental high-temperature, helium-cooled, and graphite-moderated nuclear reactor, and is being maintained in safe storage (SAFSTOR).

Enclosure

On August 1, 2018, the NRC staff published a notice of receipt of the subsequent license renewal application in the *Federal Register* (FR) (83 FR 37529). On September 6, 2018 (83 FR 45285), the NRC staff published a notice of acceptability for docketing and provided an opportunity to request a hearing and leave to intervene. A discussion below sets forth the status of an intervention petition filed in response to this notice.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA), directs Federal agencies to prepare a detailed statement in advance of making a decision on major Federal actions that may significantly affect the quality of the human environment. In accordance with the Commission's regulations in 10 CFR Part 51, the NRC prepares a site-specific supplement to an environmental impact statement (EIS) (SEIS) for all renewed reactor operating licenses, regardless of the action's environmental impact significance (10 CFR 51.20(b)(2) and 51.95(c)). In this instance, the NRC's major Federal action is to decide whether to issue subsequent renewed operating licenses for Peach Bottom, Units 2 and 3, authorizing operation through August 8, 2053, and July 2, 2054, respectively.

On September 10, 2018 (83 FR 45692), the NRC staff published a notice of intent to prepare a SEIS, and to conduct an environmental scoping process, in the *Federal Register*. In addition, Federal, State, and local agencies, as well as Tribal governments, were notified and asked to provide comment on and to participate in the environmental scoping process and review. On September 25, 2018, the NRC held a public scoping meeting near the Peach Bottom site in Delta, PA, to obtain public input on the proper scope of the NRC's environmental review of the Peach Bottom subsequent license renewal application. The NRC issued a scoping summary report on July 25, 2019 (ADAMS Accession No. [ML19037A348](#)).

ENVIRONMENTAL IMPACT STATEMENT

In accordance with 10 CFR 51.95(c), "Operating License Renewal Stage," the NRC staff documents its environmental review of a license renewal application and publishes it as a site-specific supplemental environmental impact statement (SEIS) to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants"(GEIS). The GEIS documents the results of the NRC's systematic approach to evaluating the environmental consequences of issuing renewed nuclear power plant licenses that authorize an additional 20 years of operation beyond the end of the current license term. The GEIS serves to facilitate the NRC's environmental review process for license renewal by identifying and evaluating environmental impacts that are considered generic and common to all nuclear power plants (Category 1 issues). For Category 1 issues, no additional site-specific analysis is required in the site-specific SEIS unless new and significant information is identified that would change the conclusions in the GEIS. The GEIS also identifies site-specific issues (Category 2 issues). For Category 2 issues, an additional site-specific review is required, and the NRC staff documents the results of that review in the SEIS.

The NRC established a standard of significance for each NEPA issue evaluated in the GEIS based on the Council on Environmental Quality regulations on how to evaluate significance (see Title 40, "Protection of Environment," of the *Code of Federal Regulations* (40 CFR) 1508.27, "Significantly"). The term "significantly," as used in NEPA, requires consideration of both of the following:

- 1) Context—as in the geographic, biophysical, and social context in which the effects will occur.
- 2) Intensity—which refers to the severity of the impact in whatever context it occurs.

The significance and severity of an impact can vary with the setting of the proposed action, In the case of license renewal, the context is the environment surrounding the nuclear power plant. Based on this, the NRC established a three-level standard of significance for potential impacts, SMALL, MODERATE, and LARGE, as defined below.

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

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Exelon submitted its license renewal application (ADAMS Accession No. [ML18193A689](#)) and environmental report (ADAMS Accession No. [ML18201A219](#)) under the NRC's 2013 revised rule governing license renewal environmental reviews, as codified in 10 CFR Part 51.¹ The 2013 GEIS² provided the technical bases for the list of NEPA issues and associated environmental impact findings for license renewal that were contained in Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants," in Appendix B to Subpart A of 10 CFR Part 51.

The NRC staff held an environmental scoping meeting on September 25, 2018. On August 1, 2019, the NRC staff issued a draft SEIS as draft "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 10, Second Renewal, Regarding Subsequent License Renewal for Peach Bottom Atomic Power Station, Units 2 and 3," to NUREG-1437 (ADAMS Accession No. [ML19199A113](#)).

A 45-day comment period began on August 9, 2019, when the U.S. Environmental Protection Agency (EPA) published a Notice of Availability in the *Federal Register* (84 FR 39296) of the draft SEIS to allow members of the public and agencies time to comment on the results of the environmental review. The comment period ended on September 23, 2019. Additionally, the NRC held a public meeting on September 12, 2019, to discuss the preliminary findings in the draft SEIS (ADAMS Accession No. [ML19268B351](#)).

The NRC issued the final SEIS (FSEIS) for the Peach Bottom, Units 2 and 3, subsequent license renewal application in January 2020 (ADAMS Accession No. [ML20023A937](#)). All substantive comments received during the draft SEIS comment period are included in Appendix A to the FSEIS. After consideration of those comments and its independent review, the NRC staff did not identify any new and significant information that would call into question, with respect to the subsequent license renewal of Peach Bottom, Units 2 and 3, the applicability of the GEIS conclusions on Category 1 issues. In the FSEIS, the NRC staff recommends that the adverse environmental impacts of subsequent license renewal for Peach Bottom are not so great that preserving the option of subsequent license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on: (1) the analysis and findings in the GEIS; (2) information provided in the environmental report and other

¹ 78 FR 37281. U.S. Nuclear Regulatory Commission. Final Rule, "Revisions to Environmental Review for Renewal of Nuclear Power Plant Operating Licenses." *Federal Register* 78 FR 37281. June 20, 2013.

² U.S. Nuclear Regulatory Commission. 2013. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Rev. 1, Vols. 1-3 (ADAMS Accession Nos. [ML13106A241](#), [ML13106A242](#), and [ML13106A244](#)). June 2013.

documents submitted by Exelon; (3) consultation with Federal, State, local, and Tribal agencies; (4) the NRC staff's independent environmental review; and (5) consideration of public comments received during the scoping process and on the Draft Supplemental Environmental Impact Statement.

Pursuant to 10 CFR Sections 51.102(b) and 51.103(a)(1)-(5), the NRC staff has prepared this concise public record of decision (ROD) to document its action on the Peach Bottom, Units 2 and 3, subsequent license renewal application. In accordance with 10 CFR Section 51.103(c), this record of decision incorporates by reference the materials contained in the FSEIS.

DECISION

Pursuant to 10 CFR Section 54.29, "Standards for issuance of a renewed license," a renewed license may be issued by the Commission if the Commission finds, in part, that any applicable requirements of Subpart A of 10 CFR Part 51 have been satisfied. Completion of the record of decision is required by 10 CFR 51.102.

This record of decision and the FSEIS, which is incorporated by reference herein, document the NRC's final decision on the review of the Peach Bottom, Units 2 and 3, subsequent license renewal application, in accordance with 10 CFR 51.103(a)(5), that the adverse environmental impacts of subsequent license renewal for Peach Bottom, Units 2 and 3, are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable.

In making its final decision on the proposed Federal action to authorize the continued operation of Peach Bottom, Units 2 and 3, through August 8, 2053, and July 2, 2054, respectively, the NRC must make a favorable safety finding. The purpose of the NRC's safety review is to determine if the applicant has adequately demonstrated that the effects of aging will not adversely affect the intended functions of any safety-related structures or components as specified in 10 CFR 54.4 and 10 CFR 54.21. The applicant must demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained during the license renewal period. The NRC staff documented the results of its safety review in "Safety Evaluation Report Related to the Subsequent License Renewal of Peach Bottom Atomic Power Station, Units 2 and 3," dated February 2020 (ADAMS Accession No. [ML20044D902](#)).

Further, as noted in Section 5 of the Safety Evaluation Report, the Advisory Committee on Reactor Safeguards (ACRS) completed its review and report in accordance with 10 CFR 54.25, "Report of the Advisory Committee on Reactor Safeguards," with respect to the application for subsequent renewal of the Peach Bottom Units 2 and 3 operating licenses. The ACRS completed its review during its 669th meeting, held on December 4–7, 2019, and documented its findings recommending subsequent renewal of the Peach Bottom, Units 2 and 3 licenses in a letter to the Commission dated December 19, 2019 (ADAMS Accession No. [ML19353D382](#)).

An Atomic Safety and Licensing Board appointed to rule on an intervention petition filed in response to the notice of opportunity for hearing published on September 6, 2018 (83 FR 45285), denied the hearing request and terminated the adjudicatory proceeding on June 20, 2019 (LBP-19-5) (ADAMS Accession No. ML19171A159). The petitioner's July 15, 2019, appeal of LBP-19-5 is pending before the Commission. Also pending before the Commission are the petitioner's September 3, 2019, motion for leave to file a new contention and petitioner's October 12, 2019, reply and motion for leave to reply to oppositions to its motion to reopen.

PURPOSE AND NEED

The purpose and need for the proposed Federal action (issuance of subsequent renewed licenses for Peach Bottom, Units 2 and 3) is to provide an option that allows for power generation capability beyond the term of the current renewed nuclear power plant operating licenses to meet future system generating needs. Such needs may be determined by energy-planning decisionmakers such as State regulators, utility owners, and Federal agencies other than the NRC. This definition of purpose and need reflects the NRC's recognition that, unless there are findings in the NRC's safety review (required by the Atomic Energy Act) or findings in the NRC's environmental analysis (required by NEPA) that would lead the NRC to reject a subsequent license renewal application, the NRC does not have a role in energy-planning decisions as to whether a particular nuclear power plant should continue to operate.

The issuance of a renewed license is just one of the items that a licensee must address to be able to operate its nuclear power plant during the renewal term. Ultimately, the appropriate energy-planning decisionmakers and Exelon will decide whether the plant will continue to operate based on the need for power or other factors within the State's jurisdiction or the purview of the owners.

NRC EVALUATION OF THE PROPOSED ACTION AND ALTERNATIVES

In license renewal environmental reviews, the NRC considers the environmental consequences of the proposed action (i.e., renewing each operating license), the environmental consequences of the no-action alternative (i.e., not renewing each operating license), and the environmental consequences of various alternatives for replacing the nuclear power plant's generating capacity. Section 102(2)(C)(iii) of NEPA and the NRC's regulations require the consideration of alternatives to the proposed action in the EIS. In this case, the proposed action is issuance of renewed operating licenses for Peach Bottom, Units 2 and 3, which will authorize the applicant to operate the plant for an additional period beyond the expiration date of the current licenses. FSEIS Chapter 2, "Alternatives Including the Proposed Action," and Chapter 4, "Environmental Consequences and Mitigating Actions," present the NRC staff's evaluation and analysis of the environmental impacts of the proposed action and alternatives to license renewal that were considered, as well as those alternatives that were eliminated from detailed study. The evaluation considered environmental impacts of each alternative across the following impact areas: land use and visual resources, air quality and noise, geologic environment, water resources, terrestrial resources, aquatic resources, special status species, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management.

As explained in the purpose and need for the proposed Federal action, outside of the safety and environmental reviews, the NRC does not have a role in the energy-planning decisions as to whether a particular nuclear power plant should continue to operate. Should the operating license(s) not be renewed and the nuclear plant shuts down at the end of its current license(s), the appropriate energy-planning decisionmakers will decide how best to replace the nuclear power plant's generating capacity. In evaluating alternatives to license renewal, the NRC considered energy technologies or options currently in commercial operation, as well as technologies not currently in commercial operation but likely to be commercially available (constructed, permitted and connected to the grid) by the time the current Peach Bottom, Units 2 and 3 operating licenses expire.

Evaluation of Alternatives

i. No-Action Alternative

At some point, all operating nuclear power plants will permanently cease operations and undergo decommissioning. The no-action alternative represents a decision by the NRC not to issue renewed operating licenses to a nuclear power plant beyond the current operating license term. Under the no-action alternative, the NRC would not issue the subsequent renewed operating licenses for Peach Bottom and the units would shut down at or before the expiration of the current licenses in 2033 (Unit 2) and 2034 (Unit 3). The GEIS describes the environmental impacts that arise directly from permanent plant shutdown. The NRC expects shutdown impacts to be relatively similar whether they occur at the end of the current license term (i.e., after 60 years of operation) or at the end of a subsequent renewed license term (i.e., after 80 years of operation).

After permanent shutdown, plant operators will initiate decommissioning in accordance with 10 CFR 50.82, "Termination of license." NUREG-0586, Supplement 1, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities Supplement 1 Regarding Decommissioning of Nuclear Power Reactors," called the Decommissioning GEIS (ADAMS Accession Nos. [ML023470327](#), [ML023500228](#), and [ML023500295](#)) describes the environmental impacts from decommissioning a nuclear power plant and related activities. The analysis in the Decommissioning GEIS bounds the environmental impacts of decommissioning when Exelon terminates reactor operations at Peach Bottom. Chapter 4 of the License Renewal GEIS (NUREG-1437) and Section 4.15.2, "Terminating Plant Operations and Decommissioning," of the Peach Bottom FSEIS describe the incremental environmental impacts of subsequent license renewal on decommissioning activities.

Termination of operations at Peach Bottom would result in the total cessation of electrical power production by Peach Bottom, Units 2 and 3. Unlike the replacement power alternatives described below, the no-action alternative does not expressly meet the purpose and need of the proposed action because the no-action alternative does not provide a means of delivering baseload power to meet future electric system needs. Assuming a need currently exists for the power generated by Peach Bottom Units 2 and 3, the no-action alternative would likely create a need for a replacement power alternative.

ii. Alternative Energy Sources

In evaluating alternatives to subsequent license renewal, the NRC considered energy technologies or options currently in commercial operation, as well as technologies not currently in commercial operation, but likely to be commercially available by the time the current Peach Bottom renewed operating licenses expire.

The GEIS presents an overview of some alternative energy technologies but does not conclude which alternatives are most appropriate. Because alternative energy technologies are continually evolving in capability and cost, and because regulatory structures have changed to either promote or impede the development of particular technologies, the analyses in the FSEIS rely on a variety of sources of information to determine which alternatives would be available and commercially viable when the current licenses expire. Exelon's environmental report provides a discussion of replacement power alternatives. In addition to the information Exelon provided in its environmental report, the NRC staff's analyses relied on appropriate Federal, State, and industry information sources, including the U.S Department of Energy, Energy

Information Administration and the EPA,” and energy-related statutes, regulations, and policies within the Peach Bottom region.

In total, the NRC staff considered 17 replacement power alternatives to the proposed action and eliminated 13 of these, which left the four reasonable replacement power alternatives for in-depth evaluation. These four alternatives are described in Sections 2.2.2.1 through 2.2.2.4 of the FSEIS, and NRC staff’s in-depth evaluation of these alternatives is presented in Chapter 4 of the FSEIS. The basis for elimination of the other alternatives is explained in Section 2.3 of the FSEIS. The alternatives selected for detailed evaluation in the FSEIS are briefly described below.

New Nuclear Alternative

The NRC staff considers the construction of a new nuclear plant to be a reasonable alternative to Peach Bottom subsequent license renewal. The NRC staff determined that there may be adequate time for Exelon to prepare and submit an application, build, and operate two new nuclear units using a certified design before the Peach Bottom, Units 2 and 3, licenses expire in 2033 and 2034, respectively.

The NRC staff considered the installation of multiple small modular reactors (SMRs) as the new nuclear alternative to renewing the Peach Bottom, Units 2 and 3, licenses. The SMRs generate approximately 300 MW or less, so they have lower initial capacity than that of traditional large-scale units. However, they have greater siting flexibility because they can fit in locations not large enough to accommodate traditional nuclear reactors. The NRC staff assumes that the resource requirements and key characteristics associated with constructing and operating small modular reactors would be bounded by the larger nuclear units evaluated in the SEIS.

The NRC staff assumes that the SMR facilities would use a closed-cycle cooling system with mechanical draft cooling towers. To support the plant’s cooling needs, this cooling system would withdraw approximately 80 million gallons per day (mgd) (300,000 cubic meters per day (m³/d)) of water and consume 55 mgd (210,000 m³/d) of water.

The NRC staff assumes that approximately 220 ac (89 ha) of land would be required for construction of a 2,400-MWe SMR facility. Onsite visible structures could include cooling towers, intake and discharge structures, transmission lines, and an electrical switchyard.

Supercritical Pulverized Coal Alternative

The NRC staff considered supercritical coal-fired generation equipped with carbon capture and storage technology to be a reasonable alternative to Peach Bottom subsequent license renewal because coal still provides the second-greatest share of electrical power to the regional transmission organization and coal-fired plants represent a feasible, commercially available option for providing electrical generating capacity beyond Peach Bottom’s current license expirations.

Baseload coal units have proven their reliability and can routinely sustain capacity factors as high as 85 percent. Among the technologies available, pulverized coal boilers producing supercritical steam (supercritical pulverized coal or SCPC boilers) are increasingly common for new coal-fired plants given their generally high thermal efficiencies and overall reliability. Supercritical pulverized coal facilities are more expensive than subcritical coal-fired plants to construct, but they consume less fuel per unit output, reducing environmental impacts. In a

supercritical coal-fired power plant, burning coal heats pressurized water. As the supercritical steam and water mixture moves through plant pipes to a turbine generator, the pressure drops and the mixture flashes to steam. The heated steam expands across the turbine stages, which then spin and turn the generator to produce electricity. After passing through the turbine, any remaining steam is condensed back to water in the plant's condenser.

The NRC staff assumes that the coal units would use a closed-cycle cooling system with mechanical draft cooling towers. To support the plant's cooling needs, this cooling system would withdraw approximately 66 mgd (250,000 m³/d) of water and consume 50 mgd (190,000 m³/d) of water. Onsite visible structures could include cooling towers, exhaust stacks, intake and discharge structures, transmission lines, coal storage, and an electrical switchyard.

The NRC staff assumes that the supercritical pulverized coal alternative would require approximately 4,500 ac (1,800 ha) of land for major permanent facilities for coal storage and waste disposal.

Natural Gas Combined-Cycle Alternative

The NRC staff considers the construction of a natural gas combined-cycle power plant to be a reasonable alternative to Peach Bottom subsequent license renewal because natural gas is a feasible, commercially available option for providing baseload electrical generating capacity beyond the expiration of Peach Bottom's current licenses.

Baseload natural gas combined-cycle power plants (abbreviated in this section as natural gas plants) have proven their reliability and can have capacity factors as high as 87 percent. In a natural gas combined-cycle system, electricity is generated using a gas turbine that burns natural gas. A steam turbine uses the heat from gas turbine exhaust through a heat recovery steam generator to produce additional electricity. This two-cycle process has a high rate of efficiency because the natural gas combined-cycle system captures the exhaust heat that otherwise would be lost and reuses it. Like other fossil fuel-burning plants, natural gas power plants are a source of greenhouse gases, including carbon dioxide (CO₂). For this alternative, the NRC staff assumes that five natural gas units would be constructed and operated to replace Peach Bottom's generating capacity. Each unit would have a capacity of approximately 575 MWe and operate using an 87 percent capacity factor, collectively replacing 96 percent of Peach Bottom's approximate generating capacity of 2,600 MWe,

The NRC staff assumes that the natural gas replacement power facility would be built on an existing or retired plant site within the region of influence and would allow for the maximum use of the location's existing ancillary facilities (e.g., support buildings and transmission infrastructure).

The NRC staff assumes that the natural gas combined-cycle plant would use a closed-cycle cooling system with mechanical draft cooling towers. To support the plant's cooling needs, this cooling system would withdraw approximately 18 mgd (68,000 m³/d) of water and consume 14 mgd (53,000 m³/d) of water. Because of the high overall thermal efficiency of this type of plant, the natural gas combined-cycle alternative would require less cooling water than the Peach Bottom subsequent license renewal. Onsite visible structures could include cooling towers, exhaust stacks, intake and discharge structures, transmission lines, natural gas pipelines, and an electrical switchyard.

The NRC staff assumes that approximately 250 ac (100 ha) of land would be used to construct and operate the natural gas plant. Depending on the specific site location and proximity of existing natural gas pipelines, the natural gas alternative may also require up to 10,400 ac (4,200 ha) of land for new gas wells, collection stations, and associated pipeline rights-of-way.

Combination Alternative (Natural Gas Combined-Cycle, Wind, Solar, and Purchased Power)

This alternative combines natural gas, wind, and solar replacement power generation with purchased power to meet the needs and purpose of the Peach Bottom subsequent license renewal. Natural gas, wind, and solar power generating facilities currently operate within the region of influence. For this evaluation, the NRC staff assumes that (1) a natural gas combined-cycle plant would supply 1,000 MWe, (2) wind farms would supply 1,200 MWe, (3) solar photovoltaic power plants would supply 200 MWe, and (4) 200 MWe would be purchased from other power providers. The NRC staff assumes that all components of this alternative would be located offsite of Peach Bottom but within the region of influence (i.e., Pennsylvania, Delaware, Maryland, and New Jersey). In addition, the NRC staff assumes that the natural gas component would be sited at an existing or former power plant site to maximize availability of existing infrastructure and reduce land disruption.

Natural Gas Combined-Cycle Portion of the Combination Alternative

The natural gas portion of the combination alternative would be generated using a natural gas combined-cycle plant located in the region of influence. The plant would be similar in function and appearance to the natural gas plant described previously for the natural gas-only alternative. For this analysis, the NRC assumes that the plant would consist of two natural gas units that would be constructed and operated.

Each unit would have a capacity of approximately 575 MWe and operate using an 87 percent capacity factor, collectively providing an approximate net generating capacity of 1,000 MWe.

Approximately 100 ac (40 ha) of land would be used to construct and operate the natural gas plant. Depending on the specific site location and proximity of existing natural gas pipelines, the natural gas alternative may also require up to 4,200 ac (1,700 ha) of land for new gas wells, collection stations, and associated pipeline rights-of-way.

The NRC staff assumes that the natural gas plant would use a closed-cycle cooling system with mechanical draft cooling towers. To support the plant's cooling needs, this system would withdraw approximately 7.3 mgd (27,000 m³/d) of water and consume 5.6 mgd (21,000 m³/d) of water.

Wind Portion of the Combination Alternative

The NRC staff assumes that the 1,200 MWe of wind generated replacement power under this combination alternative would come from land-based wind farms located in the region of influence. The wind portion, operating at an expected capacity factor of 40 percent, would require an installed capacity of 3,000 MWe.

The NRC staff assumes that additional installed capacity of 3,000 MWe can be reasonably attained in the region of influence by the time the Peach Bottom licenses expire in 2033 and 2034. As is the case with other renewable energy sources, the feasibility of wind resources

serving as alternative baseload power is dependent on the location (relative to expected load centers), value, accessibility, and constancy of the resource. Wind energy must be converted to electricity at or near the point where it is extracted, and there are limited energy storage opportunities available to overcome the intermittency and variability of wind resources. At the current stage of wind energy technology development, wind resources in wind power class 3 and higher are suitable for most utility-scale applications. Wind power class 3 is defined as having a wind speed of 15.7 miles per hour (7.0 meters per second) and a wind density of 500 watts per square meter at 164 ft (50 m). Each State in the region of influence has wind resources meeting this power class.

The average capacity of newly installed wind turbines in the United States is 1.9 MW. Accordingly, for this analysis the NRC staff assumes the wind component would consist of approximately 1,500 turbines with a capacity of 2.0 MW each. Construction and operation of these turbines, associated access roads, and power collection and transmission systems would result in approximately 5,100 ac (2,060 ha) of temporary land disturbance and 2,100 ac (850 ha) of permanent land disturbance. Because wind turbines require ample spacing between one another to avoid interturbine air turbulence, the total land requirement of utility-scale wind farms is significantly larger than the disturbed land. Under this alternative, approximately 255,000 ac (103,000 ha) would be required for an installed capacity of 3,000 MWe.

Wind energy's intermittency affects its viability and value as a baseload power source. However, the variability of wind-generated electricity can be tempered if the proposed wind farms were located at a large distance from one another and were operated as interconnected wind farms, an aggregate controlled from a central point. Distance between wind farms helps to ensure that multiple wind farms do not simultaneously experience the same weather conditions, and that power will likely be produced at some of the wind farms at any given time.

Solar Portion of the Combination Alternative

The solar portion of the combination alternative would be generated using solar photovoltaic energy facilities located in the region of influence. For this analysis, the NRC staff assumes that two standalone, utility-scale solar facilities would be constructed and operated. Each facility would have a capacity of approximately 400-MWe and would operate using a 25 percent capacity factor, collectively providing an approximate net generating capacity of 200 MWe.

Solar photovoltaic resources across the regional transmission organization range from 4.0 to 5.0 kilowatt hours per square meter per day (kWh/m²/day). The feasibility of solar energy resources serving as alternative baseload power is dependent on the location, value, accessibility, and constancy of solar radiation. Solar photovoltaic power generation uses solar panels to convert solar radiation into usable electricity. Solar cells are formed into solar panels that can then be linked into photovoltaic arrays to generate electricity. The electricity generated can be stored, used directly, fed into a large electricity grid, or combined with other electricity generators as a hybrid plant. Solar photovoltaic cells can generate electricity whenever there is sunlight, regardless of whether the sun is directly or indirectly shining on the solar panels. Therefore, solar photovoltaic technologies do not need to directly face and track the sun. This capability has allowed solar photovoltaic systems to have broader geographical use than concentrating solar power (which relies on direct sun). Because the region of influence contains average solar photovoltaic resources and because solar photovoltaic technology is a commercially available option for providing electrical generating capacity, the NRC staff considers the construction and operation of solar photovoltaic facilities to be a reasonable alternative when combined with other generation sources.

Utility-scale solar facilities require large areas of land to be cleared for the solar panels. For standalone sites, solar photovoltaic facilities may require approximately 6.2 ac per megawatt. Therefore, approximately 5,000 ac (2,000 ha) of land would be required collectively for the two proposed solar power installations needed under this alternative. Although not all this land would be cleared of vegetation and permanently impacted, it represents the land enclosed in the total site boundary of the solar facility. Solar photovoltaic systems do not require water for cooling purposes but do require a small amount of water to clean the panels and potable water for the workforce.

Purchased Power Portion of the Combination Alternative

Under the combination alternative, purchased power could be used to replace 200 MW of the generating capacity of Peach Bottom. Replacement power for Peach Bottom could come from anywhere within Pennsylvania or adjoining states in the region of influence. Purchased power would likely come from the most common types of electricity generation sources within the region of influence: nuclear, coal, natural gas, wind, and solar. All these power sources are discussed as alternatives to subsequent license renewal of Peach Bottom. Similarly, the impacts from purchased power would depend substantially on the generation technologies used to supply the purchased power. In addition, purchased power may require new transmission lines (which may require new construction) and may also rely on older and less-efficient power plants operating at higher than current capacities or new facilities that would be constructed.

iii. Summary

In the FSEIS for the Peach Bottom subsequent license renewal, the NRC staff considered the environmental impacts associated with subsequent license renewal and with alternatives to subsequent license renewal, including alternative power generation technologies, including some with closed-cycle cooling, and the impacts of not renewing the Peach Bottom, Units 2 and 3, operating licenses (the no-action alternative). The FSEIS concludes that environmental impacts of the proposed action (subsequent renewal of the Peach Bottom, Units 2 and 3 operating licenses) would be SMALL for all impact categories except for aquatic resources. Due to thermal impacts on the aquatic organisms in the Conowingo Pond, the impact of the Peach Bottom subsequent license renewal to aquatic resources would be SMALL to MODERATE.

As summarized in Table 2-2 of the FSEIS ("Summary of Environmental Impacts of the Proposed Action and Alternatives," reproduced below in Table 1), each of the four reasonable replacement power alternatives have environmental impacts in at least six resource areas that are greater than the environmental impacts of the proposed action of subsequent license renewal (and one resource area, aquatic resources, that has less impacts). In addition, the replacement power alternatives also involve the environmental impacts inherent to new construction projects. If the NRC adopts the no-action alternative and does not issue subsequent renewed licenses for Peach Bottom, energy-planning decisionmakers would likely implement one of the four replacement power alternatives discussed in-depth in Chapter 4 of the FSEIS. Based on the NRC staff's review of these four replacement power alternatives, the no-action alternative, and the proposed action, the staff concludes that the environmentally preferred alternative is the proposed action of subsequent license renewal. Therefore, the NRC staff recommends that the NRC issue subsequent renewed operating licenses for Peach Bottom, Units 2 and 3.

Table 1 Summary of Environmental Impacts of the Proposed Action and Alternatives

Impact Area (Resource)	Peach Bottom Subsequent License Renewal (Proposed Action)	No-Action Alternative	New Nuclear Alternative	Super-critical Pulverized Coal Alternative	Natural Gas Combined-Cycle Alternative	Combination Alternative (Natural Gas Combined-Cycle, Wind, Solar, and Purchased Power)
Land Use	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Visual Resources	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Air Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Noise	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Geologic Environment	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Surface Water Resources	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Groundwater Resources	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL
Terrestrial Resources	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Aquatic Resources	SMALL to MODERATE ^(a)	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE
Special Status Species and Habitats	See Note ^(b)	See Note ^(c)	See Note ^(c)	See Note ^(c)	See Note ^(c)	See Note ^(c)
Historic and Cultural Resources	See Note ^(d)	See Note ^(e)	See Note ^(f)	See Note ^(f)	See Note ^(f)	See Note ^(f)
Socio-economics	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Transportation	SMALL	SMALL	SMALL to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Human Health	SMALL ^(g)	SMALL ^(g)	SMALL ^(g)	SMALL ^(g)	SMALL ^(g)	SMALL ^(g)
Environmental Justice	See Note ^(h)	See Note ⁽ⁱ⁾	See Note ⁽ⁱ⁾	See Note ⁽ⁱ⁾	See Note ⁽ⁱ⁾	See Note ⁽ⁱ⁾
Waste Management and Pollution Prevention	SMALL ^(k)	SMALL ^(k)	SMALL ^(k)	MODERATE	SMALL	SMALL to MODERATE

(a) Due to thermal impacts on the aquatic organisms in the Conowingo Pond, the impact of the Peach Bottom subsequent license renewal to aquatic resources would be SMALL to MODERATE.

(b) The NRC staff concludes that the subsequent license renewal may affect, but is not likely to adversely affect the northern long-eared bat (*Myotis septentrionalis*) and Indiana bat (*M. sodalis*). The U.S. Fish and Wildlife Service concurred with these determinations in correspondence dated September 4, 2019. The subsequent license

renewal would have no effect on any other Federally listed or proposed species or on designated or proposed critical habitat. The proposed license renewal would not adversely affect designated Essential Fish Habitat.

- (c) The types and magnitudes of adverse impacts to species listed in the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), designated critical habitat, and Essential Fish Habitat would depend on Peach Bottom shutdown activities, the proposed alternative site, plant design and operation, as well as listed species and habitats present when the alternative is implemented. Therefore, the NRC staff cannot forecast a level of impact for this alternative.
 - (d) Based on (1) that no new ground disturbance, construction, or modifications are anticipated during the subsequent license renewal period, 2) State historic preservation office input, and 3) Exelon procedures, subsequent license renewal would not adversely affect any known historic properties (Title 36, "Parks, Forest, and Public Property," of the *Code of Federal Regulations* 800.4(d)(1), "No Historic Properties Affected"), or historic and cultural resources.
 - (e) As a result of facility shutdown, land-disturbance activities or dismantlement are not anticipated as these would be conducted during decommissioning, and therefore facility shutdown would have no immediate effect on historic properties.
 - (f) The potential for impacts to historic and cultural resources from construction and operation of a replacement power alternative would vary greatly depending on the location of the site. The impacts on historic and cultural resources could range from will not adversely affect known historic and cultural resources to may adversely affect known historic and cultural resources.
 - (g) The chronic effects of electromagnetic fields on human health associated with operating nuclear power and other electricity generating plants are uncertain.
 - (h) There would be no disproportionately high and adverse impacts to minority and low-income populations.
 - (i) A reduction in tax revenue resulting from the shutdown of Peach Bottom could decrease the availability of public services in the Peach Bottom area. Minority and low-income populations dependent on these services could be disproportionately affected.
 - (j) Based on the analysis of human health and environmental impacts presented in this SEIS, this alternative would not likely have disproportionately high and adverse human health and environmental effects on minority and low-income populations. However, this determination would depend on site location, plant design, and operational characteristics of the new power plant, unique consumption practices and interactions with the environment of nearby populations, and the location of predominantly minority and low-income populations. Therefore, NRC staff cannot determine whether any of the replacement power alternatives would result in disproportionately high and adverse human health and environmental effects on minority and low-income populations.
 - (k) NUREG-2157, "Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel," [ADAMS Accession No. ML14198A440] discusses the environmental impact of spent fuel storage for the timeframe beyond the licensed life for reactor operations.
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MITIGATION MEASURES

The NRC has taken all practicable measures within its jurisdiction to avoid or minimize environmental harm from the proposed action (subsequent license renewal). The FSEIS, as supplemented, concludes that the continued operation of Peach Bottom, Units 2 and 3, would have SMALL for all impact categories except for aquatic resources. Due to thermal impacts on the aquatic organisms in the Conowingo Pond, the impact of the Peach Bottom subsequent license renewal to aquatic resources would be SMALL to MODERATE.

The NRC is not imposing any license conditions in connection with mitigation measures for the continued operation of Peach Bottom Units 2 and 3. However, Peach Bottom is subject to requirements including permits, authorizations, and regulatory orders imposed by other Federal, State, and local agencies governing facility operation. For example, the National Pollutant Discharge Elimination System (NPDES) permit issued to Exelon imposes effluent limitations and monitoring requirements as well as best management practices to ensure that impacts to water quality and aquatic life are minimized. The NRC is not requiring any new environmental monitoring programs outside what is required for the NPDES permits or otherwise required of the licensee under NRC's regulations, as described in the FSEIS.

CONSIDERATION OF EMERGING INFORMATION AND COMMENTS ON THE FSEIS

The EPA Notice of Availability for the FSEIS regarding the Peach Bottom Units 2 and 3 subsequent license renewal application appeared in the *Federal Register* on January 31, 2020 (85 FR 5658). On February 28, 2020, NRC staff received an EPA Region III letter ([ML20063L324](#)), in which EPA stated that it had no objections to the proposed action (subsequent license renewal) moving forward. However, while the EPA indicated it understood that operations would continue to comply with state (Commonwealth of Pennsylvania) requirements, EPA (1) requested that the NRC consider re-evaluating conditions prior to the 2033 and 2034 commencement of the renewal period and (2) recommended, as may be needed for facility maintenance, consideration of innovations in stormwater and/or methods for reduction of entrainment.

Although the renewal period starts in the future, the time for the NRC staff to consider conditions related to the impacts of subsequent renewal will end if the proposed action is taken (i.e., issuance of the renewed licenses and such issuance is not disturbed by the Commission or a Federal court). Thus, commencement of the project is issuance of the renewed licenses, which under NRC regulations, include the requested renewal period plus any years remaining on the existing operating licenses.

In addition, as noted in the NRC staff responses to the EPA comments on the DSEIS (see Appendix A.2.2 of the FSEIS), Exelon has applied to the Pennsylvania Department of Environmental Protection (PDEP) for a renewed NPDES permit. The PDEP, not the NRC, is responsible for evaluating impingement and entrainment study results and using best professional judgment to determine the appropriate technologies, management practices, and plant operating measures that are considered best technology available to meet Clean Water Act Section 316(b) impingement and entrainment standards. As detailed in Section 4.7.1.1 of the FSEIS, the NRC staff assumes that the renewed NPDES permit will specify the conditions necessary to minimize impingement mortality and entrainment in accordance with the EPA's final 2014 Phase II Rule's best technology available requirements. The NRC staff further assumes that such requirements would be in place before the subsequent license renewal term would begin.

With respect to stormwater management, Section 3.5.1.3 of the FSEIS describes the regulation of point source and stormwater discharges from Peach Bottom in accordance with the facility's NPDES permit. The NPDES permit also requires Exelon to maintain a Stormwater Pollution Prevention Plan for the facility. Since NPDES permits must be renewed every five years, the PDEP will ensure that Peach Bottom operations will be conducted in accordance with all necessary standards and practices to protect receiving water quality and to minimize impacts on aquatic resources.

Because EPA's comments do not identify any new and significant information regarding the environmental impacts of the proposed action, the NRC staff concludes that no further evaluation of EPA's comments is needed, and no change to conclusions in the FSEIS is warranted.

DETERMINATION

Based on the NRC staff's (a) independent review, analysis, and evaluation contained in the subsequent license renewal FSEIS; (b) careful consideration of all of the identified social, economic, and environmental factors; (c) input received from other agencies, organizations, and the public; and (d) consideration of mitigation measures, the NRC has determined that the standards for the issuance of a subsequently renewed operating licenses, with respect to the environmental matters as described in 10 CFR 54.29(b), have been met and that the requirements of Section 102 of NEPA have been satisfied. The NRC has determined that the adverse environmental impacts of issuing subsequent renewed operating licenses for Peach Bottom, Units 2 and 3, are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable.

Dated at Rockville, MD, this 4th day of March 2020,

APPROVED BY:

/RA/

Anna H. Bradford, Director
Division of New and Renewed Licenses
Office of Nuclear Reactor Regulation