

9.0 Summary and Conclusions

By letter dated January 31, 2000, Entergy Operations, Inc. (Entergy 2000) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the Arkansas Nuclear One, Unit 1 (ANO-1), operating license for an additional 20-year period. If the operating license is renewed, Federal (other than NRC) decision-makers, State regulatory agencies, and the owners of the plant 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 license is not renewed, the plant will be shut down at or before the expiration of the current operating license on May 20, 2014.

Under the National Environmental Policy Act of 1969 (NEPA), an environmental impact statement (EIS) is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor operating license; 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 (NRC 1996; 1999).^(a)

Upon acceptance of the Entergy application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping (65 FR 13061). The staff visited the ANO-1 site in April 2000 and held public scoping meetings on April 4, 2000, in Russellville, Arkansas (NRC 2000a, NRC 2000b). The staff reviewed the Entergy Environmental Report (ER) (Entergy 2000) and compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000c).

The staff then issued a draft of the supplemental environmental impact statement (SEIS) for public comment on October 3, 2000, which contained the preliminary results of its evaluation and recommendation. In addition, the staff held two public meetings during the comment period on the draft on November 14, 2000. When the comment period ended on January 4, 2001, the staff considered and dispositioned all the comments received, as discussed in Appendix A of this report. Modifications were made to this report to address certain comments, where appropriate, as described in Appendix A.

This SEIS presents the staff's analysis of the environmental impacts of renewal of the ANO-1 operating license. The analysis considers and weighs the environmental effects of the

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

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proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse impacts. It also includes the staff's final recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

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

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

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

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current operating license.

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

The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operations—generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the following three-level standard of significance—SMALL, MODERATE, or LARGE—based on Council on Environmental Quality guidelines:

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.

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

- (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 plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite 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.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of significant new information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

Of the 23 issues not meeting the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must also be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

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This SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the ANO-1 operating license) and alternative methods of power generation. Among the alternative methods of power generation, coal-fired and gas-fired generation appear the most likely if the power from ANO-1 is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the ANO-1 site or an unspecified "greenfield" site.

9.1 Environmental Impacts of the Proposed Action - License Renewal

Entergy and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Entergy nor the staff has identified any new issue applicable to ANO-1 that has a significant environmental impact.

Neither Entergy nor the staff has identified any significant new information related to Category 1 issues that would call into question the conclusions in the GEIS. Therefore, the staff relies upon the conclusions of the GEIS for all 69 Category 1 issues.

Entergy's license renewal application presents analyses of the Category 2 issues. The staff has reviewed the Entergy analysis for each issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at ANO-1. Four additional Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Entergy (2000) has stated that their evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of ANO-1 beyond the end of the existing operating license. In addition, any replacement of components or additional inspection activities is within the bounds of normal plant component replacement and, therefore, is not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to the Arkansas Nuclear Unit One* for ANO-1 (AEC 1973).

Twelve Category 2 issues, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this SEIS in relation to operation during the renewal term. For all

12 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Although one cost-beneficial SAMA was identified, further evaluation by Entergy showed that this issue was already adequately addressed in the operations training cycle. Therefore, no further action is necessary as part of license renewal pursuant to 10 CFR Part 54.

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

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

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

Because there is no refurbishment at ANO-1, there are no refurbishment-related environmental impacts. The adverse impacts of continued operation identified are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives in the event that ANO-1 ceases operation at or before the expiration of the current operating license will not be smaller than those associated with continued operation of ANO-1, and they may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of ANO-1 during its current license period was made when the plant was built. The resource commitments to be

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considered in this SEIS are associated with continued operation of the plant for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactor, and, ultimately, permanent offsite storage space for the spent fuel assemblies.

The most significant resource commitments related to operation during the renewal term are the fuel and the permanent storage space. ANO-1 replaces approximately 60 fuel assemblies during every refueling outage, which occurs on an 18-month cycle. Assuming no change in use rate, about 800 spent fuel assemblies would be required for operation during a 20-year license renewal period.

The likely power generation alternatives in the event ANO-1 ceases operation on or before the expiration of the current operating license will require commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the ANO-1 site was set when the plant was approved and construction began. That balance is now well established. Renewal of the ANO-1 operating license and continued operation of the plant will not alter the existing balance, but it may postpone the availability of the site for other uses. Denial of the application to renew the operating license will lead to shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the ANO-1 site into a park or an industrial facility are quite different.

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

The proposed action is renewal of the operating license for ANO-1. Chapter 2 describes ANO-1 and the environment in the vicinity of the plant. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at ANO-1. Chapters 4 through 7 discuss environmental issues associated with renewal of the operating license. Environmental issues associated with the no-action alternative and alternatives involving power generation are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the operating license), the no-action alternative (denial of the application), and alternatives involving coal-fired and gas-fired generation of power at the

ANO-1 site and an unspecified “greenfield site” are compared in Table 9-1. Continued use of the ANO-1 once-through cooling system is assumed for Table 9-1. Substitution of a cooling tower for the once-through cooling system in the evaluation of the coal-fired and gas-fired generation alternatives would result in somewhat greater environmental impacts in some impact categories.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories. The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendations

The staff recommends that the Commission determine that the adverse environmental impacts of license renewal for ANO-1 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants*, NUREG-1437 (NRC 1996, 1999); (2) the Entergy ER (Entergy 2000); (3) consultation with other Federal, State, and local agencies; (4) the staff’s own independent review; and (5) the staff’s consideration of public comments.

9.4 References

10 CFR Part 51, “Environmental protection regulations for domestic licensing and related regulatory functions.”

10 CFR 51.20, “Criteria for and identification of licensing and regulatory actions requiring environmental impact statements.”

10 CFR 51.23, “Temporary storage of spent fuel after cessation of reactor operations—generic determination of no significant environmental impact.”

10 CFR 51.71, “Draft environmental impact statement—contents.”

10 CFR 51.94, “Requirement to consider final environmental impact statement.”

10 CFR 51.95, “Supplement to final environmental impact statement.”

Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation (Including a Combination of Alternatives), Assuming a Once-Through Cooling System

Impact Category	Proposed Action (License Renewal)	No-Action Alternative (Denial of Renewal)	Coal-Fired Generation		Gas-Fired Generation		Combination	
			ANO Site	“Greenfield Site”	ANO Site	“Greenfield Site”	ANO Site	“Greenfield Site”
Land Use	SMALL	SMALL	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Ecology	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Quality — Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Water Quality — Groundwater	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	MODERATE to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE
Aesthetics	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Historic and Archaeological Resources	SMALL	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to MODERATE	MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants."

10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

10 CFR 54.21, "Contents of application—technical information."

65 FR 13061, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." March 10, 2000.

Entergy Operations, Inc. 2000. Letter from C. Randy Hutchinson, Vice President, Operations, ANO, to U.S. Nuclear Regulatory Commission. Subject: License Renewal Application - Arkansas Nuclear One, Unit 1. Dated January 31, 2000. (Contains the Entergy Environmental Report [ER]).

National Environmental Policy Act of 1969, as amended, 42 USC 4321-4370d.

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement related to the Arkansas Nuclear One Unit 1*. February 1973. Washington, D.C.

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

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report, Section 6.3 - Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants*. NUREG-1437, Vol. 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000a. *Summary of Site Audit to Support Review of License Renewal Application of Arkansas Nuclear One, Unit 1*. Washington, D.C., Dated May 1, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2000b. *Summary of Public Meeting to Discuss the Environmental Scoping Process for Arkansas Nuclear One, Unit 1 License Renewal Application*. Washington, D.C. Dated May 1, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2000c. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1, Washington, D.C.