

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 37

Regarding Three Mile Island Nuclear Station, Unit 1

Final Report

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ABSTRACT

This supplemental environmental impact statement (EIS) has been prepared in response to an application submitted by Exelon Generation Company, LLC to renew the operating license for Three Mile Island Nuclear Station, Unit 1 for an additional 20 years.

This supplemental EIS includes the preliminary analysis that evaluates the environmental impacts of the proposed action and alternatives to the proposed action. Alternatives considered include replacement power from new supercritical coal-fired generation and natural gas combined-cycle generation; energy conservation/energy efficiency; and a combination of alternatives that included natural gas combined-cycle generation, conservation/efficiency, and improvements to hydroelectric dams; and not renewing the license (the no-action alternative).

The NRC has determined that the adverse environmental impacts of license renewal for Three Mile Island Nuclear Station, Unit 1 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This determination is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Exelon Generation; (3) consultation with Federal, State, and local agencies; (4) the NRC staff's own independent review; and (5) the NRC staff's consideration of public comments received during the scoping process and draft supplement EIS comment period.

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EXECUTIVE SUMMARY

Background

By letter dated January 8, 2008, Exelon Generation Company, LLC (Exelon Generation) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to issue a renewed operating license for Three Mile Island Nuclear Station, Unit 1 (TMI-1) for an additional 20-year period.

The following document and the review it encompasses are requirements of NRC regulations implementing Section 102 of the National Environmental Policy Act (NEPA), of the *United States Code* (42 U.S.C. 4321), in Title 10 of the *Code of Federal Regulations* (CFR), Part 51 (10 CFR Part 51). In 10 CFR 51.20(b)(2), the Commission indicates that issuing a renewed power reactor operating license requires preparation of an Environmental Impact Statement (EIS) or a supplement to an existing EIS. In addition, 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Vol. 1 and 2 (NRC 1996, 1999).

Upon acceptance of Exelon Generation's application, we (the NRC staff) began the environmental review process described in 10 CFR Part 51 by publishing a Notice of Intent to prepare an EIS and conduct scoping. We conducted a site audit at the plant in late April 2008 and held public scoping meetings on May 1, 2008, in Middletown, Pennsylvania. In the preparation of this supplemental EIS for TMI-1, we reviewed Exelon Generation's environmental report and compared it to the GEIS, consulted with other agencies, conducted a review of the issues following the guidance set forth in NUREG-1555, Supplement 1: *Standard Review Plans for Environmental Reviews for Nuclear Power Plants; Supplement 1: Operating License Renewal* (NRC 2000), and considered the public comments received during the scoping process and on the draft supplemental EIS.

Proposed Action

Exelon Generation initialized the proposed Federal action—issuing a renewed power reactor operating license—by submitting an application for license renewal of TMI-1, for which the existing license (DPR-50) expires April 19, 2014. NRC's Federal action is the decision whether to renew the license for an additional 20 years.

Purpose and Need for Action

The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license, and to meet future system generating needs, as determined by State, utility, and, where authorized, Federal (other than NRC) decisionmakers. This definition of purpose and need for action reflects the Commission's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954 or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate.

If the renewed license is issued, State regulatory agencies and Exelon Generation will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the operating

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license is not renewed, then the facility must be shut down on or before the expiration date of the current operating license—April 19, 2014.

Environmental Impacts of License Renewal

The supplemental EIS evaluates the potential environmental impacts of the proposed action. The environmental impacts from the proposed action can be SMALL, MODERATE, or LARGE. Exelon Generation and the NRC staff established separate processes for identifying and evaluating the significance of any new and significant information on the environmental impacts of license renewal of TMI-1. Neither Exelon Generation nor the NRC identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither the scoping process nor the NRC has identified any new issue applicable to TMI-1 that has a significant environmental impact. Therefore, the NRC staff relies upon the conclusions of the GEIS for all the Category 1 issues applicable to TMI-1.

Land Use

SMALL. The NRC did not identify any Category 2 impact issues for land use, nor did the staff identify any new and significant information during the environmental review. Therefore, there would be no impacts beyond those discussed in the GEIS.

Air Quality

SMALL. The NRC did not identify any Category 2 issues for the impact of transmission lines on air quality, nor did the staff identify any new or significant information during the environmental review. Therefore, for plant operation during the license renewal term, there are no impacts beyond those discussed in the GEIS.

However, air quality during refurbishment (in nonattainment and maintenance areas) is a Category 2 issue. Emission calculations for refurbishment activities at TMI-1 indicate that emissions are not expected to exceed emission budgets specified in the Pennsylvania State Implementation Plan, and on this basis, the NRC staff concludes that the impact of vehicle exhaust emissions resulting from refurbishment activities would be SMALL. Potential mitigation measures include implementation of best management practices for dust control and the use of staggered workforce shift changes to reduce the number of vehicles on the road at any one given time.

Ground Water Use and Quality

SMALL. Ground water use conflicts: potable and service water—plants using greater than 100 gallons per minute; and plants using cooling towers withdrawing make-up water from a small river) are Category 2 issues related to license renewal at TMI-1. Information provided by Exelon Generation, including Susquehanna River Basin Commission pump test data, shows that TMI-1 ground water withdrawal has no effect on offsite ground water wells and ground water supplies. In addition, the withdrawal of surface water from the Susquehanna River is a small percentage of overall river flow and does not affect ground water levels in the area.

Surface Water Use and Quality

SMALL. Water use conflicts—plants with cooling ponds or cooling towers using make-up water from a small river with low flow is a Category 2 issue related to license renewal at TMI-1. Withdrawals of Susquehanna River water by TMI-1 are less than 1.6 percent of the lowest daily mean flow and less than 0.1 percent of the average annual flow of the river. TMI-1 also

participates in the Cowanesque Lake water storage project, which releases water to the Susquehanna River during drought conditions. There are no Category 2 issues related to surface water use and quality during refurbishment activities.

Aquatic Resources

SMALL. With regard to operation of TMI-1 during the license renewal term, the NRC did not identify any Category 2 issues for aquatic resources, nor did the staff identify any new and significant information during the environmental review. Therefore, there are no impacts beyond those discussed in the GEIS. Besides Threatened and Endangered Species (discussed below), there are no Category 2 issues related to aquatic resources during refurbishment activities.

Terrestrial Resources

SMALL. With regard to operation of TMI-1 during the license renewal term, the NRC did not identify any Category 2 issues for terrestrial resources, nor did the staff identify any new or significant information during the environmental review. Therefore, there are no impacts beyond those discussed in the GEIS.

Impacts to terrestrial resources during refurbishment activities is a Category 2 issue. The majority of refurbishment activities will take place on existing facility grounds at TMI-1, and new, permanent structures will be constructed on previously disturbed land. Exelon Generation's steam generator vendor, AREVA NP, Inc. (AREVA) is required to obtain all necessary Federal and State environmental and construction permits to cover the transportation route of the new steam generators from Port Deposit, Maryland, to the TMI-1 site. Environmental and construction permits, as well as consultation correspondence with Pennsylvania and Maryland State resource agencies, will likely contain mitigation measures to minimize impacts to terrestrial resources, including installing silt fences to minimize sediment transport, the use of best management practices, and the restoration of cleared land upon completion of construction activities. Based on the environmental permit requirements and implementation of mitigation measures, impacts to terrestrial resources during refurbishment activities at the TMI-1 site and along the steam generator transportation route will be SMALL.

Threatened and Endangered Species

SMALL. Impacts to threatened and endangered species during the period of extended operation and during refurbishment activities are Category 2 issues. The U.S. Fish and Wildlife Service indicated that no known Federally-listed threatened and endangered species occur within the project area; therefore, the proposed project would not likely impact any Federally-listed species. The Pennsylvania Department of Natural Resources indicated that although several State-listed species of concern are known to occur in the vicinity of the TMI-1 project site, no impact to these species is anticipated. Furthermore, the Pennsylvania Fish and Boat Commission indicated that no adverse impacts to State-listed rare, candidate, threatened, or endangered aquatic species are expected from the proposed project.

Refurbishment activities will take place on existing facility grounds at the TMI-1 site, and new, permanent structures will be constructed on previously disturbed land; therefore, no impact to these species is anticipated.

Summary

With regard to the transportation of the new steam generators from Port Deposit, Maryland, to the TMI-1 site, AREVA is required to consult with the Pennsylvania Fish and Boat Commission, the Pennsylvania Game Commission, and the Pennsylvania Department of Natural Resources to determine if modifications to existing bridges, construction of temporary bridge by-passes, and other infrastructure modifications could impact threatened and endangered species along the steam generator transportation route. The consultation process will likely include mitigation measures to minimize potential impacts to threatened or endangered species that may be present in the vicinity of transportation route. AREVA will also require a joint permit for waterway construction work from the Pennsylvania Department of Environmental Protection and the U.S. Army Corps of Engineers. Approval of this permit is predicated on consultations with State resource agencies regarding impacts to threatened and endangered species.

Human Health

SMALL. With regard to Category 1 human health issues during the license renewal term—microbiological organisms (occupational health), noise, radiation exposures to public, occupational radiation exposures, and electromagnetic fields (chronic effects)—the staff did not identify any new or significant information during the environmental review. Therefore, there are no impacts beyond those discussed in the GEIS. Refurbishment activities are not expected to generate an amount of radioactive material that is significantly different from the historical radiological effluent releases which included refueling outage activities. Based on past regulatory compliance, the dose to a maximally exposed individual in the vicinity of TMI-1 for the refurbishment period is expected to continue to be a small fraction of the limits and standards specified in 10 CFR Part 20, Appendix I to 10 CFR Part 50, and 40 CFR Part 190.

Microbiological organisms (public health) and electromagnetic fields—acute effects (electric shock) are Category 2 human health issues. When thermal discharge from TMI-1 is at its maximum temperature and the Susquehanna River is at its maximum temperature, the resulting temperature of the mixed water in the vicinity of the TMI-1 discharge is approximately 91.3 degrees Fahrenheit, which is well outside the optimal growth temperature range of thermophilic microbiological organisms; therefore the impact is **SMALL**. Potential mitigation measures to reduce human health impacts include monitoring for thermophilic organisms in the water and sediments near the discharge, as well as prohibiting recreational use near the discharge plume. NRC staff reviewed Exelon Generation's analysis of electromagnetic fields—acute shock resulting from induced charges in metallic structures, and verified that none of TMI-1's in-scope transmission lines have the capability to induce greater than 5 milliamperes in a vehicle parked beneath the lines. This finding conforms with National Electric Safety Code provisions for preventing electric shock from induced current. Potential mitigation measures include limiting public access to transmission line structures, installing signs at road crossings, and increasing transmission line clearances. The NRC staff considers the GEIS finding of "uncertain" for electromagnetic fields—chronic effects still appropriate and will continue to follow developments on this issue.

Socioeconomics

SMALL. The NRC identified no Category 1 public service and aesthetic impacts applicable to TMI-1, or new and significant information during the environmental review. Therefore, there would be no impacts related to these issues beyond those discussed in the GEIS. Category 2 socioeconomic impacts include housing impacts, public services (public utilities), offsite land use, public services (public transportation), and historic and archaeological resources. Since TMI-1 is located in a high-density population area, and growth-control measures are not in effect, any changes in TMI-1 employment would have little noticeable effect on housing availability in the surrounding area. Exelon Generation has indicated they have no plans to add non-outage employees during the license renewal period; therefore non-outage employment levels at TMI-1 would remain relatively unchanged with no additional demand for public water and sewer services. This also applies to offsite land use and transportation issues. Because non-outage employment levels at TMI-1 would remain relatively unchanged during the license renewal period, there would be no land use impacts related to population or tax revenues, and no transportation impacts. Category 2 socioeconomic impacts related to refurbishment at TMI-1 would be SMALL, because the TMI-1 steam generator project is expected to require a one-time increase of outage workers for up to 70 days—a short duration of time.

No impacts to known historic and archaeological resources are expected from the continued operation of TMI-1 during the license renewal term. Exelon Generation has indicated no plans to change or modify the plant or transmission line structures. Based on the review of Pennsylvania Historical and Museum Commission files, archaeological surveys, assessments, and other information, the potential impacts on historic and archaeological resources at TMI-1 would be SMALL. Since TMI-1 is situated in an archaeologically sensitive area, development of a cultural resources management plan in addition to Exelon Generation's review procedures would serve to integrate cultural resource considerations with ongoing TMI-1 activities. Additionally, training of Exelon Generation staff in the Section 106 process would ensure that informed decisions are made when considering the effects of future projects on historic and archaeological resources. Lands that have not been surveyed should be investigated by a professional archaeologist prior to any ground disturbance. In addition, the historical farmstead site (36Da235) should be recorded and evaluated for eligibility. Because refurbishment activities will occur on previously disturbed land, the impacts associated with refurbishment are not expected to adversely affect historic or archaeological sites in the area of TMI-1. An analysis of minority and low-income populations residing within a 50-mile (80-kilometer) radius of TMI-1 indicated there would be no disproportionately high and adverse impacts to these populations from the continued operation of TMI-1 during the license renewal period. Based on recent monitoring results, concentrations of contaminants in native leafy vegetation, soils and sediments, surface water, and fish in areas surrounding TMI-1 have been low (at or near the threshold of detection) and seldom above background levels. Consequently, no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations in the region as a result of subsistence consumption of fish and wildlife.

Severe Accident Mitigation Alternatives

Since TMI-1 had not previously considered alternatives to reduce the likelihood or potential consequences of a variety of highly uncommon but potentially serious accidents, NRC

Summary

regulation 10 CFR 51.53(c)(3)(ii)(L) requires that TMI-1 evaluate Severe Accident Mitigation Alternatives (SAMAs) in the course of license renewal review. SAMAs are potential ways to reduce the risk or potential impacts of uncommon but potentially severe accidents, which may include changes to plant components, systems, procedures, and training. Based on our review of potential SAMAs and Exelon Generation responses to the NRC staff's requests for additional information, we conclude that TMI-1 made a reasonable, comprehensive effort to identify and evaluate SAMAs. Based on the review of the SAMAs for TMI-1, and the plant improvements already made, we conclude that none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation; therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

Alternatives

We considered the environmental impacts associated with alternatives to license renewal. These alternatives include other methods of power generation and not renewing the TMI-1 operating license (the no-action alternative). Replacement power options considered were supercritical coal-fired generation, natural gas combined-cycle generation and, as part of the combination alternative, uprates to existing hydroelectric dams located in Pennsylvania. Wherever possible, we evaluated potential environmental impacts for these alternatives located both at the TMI-1 site and at some other unspecified alternate location. Energy conservation/energy efficiency, purchased power, and a combination alternative, which included natural gas combined-cycle generation, energy conservation/energy efficiency, and a series of uprates to hydroelectric dams, were also considered. We evaluated each alternative using the same impact areas that we used in evaluating impacts from license renewal. The results of this evaluation are summarized in the table on the following page.

Comparison of Alternatives

The coal-fired alternative is the least environmentally favorable alternative, due to the following: impacts to air quality from nitrogen oxides, sulfur oxides, particulate matter, polycyclic aromatic hydrocarbons, carbon monoxide, carbon dioxide, and mercury—and the corresponding human health impacts; construction impacts to aquatic, terrestrial, and potentially historic and archaeological resources are also factors that make the coal-fired alternative the least environmentally favorable alternative. The gas-fired alternative would have slightly lower air emissions, and impacts to aquatic, terrestrial, and historic and archaeological resources would vary depending upon location of the plant. Purchased power would likely have operational impacts that would include aspects of coal-fired, gas-fired, and existing nuclear generation.

The NRC notes that the energy conservation/energy efficiency alternative has SMALL impacts in all categories evaluated and, upon shut down of TMI-1, current operating impacts of TMI-1 would cease. Therefore, the energy conservation/energy efficiency alternative is the environmentally preferred alternative to license renewal. All other alternatives capable of meeting the needs currently served by TMI-1 entail potentially greater impacts than the proposed action of license renewal of TMI-1. The no-action alternative does not meet the purpose and need of this supplemental EIS, though if it triggers the energy conservation/energy efficiency action to replace the capacity currently supplied by TMI-1, it could result in an overall SMALL impact, as well.

Recommendation

The NRC has determined that the adverse environmental impacts of license renewal for TMI-1 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This determination is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Exelon Generation; (3) consultation with Federal, State, and local agencies; (4) the NRC staff's own independent review; and (5) the NRC staff's consideration of public comments received during the scoping process and draft supplement EIS comment period.

Alternative	Impact Area						
	Air Quality	Ground Water	Surface Water	Aquatic and Terrestrial Resources	Human Health	Socioeconomics	Waste Management
License Renewal	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Supercritical coal-fired alternative at a new site	MODERATE	SMALL	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE
Gas-fired alternative at the TMI-1 site	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL
Gas-fired alternative at a new site	MODERATE	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL to MODERATE	SMALL
Energy Conservation/ Energy Efficiency	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Combination of Alternatives	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL
No Action Alternative	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL