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Public Comments on the Proposed 10 CFR Part 51 Rule for Renewal of Nuclear Power Plant Operating Licenses and Supporting Documents: Review of Concerns and NRC Staff Response

Executive Summary

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ABSTRACT

This report documents the Nuclear Regulatory Commission (NRC) staff review of public comments provided in response to the NRC's proposed amendments to 10 Code of Federal Regulations (CFR) Part 51, which establish new requirements for the environmental review of applications for the renewal of operating licenses of nuclear power plants. The public comments include those submitted in writing, as well as those provided at public meetings that were held with other Federal agencies, State agencies, nuclear industry representatives, public interest groups, and the general public. This report also contains the NRC staff response to the various concerns raised, and highlights the changes made to the final rule and the supporting documents in response to these concerns.

ACKNOWLEDGEMENTS

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ALARA	as low as reasonably achievable
BWR	boiling water reactor
CAA	Clean Air Act
CEQ	Council for Environmental Quality
CFR	Code of Federal Regulations
CPI	Containment Performance Improvement
CWA	Clean Water Act
DOE	Department of Energy
DOI	Department of the Interior
EA	Environmental Assessment
EI	exposure index
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
GEIS	Generic Environmental Impact Statement
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
ISFSI	Independent Spent Fuel Storage Installation
LLRWPA	Low-Level Radioactive Waste Policy Act of 1980
LLW	low-level radioactive waste
LOS	level of service
MDPH	Massachusetts Department of Public Health
MTHM	metric tonne heavy metal
NARUC	National Association of Regulatory Utility Commissioners
NAS	National Academy of Sciences
NCI	National Cancer Institute
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NUMARC	Nuclear Management and Resources Council
PRA	probabilistic risk assessment
PWR	pressurized water reactor
SAMDA	severe accident mitigation design alternative
SEIS	Supplemental Environmental Impact Statement
TVA	Tennessee Valley Authority
YAEC	Yankee Atomic Electric Company

1. INTRODUCTION

The Nuclear Regulatory Commission (NRC) is amending its regulations under 10 Code of Federal Regulations (CFR) Part 51 to establish new requirements for the environmental review of applications for renewal of nuclear power plant operating licenses.

1.1 Purpose

The purpose of this report is to document (1) the NRC staff review of public comments received on the proposed changes to 10 CFR Part 51, and (2) responses to the concerns raised. The responses are intended to clarify the basis for the NRC's actions, and identify appropriate changes made to the rule and to the supporting analyses and documents.

1.2 Background

The regulations contained in 10 CFR Part 51 implement Section 102(a) of the National Environmental Policy Act (NEPA) of 1969, as amended, which requires all Federal agencies to examine the environmental impacts of proposed major Federal actions. With respect to the NRC's regulatory functions, major Federal actions include the issuance of a domestic license to operate a commercial nuclear power plant.

The NRC initiated a program to develop license renewal regulations and associated regulatory guidance in 1986. Initially, the NRC planned to develop a policy statement (51 *Federal Register* [FR] 40334, November 6, 1986). However, the NRC decided to forego the development of a policy statement, and on August 29, 1988 issued an advance notice of proposed rulemaking (53 FR 32919). Draft NUREG-1317, *Regulatory Options for Nuclear Plant License Renewal*, was also made available for public comment. In March 1989, NUREG/CR-5332, *Summary and Analysis of Public Comments on NUREG-1317: Regulatory Options for Nuclear Plant License Renewal*, was published. Subsequently, the NRC determined that, in addition to the development of license renewal regulations focused on safety and public health protection, an amendment to the environmental protection regulations in 10 CFR Part 51 was warranted.

On October 13, 1989, the NRC published a notice of its intent to hold a public workshop on license renewal on November 13 and 14, 1989 (54 FR 41980). One of the workshop sessions focused primarily on the environmental issues associated with license renewal and the possible merits of amending 10 CFR Part 51. The workshop is summarized in NUREG/CP-0108, *Proceedings of the Public Workshop on Nuclear Power Plant License Renewal* (April 1990). Responses to the public comments submitted after the workshop are summarized in NUREG-1411, *Responses to Public Comments Resulting from the Public Workshop on Nuclear Power Plant License Renewal* (July 1990).

On July 23, 1990, the NRC published an advance notice of proposed rulemaking (55 FR 29964) and a notice of intent to prepare a generic environmental impact statement (GEIS) (55 FR 29967). On September 27, 1991, the NRC issued for public comment a proposal to amend 10 CFR Part 51 by establishing new requirements for the environmental review of applications to renew operating licenses for nuclear power plants (56 FR 47016). The proposed new requirements defined the scope of the environmental impacts that would be addressed as part of a license renewal application. Together with these proposed amendments, the NRC also issued for comment the following draft documents: (1) *Generic Environmental Impact Statement for License Renewal of*

Nuclear Plants, NUREG-1437; (2) Supplement to Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations*, DG-4002; (3) *Environmental Standard Review Plan—License Renewal*, NUREG-1429; and (4) *Regulatory Analysis of Proposed Amendments to Regulations Concerning the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses*, NUREG-1440.

Following the issuance of the proposed rule, the NRC conducted a public workshop on November 4–5, 1991, in Arlington, Virginia. The purpose of the workshop was to discuss the major aspects of the proposed rule and to obtain initial feedback from interested parties prior to the end of the comment period (March 31, 1992).

After the comment period, NRC staff exchanged letters with the Council for Environmental Quality (CEQ) and the Environmental Protection Agency (EPA) to address the concerns raised by these agencies about the procedural aspects of the proposed rule. The NRC also directed staff to hold discussions with the States to address their concerns regarding certain features of the proposed rule that conflicted with the States' regulatory authorities with regard to the need for power and utility economics. To facilitate the discussion, NRC staff prepared a paper discussing a set of options for determination of need for generating capacity and alternative energy sources in the context of license renewal. The NRC issued this paper for public comment on January 12, 1994 (59 FR 2542). NRC staff conducted three public meetings to solicit the views of States and others on the options paper. These meetings were held during the month of February 1994, in Rockville, Maryland; Rosemont, Illinois; and Chicopee, Massachusetts. In addition, NRC staff held a public meeting with the Nuclear Energy Institute (NEI) (formerly known as the Nuclear Management and Resources Council [NUMARC]) and Yankee Atomic Electric Company (YAEC) to better understand the proposals they had submitted in response to the January 1994 options paper. That meeting was held on May 16, 1994, in Rockville, Maryland.

Based on the comments received on the options paper, the NRC issued for comment a proposed supplement to the proposed rule on July 25, 1994 (59 FR 37724). The proposed supplement addressed NRC staff's recommended approach for consideration of the need for generating capacity and alternative energy sources which would satisfy the concerns of the States and others, as well as meet NEPA requirements. A 45-day comment period was provided.

1.3 Approach

This document presents all the issues raised since the initial publication of the proposed rule. The approach used to generate this report included the following steps: (1) summary of comments, (2) analysis of the comment summary to catalog comments by topic and subtopic, (3) identification of concerns raised and cataloging of each concern by topic, and (4) documentation of responses to the concerns raised. Detailed responses have been prepared for each area of concern identified from the analysis of comments. These responses are presented in Volume 2 of this report. In addition, Volume 2 contains the following: (1) lists of commenters who provided comments at various stages of the rulemaking process; and (2) summaries of comments submitted in writing, as well as those made at the various public meetings.

1.4 Scope and Nature of Public Comments

Sixty-eight organizations and 49 private citizens submitted written comments in response to the September 1991 solicitation on the proposed rule. Figure 1 provides a breakdown of the commenters by group. The 68 organizations included 5 Federal agencies; 26 State, regional, and local agencies; 19 nuclear industry organizations and engineering firms; 3 law firms; and 15 public interest groups. Multiple submissions by some organizations (e.g., the NEI and the Deerfield River Compact) resulted in 10 additional comment letters. Thus, a total of 127 separate comment letters was received.

Representatives from Federal agencies, State agencies, utilities, engineering firms, law firms, and public interest groups attended the November 1991 workshop. Workshop panelists included NRC staff, as well as representatives from the Department of Energy (DOE), the Department of the Interior (DOI), the EPA, the CEQ, several State agencies, the nuclear industry, and public interest groups.

Representatives from several States, the National Association of Regulatory Utility Commissioners (NARUC), the nuclear industry, and public interest groups actively participated at the three regional meetings held in February 1994.

Nineteen comment letters were received on the January 1994 *Federal Register* solicitation. The comments came largely from the States and the nuclear industry. In their submittal, NEI and YAEC each proposed an approach for addressing the need for generating capacity and alternative energy sources in the rule.

Twenty comment letters (from Federal and State agencies, the nuclear industry, a public interest group, and two private citizens) were received in response to the July 1994 proposed supplement to the proposed rule.

2. PUBLIC COMMENTS ON THE PROCEDURAL ASPECTS OF THE PROPOSED RULE

The commenters on the proposed rule raised significant concerns regarding the following procedural aspects of the rule: (1) participation of State representatives and the public in the license renewal process, and periodic assessment of the rule and the GEIS findings; (2) use of economic costs and cost-benefit balancing; and (3) consideration of the need for generating capacity and alternative energy sources in the environmental review of license renewal applications.

2.1 Public Participation and the Periodic Assessment of the Rule and the GEIS

Many commenters criticized the draft GEIS for its finding that 80 of 104 environmental issues are generic, so that the conclusions on these issues apply to all affected plants. This effectively limits the plant-specific review at the time of license renewal to a relatively small number of environmental issues. These commenters believe that such action denies them the opportunity to participate in the license renewal process. Moreover, they feel that the site-specific nature of many important environmental issues does not justify a generic finding, particularly when that finding was made 20 years in advance of the decision to renew an operating license. These commenters believe that only a site-specific environmental impact statement (EIS) to support a license renewal decision would satisfy NEPA requirements. The EPA and the CEQ suggested that the proposed rule would present obstacles

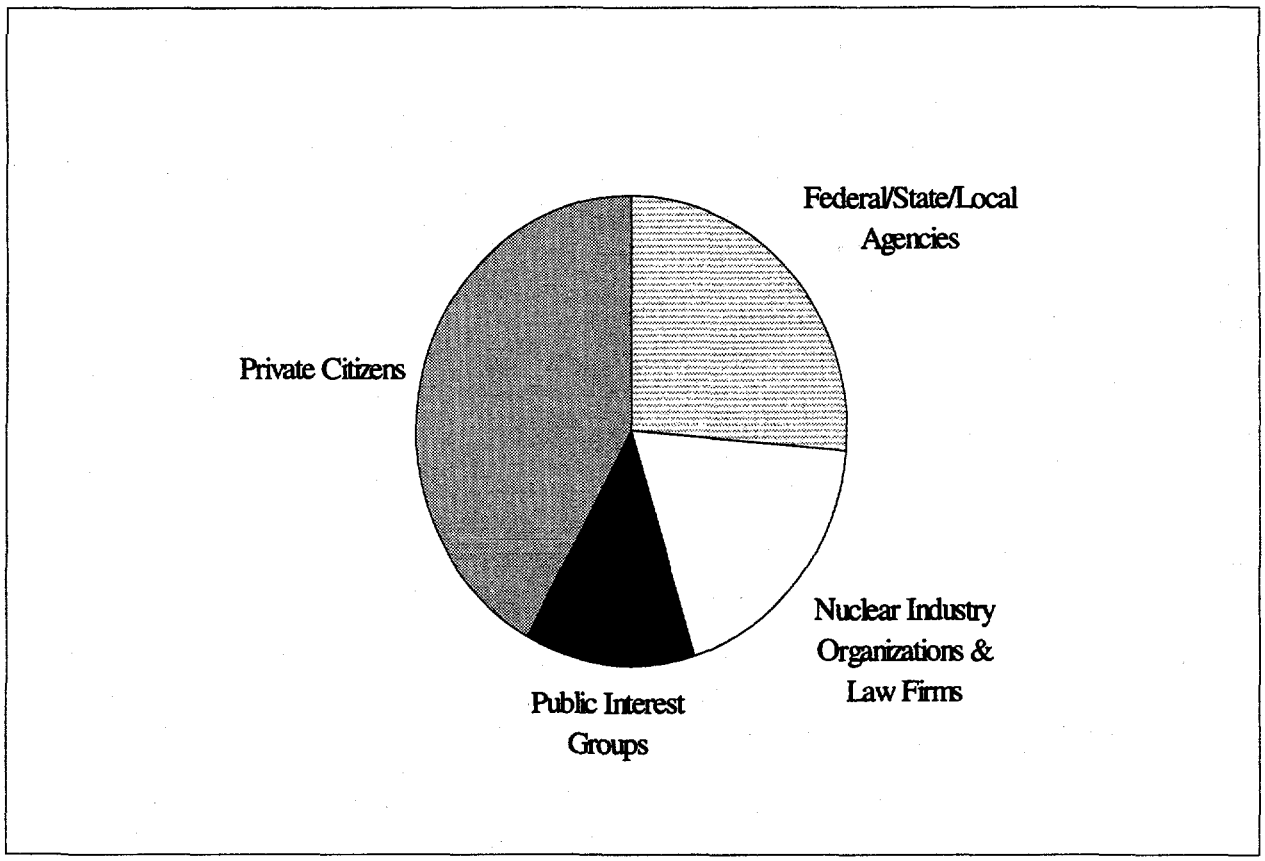

Figure 1. Commenters on the Proposed Rule

to public participation in the site-specific license renewal reviews. Various State agencies made similar comments.

Federal and State agencies also questioned how new scientific information could be folded into the GEIS findings since the GEIS was prepared so far in advance of the actual renewal of plant operating licenses. There were differing views on how exactly the NRC should address this question. A group of commenters noted that the rigidity of the proposed rule hampers the NRC's ability to respond to new information or to environmental issues not listed in the proposed rule. They believe that incorporation of new information can be achieved only through the process of amending the NRC's regulations. One commenter recommended that, should the NRC decide to pursue the approach of making generic findings as embodied in the GEIS, the periodicity of the review and update of the rule and the GEIS should be stated specifically in the rule. Recommendations on the frequency of the

review and update ranged from every 2 to 5 years.

In SECY-93-032 (February 9, 1993), NRC staff reported to the Commission on their discussions with the CEQ and the EPA regarding the concerns raised by these agencies, as well as by other commenters, about limits on public participation and about the consideration of significant new information in individual license renewal environmental reviews. The following are the major changes incorporated in the rule as a result of those discussions:

- The NRC will prepare a site-specific supplemental environmental impact statement (SEIS), rather than an environmental assessment (EA) (as initially proposed), for each license renewal application. The SEIS will supplement the GEIS. The NRC will review comments on the draft SEIS, and determine whether they raise new and significant information not previously considered in the analysis performed for the GEIS.

- The final rule and the GEIS will not include conditional cost-benefit conclusions. Conclusions on the overall cumulative environmental impacts will be left entirely to each site-specific SEIS.

- The NRC will review the rule and the GEIS on a schedule that allows revisions every 10 years, if required. These reviews will be initiated 7 years after completion of the previous revision. The NRC will conduct this review to determine which requirements, if any, in the rule require revision.

Among their comments on the July 1994 solicitation, NEI, several utilities, and the DOE asked that the NRC reconsider its understanding with the CEQ and the EPA regarding the preparation of a site-specific SEIS for each license renewal action. These commenters supported an approach that would allow the preparation of an EA for reviewing the environmental impacts of license renewal. The NRC disagrees with this position. The NRC believes it is not reasonable to expect that an assessment of the full set of environmental impacts associated with an additional 20 years of operation would result in a finding of no significant impact, as would be required if an EA were prepared.

2.2 Economic Costs and Cost-Benefit Balancing

State, Federal, and utility representatives expressed concern about the use of economic costs and cost-benefit balancing in the proposed rule and the draft GEIS. These commenters criticized the NRC's heavy emphasis on economic analysis and use of economic decision criteria. They argued that regulatory authority over utility economics falls within the States' jurisdiction, and to some extent that of the Federal Energy Regulatory Commission (FERC). They also suggested that the cost-benefit balancing used in the proposed rule and the draft GEIS went beyond NEPA requirements and CEQ regulations (40 CFR Part 1500). They noted that CEQ regulations interpret NEPA to require only an assessment of the cumulative effects of a proposed Federal action on the natural and man-made environment.

In response to these concerns, the NRC eliminated the use of cost-benefit analysis and consideration of utility economics in its NEPA review of a license renewal application. As discussed in more detail in the following section, the NRC recognizes that the determination of the economic viability of renewing a license and continuing operation should be made by State and utility officials.

2.3 Need for Generating Capacity and Alternative Energy Sources

Several States expressed concern that the NRC's analysis of need for generating capacity would preempt or prejudice State energy planning decisions. They argued that the determination of need for generating capacity has always been the States' responsibility. Recommendations on how to address this issue ranged from withdrawing the proposed rule to changing the categorization of the issue so that a site-specific review can be performed, thus allowing for meaningful State and public participation. Almost all the concerned States called on the NRC to modify the rule to state explicitly that the NRC's analysis does not preempt a State's jurisdiction over the determination of need for generating capacity.

Regarding the issue of alternative energy sources, several commenters contended that the site-specific nature of the choice of alternatives to license renewal does not justify the generic finding in the GEIS. One significant concern about this finding is the States' perception that this, in effect, preempts the States' responsibility to decide on the appropriate mix of energy alternatives in their respective jurisdictions.

Approaches for Treatment of "Need and Alternatives"

Based on information obtained from the three regional meetings, the public meeting held with industry representatives, and the written comments received on the NRC staff's options paper, the staff identified two basic approaches for consideration of the need for generating capacity and alternative energy sources that could satisfy the concerns of the States and meet NEPA requirements. These two approaches were presented in the *Federal Register* on July 25, 1994 (59 FR 37724).

One approach was proposed by the State of New York, and endorsed by several other States. This approach had the following three major conditions: (1) a statement in the rule that the NRC's findings on need and alternatives are intended only to satisfy the NRC's NEPA obligation, and do not preclude States from making their own determinations with respect to these issues; (2) the designation of need for generating capacity and alternative energy sources as Category 3 (i.e., requiring a site-specific evaluation); and (3) a requirement that all site-specific EISs and relicensing decisions reference State determinations of need for generating capacity and alternative energy sources, and that they defer to those State determinations to the maximum extent possible. NRC staff did not accept all elements of this approach because, from an overall perspective, it would have required that the NRC develop guidelines for determining the acceptability of State economic analyses, which some States may have viewed as an intrusion on their planning process. In addition, this approach would have continued to require that the NRC consider the need for generating capacity and utility economics as part of its environmental analysis.

As presented in 59 FR 37724, NRC staff developed and recommended a second approach after considering information gathered from the regional meetings and the written comments. This approach, which borrows some elements from the NEI and YAEC proposals, has the following major features: (1) neither the rule nor the GEIS would contain consideration of the need for generating capacity or other issues involving economic costs and benefits of license renewal and the alternatives to license renewal; (2) the purpose and need for the proposed action (i.e., license renewal) would be defined as preserving the continued operation of a nuclear power plant as a safe option that State regulators and utility officials might consider in their future planning actions; (3) the only alternative to the

proposed action would be the "no action" alternative, and the environmental consequences of this alternative would be defined by the impacts of a range of energy sources that might be used if a nuclear power plant operating license were not renewed; (4) the environmental review for license renewal would include a comparison of the environmental impacts of license renewal with those of the range of alternative energy sources; and (5) the NRC's NEPA decision standard for license renewal would require a determination of whether the adverse environmental impacts of license renewal, when compared with the impacts of the alternatives, were so great that preserving the license renewal option for future energy planning decision makers would be unreasonable.

Comments on the Staff's Proposal

Comments received from several States on the staff's recommended approach ranged from rejection to endorsement. Some States reiterated the three conditions proposed by the State of New York. Several States were still concerned about whether a meaningful analysis of need for generating capacity and alternative energy sources can be undertaken 20 years ahead of time. One State wanted the proposed rule withdrawn. Another wanted the proposed rule reissued for public comment. The CEQ supported the approach proposed by the State of New York. The CEQ believes that the NRC's recommended approach is in conflict with the NEPA process because the proposed statement of purpose and need for the proposed action is too narrow and does not provide for an appropriate range of alternatives to the underlying need for the proposed action. The CEQ suggested that the NRC address other energy sources as separate alternatives, rather than as consequences of the no action alternative. Moreover, the CEQ expressed its concern that the proposed decision standard places a "weighty and improper burden of proof" on consideration of the alternatives to license renewal. The EPA endorsed the CEQ's comments. In general, the nuclear industry supported the recommended approach. However, the NEI and the utilities strongly expressed the opinion that, with the redefined statement of purpose and need, alternative energy sources would no longer be alternatives to the proposed action, and therefore would not need to be considered.

Upon reviewing the comments received on the July 1994 proposal, the NRC modified and clarified its approach to address the CEQ's concerns regarding consideration of appropriate alternatives and the narrow definition of purpose and need. These modifications also address the concerns of States regarding the consideration of the need for generating capacity and alternative energy sources. The NRC clarified the purpose and need for license renewal in the GEIS as follows:

> "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 above statement provides for a characterization of other energy sources as the specific alternatives to license renewal and not merely a set of consequences of the no action alternative, and thus addresses the CEQ's concern that the scope of the alternatives analysis is unacceptably restricted.

With respect to the States' concerns, under this definition of purpose and need, the NRC will neither perform analyses of the need for generating capacity nor draw any conclusions about this issue in a license renewal review. This

definition of purpose and need also reflects the NRC's recognition that, absent findings in the safety review conducted pursuant to the Atomic Energy Act of 1954 or in the NEPA environmental analysis that would lead to the rejection of a license renewal application, the NRC has no role in the energy- planning decisions of State regulators and utility officials. From the perspective of the licensee and the State regulator, the purpose of renewing an operating license is to maintain the availability of the nuclear power plant to meet energy requirements beyond the term of the plant's current operating license. The underlying need that would be met by the continued availability of a nuclear power plant is defined by the various operational and investment objectives of the licensee. Each of these objectives may be dictated by State regulatory requirements or strongly influenced by State energy policies and programs. In cases of interstate generation or other special circumstances, Federal agencies such as the FERC or the Tennessee Valley Authority (TVA) may be involved in making these decisions. The objectives of these entities may include lower energy cost, increased efficiency of energy production and use, reliability in electric power generation and distribution, improved fuel diversity within the State, and improved environmental quality (e.g., clean air and minimum land use impacts).

Consideration of alternative energy sources will now be part of the individual plant review. The Part 51 rule itself contains no information or conclusions regarding the environmental impacts of alternative energy sources. It merely indicates that consideration of the environmental impact of alternatives to license renewal will be conducted at the individual plant review. The GEIS, however, contains a discussion of the environmental impacts of alternative energy sources based on currently available information. The information in the GEIS is available for use by the NRC and the licensee in performing the site-specific analysis of alternatives, and will be updated as appropriate. In reaching conclusions in the site-specific SEIS, the NRC will consider information codified in the rule, information presented in the GEIS, and any new and significant information provided by State agencies and members of the public. This approach will satisfy State concerns regarding the meaningful analysis of alternative energy sources.

The NRC disagrees with the CEQ's assertion about the inappropriateness of the decision standard the NRC is adopting. Under this standard, the NRC must determine whether the adverse environmental impacts of license renewal are so much greater than the impacts of all or almost all alternatives that it would be unreasonable to proceed with license renewal and continued operation. The NRC will use the standard to determine whether, from an environmental perspective, it is reasonable to renew a plant's operating license. Such action gives State and utility decision makers the option of considering that plant as an alternative for meeting future electrical energy needs. The test of reasonableness is whether the environmental impacts anticipated for continued plant operation during the license renewal term compare reasonably with the impacts expected from other alternatives being considered for meeting power-generation requirements.

As noted earlier, the NRC has no authority or regulatory control over the ultimate selection of future energy alternatives. Likewise, the NRC has no regulatory authority to ensure that environmentally superior energy alternatives are used in the future. Hence, while the NRC could decide to renew a nuclear power plant's operating license based on safety and environmental considerations, the final decision on allowing a plant to continue operating will be made by utility, State, and non-NRC Federal decision makers. Thus, the NRC believes that,

under the circumstances, the decision standard does not place a "weighty and improper burden of proof" on other alternatives as the CEQ claims.

With respect to the industry's desire to eliminate consideration of alternative energy sources in the environmental review of license renewal, the NRC disagrees. The NRC is not prepared to say, well in advance of an actual license renewal decision, that no nuclear power plant will fall outside the range of other reasonably available alternatives. To do so would not lead to the comparison of the proposed action with a meaningful set of alternatives.

Finally, the NRC does not believe it is necessary to reissue the rule for public comment. As discussed earlier, the NRC has conducted several public meetings and published its recommended procedural revisions to the proposed rule for public comment. The NRC believes that the modifications made to the proposed rule reflect the staff's serious consideration of all the public comments received.

3. PUBLIC COMMENTS ON THE TECHNICAL ASPECTS OF THE PROPOSED RULE AND SUPPORTING DOCUMENTS

Many comments were made concerning the categorization of environmental issues in the proposed rule and draft GEIS. Many commenters expressed concern that the category definition and the impact-significance definition were ambiguous and appeared somewhat interconnected. In addition, the EPA suggested that mitigation of adverse impacts was not addressed adequately.

In the proposed rule and draft GEIS, findings about the environmental impact associated with each issue were divided into three categories of applicability to individual plant reviews:

- **Category 1:** A generic conclusion on the impact has been reached for all affected nuclear plants.

- **Category 2:** A generic conclusion on the impact has been reached for affected nuclear plants that fall within defined bounds.

- **Category 3:** A generic conclusion on the impact has not been reached for any affected nuclear plants.

Furthermore, the significance of the magnitude of the impact for each issue was expressed as one of the following three levels:

- **Small:** These impacts are so minor that they warrant neither detailed investigation nor consideration of mitigative actions when such impacts are negative.

- **Moderate:** These impacts are likely to be clearly evident and when negative, usually warrant consideration of mitigation alternatives.

- **Large:** These impacts involve either a severe penalty or a major benefit, and when they are negative, mitigation alternatives are always considered.

With respect to the categories of applicability, the proposed rule would have required all applicants to do the following: (1) not provide additional analyses of Category 1 issues; (2) not provide additional analyses if the plant fell within the bounds defined for a specific Category 2 issue; (3) provide additional plant-specific analyses if the plant did not fall within the bounds defined for a specific Category 2 issue; and (4) provide plant-specific analyses of Category 3 issues.

Commenters expressed a number of concerns regarding use of the applicability and impact level categories. With respect to the applicability categories, these ranged from a general concern that Category 1 would preclude or hinder public involvement in an issue at the time of the plant-specific review, to specific concerns about the technical adequacy of the analysis supporting a Category 1 finding for an issue. Several commenters pointed out that the definitions created confusion, especially as to whether the findings of small impact and Category 1 applicability are interrelated. They suggested that the draft GEIS appeared to use Category 1 and small impact interchangeably. Commenters also expressed concern that the requirement to consider mitigative actions was inadequately addressed in the draft GEIS and proposed rule.

To reduce potential confusion over the definitions, use of categories, and treatment of mitigation within the context of the categorization scheme, the NRC revised the definitions to eliminate any ambiguity regarding how they are used. First, the level of significance of the effects of an environmental issue was defined as small, moderate, or large. The revised definitions differ slightly from those in the proposed rule and draft GEIS. They are given in Table B-1, Appendix B to 10 CFR Part 51.

Each issue was then further categorized according to whether the analysis of that issue could be applied to all plants or a set of plants with specified characteristics. Instead of three issue categories, there are now only two:

- **Category 1:** For the issue, the analysis reported in the GEIS has shown:
  (1) the environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic;
  (2) a single significance level (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 (HLW) and spent fuel disposal); and (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 as to warrant implementation.

  The generic analysis of the issue may be adopted in each plant-specific review.

- **Category 2:** For the issue, the analysis reported in the GEIS has shown that one or more of the criteria for Category 1 cannot be met, and therefore additional plant-specific review is required.

The revised definitions of the significance level are:

- **Small:** For the issue, the environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in NRC regulations are considered small.

- **Moderate:** For the issue, the environmental effects are sufficient to alter noticeably but not to destabilize important attributes of the resource.

- **Large:** For the issue, the environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The following subsections summarize the major concerns raised regarding the environmental issues examined in the draft GEIS and the NRC staff's response to those concerns.

3.1 Surface Water Use and Quality

In support of the proposed rule, the draft GEIS (Chapters 3 and 4) examined a broad range of aspects associated with surface water, including the character, chemical composition, cleanliness, and utilization of surface water bodies.

Several commenters expressed concerns related to the National Pollutant Discharge Elimination System (NPDES) permitting process for surface water discharge. They pointed out that the NRC may have overlooked its legal obligation to comply with Section 401 of the Clean Water Act (CWA). Their recommendations included (1) the withholding of approval for license renewal until a facility has complied with Section 401, and (2) a decoupling of the NRC relicensing process from the NPDES permitting process.

With regard to the first of these recommendations, the NRC will continue to comply with the provisions of Section 401 of the CWA. Furthermore, pursuant to Section 511(c) of the CWA, the NRC cannot question or reexamine the effluent limitations or other requirements in permits issued by the relevant permitting authorities. Nevertheless, compliance with environmental quality standards and the requirements of such permits is not a substitute for and does not negate the requirement that the NRC consider all environmental effects of the proposed action. Accordingly, the NRC has not only taken existing permits into account in its analysis of water quality impacts, but also considered information on actual operating impacts collected from individual plants, State and Federal regulatory agencies, and published literature. As a result, the NRC has concluded that the environmental impacts on surface water quality are small for those effluents subject to existing permit or certification requirements. For those issues for which the permit is still open at the time of the license renewal application, the NRC will work with the permitting agency in evaluating the magnitude of the impact as part of its NEPA review.

With regard to the second recommendation above, a total decoupling of the license renewal process and the NPDES permitting process is not appropriate, in that for those issues with incomplete CWA determinations, the NRC cannot complete its weighing and balancing of impacts without independently addressing the issues. The NRC also believes that it is not the purpose of NEPA to provide a second opportunity to litigate matters regulated under the CWA. An NPDES permit is issued for a maximum period of five years. Aquatic impacts could be reviewed as many as nine times under the NPDES permitting process before a nuclear plant had begun its forty-first year of operation.

Several commenters suggested that various issues related to surface water should be Category 2 or 3 issues. These included the following:

- Water use conflicts as experienced in Arizona and the Midwest: The NRC has considered the impacts on surface water during the renewal period and concluded that such impacts are small for plants with once-through cooling system (i.e., Category 1 issue). However, this issue is designated Category 2 for plants with cooling towers and cooling ponds because the impacts could be small or moderate. Given the analysis and conclusions regarding this issue, the NRC will not interfere with the decisions made by State authorities in this area. The NRC will, however, require an applicant for license renewal to identify and indicate the status of

State and local approvals regarding water use issues.

- Thermal stratification and salinity gradients associated with once-through cooling systems: For those reactor sites where thermal stratification or salinity gradient has been found to be the most pronounced, the States have resolved the problems as part of the NPDES process. None of the agencies consulted about these issues expressed concern about the effects of altered thermal stratification or salinity changes. This issue is designated as Category 1.

- Toxicity of biofouling compounds: Similarly, the NPDES permit for a facility establishes allowable discharges, including biocides. The NRC has found no indication that residual environmental impacts would occur as a result of license renewal activities at any nuclear plant site. Hence, the issue involving discharge of chlorine and other biocides is Category 1.

3.2 Aquatic Ecology

The draft GEIS (Chapters 3 and 4) evaluated the potential impacts to aquatic ecology resulting from both refurbishment activities and an additional 20 years of plant operation. A number of comments regarding the ecological impact of cooling water withdrawal from aquatic bodies were received. Specific concerns included fish kills associated with the entrainment and impingement of fish within seawater cooling systems, the use of chlorine and molluscicides to control mussel and clam growth, and the long-term effects of heavy metal discharges from plants with copper-nickel condenser tubes. Another commenter noted that license extension affords the opportunity to review the intake and discharge configuration of plant cooling water systems, since the best available technology that is economically available may be different given the additional 20 years of plant operating life.

As in the case of surface water quality discussed in Section 3.1, the NRC has considered the impacts of license renewal on aquatic ecology and, in doing so, has reviewed existing NPDES permits and other information. Based on this analysis, the NRC has concluded that the impacts are small. Agencies responsible for existing permits are not constrained from reexamining the permit issues if they have reason to believe that the basis for permit issuance is no longer valid. The NRC has no authority under NEPA to impose an effluent limitation other than those established in permits issued pursuant to the CWA.

Regarding the concern over the long-term effects of heavy metal discharges from plants with copper-nickel condenser tubes, this problem has been found at only one plant, and the affected condenser tubes have been replaced with tubing of a more corrosion-resistant material. The draft GEIS cited a study designed to detect water quality and ecosystem impacts of power plant operation on 14 cooling impoundments. These cooling impoundments were selected from a population of 135 steam-electric power plant cooling ponds across the United States as those most likely to provide worst-case conditions for identifying environmental impacts—low ratio of impoundment surface area to electricity generating capacity, high water evaporation rates, or limited drainage. The study indicated that trace metals did not appear to be accumulating in the impoundments, and that concentrations of metals were too low to be toxic to aquatic organisms.

A commenter suggested that the issue of riparian zones should be addressed in the GEIS since the vegetation region along a water course can be affected by water withdrawal, and it is important in maintaining the habitat. The NRC agrees with the importance of addressing the impacts of

license renewal on the riparian habitat. The final GEIS provides a discussion of the riparian habitat as an important resource and the potential effects of consumptive water use on riparian zones.

3.3 Groundwater Use and Quality

The draft GEIS (Chapters 3 and 4) addressed the potential impacts to groundwater use and quality resulting from plant refurbishment activities and from the subsequent license renewal period. Several commenters suggested that groundwater issues should be reviewed on a site-specific basis because of groundwater use conflicts (in particular, the effect on aquifer recharge by using surface water as cooling water), opportunities for saltwater intrusion, and concerns over tritium found in wells at one site. On the other hand, another commenter requested that the issue of groundwater use for cooling tower makeup water be changed from Category 2 to Category 1, since this issue is based solely on data from Ranney wells at Grand Gulf, and tests have shown that the elevation of the water plain around Grand Gulf is not dropping.

Based on consideration of the above comments, the issue of groundwater use conflicts resulting from withdrawal of surface water for cooling tower makeup, thereby potentially affecting aquifer recharge, is now Category 2 for plants withdrawing surface water from small water bodies during low-flow conditions. The GEIS now identifies a potential reduction in aquifer recharge as a result of competing water use. Indeed, such water use conflicts are already a concern at two closed-cycle nuclear power plants.

Regarding the issue of saltwater intrusion, the GEIS analysis did not identify any situation where groundwater consumption by nuclear power plants has led to saltwater intrusion problems. Data indicate that the major cause of saltwater intrusion has been the large consumption of groundwater by agricultural and municipal users. Groundwater consumption by nuclear power plants is small by comparison.

The NRC does not see that the issue of groundwater quality requires a plant-specific review because of tritium contamination problems. Traces of tritium contamination of groundwater have been detected at only one nuclear power plant, the Prairie Island plant. The draft GEIS recognized and addressed the potential for contamination of groundwater by cooling lakes, but did not discuss the potential for groundwater contamination due to leakage of cooling water intake and discharge channels because the potential impact from this type of leakage is small. Steps have been taken to correct the leakage at Prairie Island. Furthermore, the impact represented by the tritium found in the well is small, with the resultant concentrations of tritium being many times lower than the national drinking water standard for tritium of 20,000 picocuries per liter. The GEIS has been revised to provide a reference to the Prairie Island analyses.

With respect to the issue of groundwater use for cooling tower makeup, the GEIS analysis found this to be Category 2 even though only the Grand Gulf Nuclear Station currently uses Ranney wells to withdraw groundwater, and this water intake does not conflict with other groundwater uses in the area. It is not possible to predict whether water use conflicts will occur at Grand Gulf in the future. It is also not possible to determine, at this time, the significance of environmental impacts associated with Ranney well use at other nuclear plants that might choose to adopt this method in the future.

3.4 Terrestrial Ecology

The sections (in Chapters 3 and 4) of the draft GEIS on terrestrial ecology examined the

potential for the loss of plant and animal habitat resulting from license renewal activities. Several commenters recommended that the issue of bird mortality resulting from collisions with transmission lines, towers, or cooling towers be characterized as a Category 2 issue to provide for mitigation at those plants with cooling towers that do not have illumination, or for power plant transmission lines that cross wetlands used by large concentrations of birds or that transect major flyways. The NRC does not agree with this recommendation. The GEIS cites several studies which conclude that bird mortalities resulting from collision with transmission lines, towers, or cooling towers are not impacting bird populations significantly. This issue is Category 1 because the associated refurbishment will not involve construction of any additional transmission lines or natural draft cooling towers, the levels of bird mortality are low, and deaths due to collisions are not significantly reducing bird populations.

One commenter expressed concern that the draft GEIS analysis of terrestrial land use did not adequately encompass the impact of on-site spent fuel storage on land use; hence, the Category 1 finding was questionable. Of specific concern was the potential need for construction of additional spent fuel storage facilities associated with the license renewal term, and the associated impacts to the terrestrial environment. The NRC does not agree that there is a need to change the Category 1 determination for the on-site land use issue. Indeed, waste management operations could require the construction of additional storage facilities, and thus adversely affect land use and terrestrial ecology. However, experience has shown that the associated land requirements would be relatively small (less than 9 acres), as would the impacts to land use and terrestrial ecology (see also the discussion of concerns related to solid waste management in Section 3.7). Terrestrial ecology with disturbance of sensitive habitat is treated as a separate issue and is designated Category 2.

Several comments were received concerning the impact of license renewal on threatened and endangered species. Some commenters recommended that the endangered species provisions in the draft GEIS be expanded to include species that are proposed to be listed as threatened or endangered by the U.S. Fish and Wildlife Service, in addition to those already listed as such. The NRC agrees with this recommendation. The GEIS has been revised to state explicitly that species listed, or proposed to be listed, as threatened or endangered will be considered in the staff's environmental review of individual plant license renewal applications. The environmental review, however, will not include candidate species, as they do not have the protected status of species proposed to be listed. Moreover, neither the Endangered Species Act nor any other Federal regulation requires that candidate species be considered.

There were comments on the use of herbicides within transmission line rights-of-way. The commenters expressed concern that herbicide toxicity has been tested on only a few wildlife species, and that some pesticides used for right-of-way maintenance may pose significant environmental concerns. The NRC believes that the use of herbicides for transmission line right-of-way maintenance is done consistently with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Registered herbicides are being used. There is no evidence to indicate that this is not the standard practice of the industry. A pesticide is registered under FIFRA after the EPA has determined that it will perform its intended function without unreasonable adverse effects on the environment, when used in accordance with widespread and commonly accepted practice. Where such assurance cannot be derived, the pesticide may still be registered, but with use restricted to a certified application.

If a nuclear utility were to apply a restricted pesticide, it would be required to use a licensed operator. Whereas some individual animals may be adversely affected by herbicides and vegetation changes from herbicide applications, studies indicate that populations are not significantly impacted by toxic effects or by herbicide effects on vegetation.

3.5 Human Health

The draft GEIS (Chapters 3 and 4) examined the radiological impacts on the health of occupational workers and the general public in connection with plant refurbishment activities and normal plant operations during the license renewal term. Several commenters indicated that it was inappropriate to compare the radiation exposures associated with license renewal with natural background levels. They suggested that the appropriate argument should be that the risks associated with the additional exposures are so small as to require no additional mitigative measures. The NRC agrees with this comment. The revised text in the GEIS indicates that current dose and release levels and their potential incremental additions to risk are of small significance because they are within the limits established by the NRC. Furthermore, little change is anticipated from current safe and acceptable operating experience.

Several commenters indicated that the draft GEIS needed a broader treatment of the notion of uncertainty as related to human health issues. The NRC agrees that there is considerable uncertainty associated with health effects, especially at low occupational public dose levels, and particularly with respect to electromagnetic fields. Health effect estimates from radiation exposures are based on the best scientific evidence available and are considered to be upper estimates. Several sections of the GEIS have been expanded to explain more thoroughly how predicted impacts could be affected by changes in conditions or standards.

One commenter indicated that the draft GEIS and the proposed rule should have used risk coefficients for chemicals and radiation to obtain upper-bound risk estimates of cancer incidence. The NRC does not agree with this comment. In comparing alternatives to license renewal, NEPA requires comparison of the central or best estimates of impacts, as this provides the fairest determination. The draft GEIS was written using current, Commission-approved risk estimators. Worst-case or conservative estimates could distort the comparisons and lead to poor decisions.

Two commenters expressed concern regarding the GEIS conclusion that the impact of radiation exposure to the public is small, citing a study done by the Massachusetts Department of Public Health (MDPH). That study concluded that adults living within 10 miles of the Pilgrim nuclear power plant have a four times greater than average risk of contracting leukemia. NRC staff reviewed the MDPH study and compared it with other studies. The MDPH study has been contradicted by the National Cancer Institute (NCI) study entitled *Cancer in Populations Living Near Nuclear Facilities* (July 1990). The NCI study, which included the Pilgrim plant in its analysis, found no reason to suggest that nuclear facilities may be linked causally with excess deaths from leukemia or other cancers. The findings of the NCI study are consistent with the findings of several similar epidemiological studies in foreign countries, and with the latest conclusions of expert bodies, such as the National Research Council's Committee on the Biological Effects of Ionizing Radiation. The NRC bases its assessment of the health effects of ionizing radiation on the overall body of scientific knowledge and on the recommendations of expert groups.

3.6 Socioeconomics

The draft GEIS (Chapters 3 and 4) addressed the significance of socioeconomic impacts associated with license renewal. Comments relate to the issues of historic preservation, transportation during refurbishment activities (including the safe transport of radioactive wastes generated from refurbishment), and housing.

Those concerned about historic preservation suggested that this issue must be addressed through the National Historic Preservation Act (NHPA), and cannot be resolved generically. The NRC agrees with this comment. Historic and archaeological resource impacts have been changed from a Category 1 to a Category 2 issue (based on the revised category definition). Consultation with State historic preservation offices and other government agencies, as required by NHPA, must be undertaken to determine whether protected historical or archaeological resources are in areas that might be disturbed during refurbishment activities. The GEIS has been revised to state explicitly that the Section 106 process as directed in the NHPA must be initiated by the license renewal applicant.

Several commenters suggested that transportation issues associated with refurbishment activities should be changed from Category 3 to Category 2, since the impacts will be insignificant in the majority of cases. One recommendation was to use a level of service (LOS) determination for specific plants as the bounding criterion. The analysis would require that LOS be determined for that part of the refurbishment period during which non-plant-related traffic is expected to be the heaviest. Another recommendation was to establish a bounding criterion based on past major routine outages. The NRC agrees with the use of the LOS approach. Transportation has been changed to a Category 2 issue (based on the revised definition).

There were also recommendations to make housing impacts during refurbishment Category 1 instead of Category 2. One commenter noted that the construction period data used in the analysis appeared to over-estimate the impact on housing. The housing issue is now Category 2 (based on the new definition) because moderate and large impacts on housing are possible, depending on local conditions (e.g., areas with extremely slow population growth or areas with growth control measures that limit housing development).

3.7 Solid Waste Management

Chapter 6 of the draft GEIS addressed the potential environmental impacts from the generation of various types of wastes during refurbishment activities and the license renewal period. The overriding concerns raised on the proposed rule and the draft GEIS relate to the treatment of storage and disposal of low-level radioactive waste (LLW), mixed waste, spent fuel, and nonradiological waste, and the transportation of fuel and waste to and from nuclear power plants as a result of license renewal. Recommendations on how to treat these issues ranged from treating them as Category 2 to treating them as Category 3.

Commenters also expressed concern about the following: (1) the uncertain availability of disposal facilities for LLW, mixed waste and spent fuel; (2) the prospect of on-site storage of waste generated for 20 more years; (3) the resulting pressure that would be placed on the States to provide for LLW disposal facilities; and (4) the adequacy of the treatment of the cost of waste management and its implications on the economic viability of license renewal. Numerous comments were provided on updating and clarifying the data on waste management

presented in the draft GEIS. In addition, several commenters questioned the applicability of Table S-3 (table of uranium fuel cycle environmental data given in 10 CFR 51.51) to the management of waste generated as a result of license renewal.

With regard to the spent fuel issue, commenters pointed out that the storage of spent fuel is not a "tried and true" technology (e.g., use of dry cask storage), and suggested that the additional 20 years of plant operation will pose environmental, safety, emergency planning, and transportation problems with regard to spent fuel storage.

The NRC acknowledges that there is uncertainty in the schedule of availability of disposal facilities for LLW, mixed waste, and spent fuel. However, it believes that there is sufficient understanding of and experience with the storage of LLW, mixed waste, and spent fuel to conclude that the waste generated at any plant as a result of license renewal can be stored safely and without significant environmental impacts before permanent disposal. In addition, the NRC concluded that the classification of storage and ultimate disposal as a Category 1 issue is appropriate because States are proceeding, albeit slowly, with the development of new disposal facilities; LLW and mixed waste have been and can be safely stored at reactor sites until new disposal capacity becomes available. Analyses to support this conclusion are presented in Chapter 6 of the final GEIS (NUREG-1437). The following summary of the responses to comments emphasizes the main features of these analyses.

In the draft GEIS, the environmental data in Table S-3 were discussed with respect to applicability during the license renewal period and supplemented with an analysis of the radiological release and dose commitment data for radon-222 (^{222}Rn) and technetium-99 (^{99}Tc). The proposed rule would have had this discussion apply to each plant at the time of its review for license renewal. Further, in the draft GEIS, Chapter 6, "Solid Waste Management," covered the generation of LLW, mixed waste, spent fuel, and nonradiological waste as a result of license renewal; the transportation of the radiological waste; and the environmental impacts of waste management, including storage and disposal. The findings that were to have been codified in the rule were that, for nonradiological waste, mixed waste, spent fuel, and transportation, the environmental impacts are of small significance and that the analysis in the GEIS applies to each plant (Category 1). For LLW, the finding that would have been codified in the rule was that, if an applicant does not have access to a LLW disposal facility through a LLW compact or an unaffiliated State, the applicant must present plans for interim waste storage with an assessment of potential ecological habitat destruction caused by construction activities (Category 2).

In response to the questions about the applicability of Table S-3 to the management of waste associated with license renewal and to the various comments challenging the treatment of the several forms of waste in the draft GEIS and in the proposed rule, the discussion of Table S-3 has been moved from Section 4.8 of the draft GEIS to Chapter 6 of the final GEIS in order to provide a more integrated assessment of the environmental impacts associated with waste management as a consequence of license renewal. Also in response to various comments, the discussion of Table S-3 and of each of the types of waste has been expanded.

Supplemental data are presented in Chapter 6 of the final GEIS in order to extend the coverage of the environmental impacts of the uranium fuel cycle presented in the current Table S-3 and of transportation of radioactive waste presented in the current Table S-4 to ^{222}Rn, ^{99}Tc, higher fuel enrichment, and higher fuel burnup. In part, the

current Table S-3 and the data supplementing it cover environmental impacts of:

(1) Onsite storage of spent fuel assemblies in pools for 10 years, packaging and transportation to a Federal repository, and permanent disposal; and

(2) Short-term storage onsite of LLW, packaging and transportation to a land-burial facility, and permanent disposal.

The following conclusions have been drawn with regard to the environmental impacts associated with the uranium fuel cycle.

The radiological and nonradiological environmental impacts of the uranium fuel cycle have been revised. The review included a discussion of the values presented in Table S-3, an assessment of the release and impact of ^{222}Rn and of ^{99}Tc, and a review of the regulatory standards and experience of fuel cycle facilities. For the purpose of assessing the radiological impacts of license renewal, the NRC uses the standard that the impacts are of small significance if doses and releases do not exceed permissible levels in its regulations. Given the available information regarding the compliance of fuel cycle facilities with applicable regulatory requirements, the NRC has concluded that, other than for the disposal of spent fuel and HLW, the impacts on individuals from radioactive gaseous and liquid releases will remain at or below the NRC's regulatory limits. Accordingly, the NRC concludes that offsite radiological impacts of the fuel cycle (individual effects from other than the disposal of spent fuel and HLW) are small. ALARA efforts will continue to apply to fuel cycle activities. This is a Category 1 issue.

The radiological impacts of the uranium fuel cycle on human populations over time (collective effects) have been considered within the framework of Table S-3. The 100-year environmental dose commitment to the U.S. population from the fuel cycle (except HLW and spent fuel disposal) is calculated to be about 14,800 man-rem, or 12 cancer fatalities, for each additional 20 year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these dose projections over thousands of years are meaningful. However these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits, and even smaller fractions of natural background exposure to the same populations. No standards exist that can be used to reach a conclusion as to the significance of the magnitude of the collective radiological effects. Nevertheless, some judgment as to the regulatory NEPA implication of this issue should be made and it makes no sense to repeat the same judgment in every case. The NRC concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the NRC has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1. For other Category 1 issues, the impacts will be considered at the individual renewal stage as a means of judging the total impact of an individual license renewal decision. However, the NRC has already judged the impact of

collective effects of the fuel cycle as part of this rule.

There are no current regulatory limits for off-site releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, and that in accordance with the NRC's Waste Confidence Decision, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem per year or less. However, while the NRC has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed and no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem per year. The lifetime individual risk from 100 millirem per year dose limit is about $3x10^{-3}$. Doses to populations from disposal cannot now (or possibly ever) be estimated without very great uncertainty. Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the DOE in the *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste* (October 1980). The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. The release scenarios covered a wide range of consequences from the limited consequences of humans accidentally drilling into a waste package in the repository to the catastrophic release of the repository inventory by a direct meteor strike. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a HLW repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, the EPA's generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR Part 191 protects the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. The cumulative release limits are based on EPA's population impact goal of 1,000 premature cancer deaths world-wide over a 100,000 metric tonne heavy metal (MTHM) repository.

Nevertheless, despite all the uncertainty surrounding the effects of the disposal of spent fuel and HLW, some judgment as to the

regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the NRC concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the NRC has not assigned a single level of significance for the impacts of spent fuel and HLW disposal, this issue is considered Category 1. Excepting the collective effects previously discussed, for other Category 1 issues, the impacts will be considered at the individual renewal stage as a means of judging the total impact of an individual license renewal decision. However, the NRC has already judged the impacts of HLW disposal as part of this rule.

With respect to the nonradiological impact of the uranium fuel cycle, data listed in Table S-3 concerning land requirements, water requirements, use of fossil fuel, gaseous effluent, liquid effluent, and tailings solutions and solids have been reviewed to determine the significance of the environmental impacts of a power reactor operating an additional 20 years. The nonradiological impacts attributable to the relicensing of an individual power reactor are found to be of small significance. License renewal of an individual plant is so indirectly connected to the operation of fuel cycle facilities that it is meaningless to address the mitigation of impacts identified above. This is a Category 1 issue.

Table S-3 does not take into account long-term onsite storage of LLW, mixed waste, and storage of spent fuel assemblies onsite for longer than 10 years, nor does it take into account impacts from mixed waste disposal. The environmental impact of these aspects of onsite storage are also addressed in Chapter 6 of the final GEIS and the findings are included in the final rule in Table B-1 of Appendix B to 10 CFR Part 51.

Chapter 6 of the final GEIS discusses the impacts of offsite disposal of LLW and mixed waste and concludes that impacts will be small. The conclusion that impacts will be small is based on the regulations and regulatory programs in place (e.g., 10 CFR Part 61 for LLW and 40 CFR Parts 261, 264, and 268 for hazardous waste), experience with existing sites, and the expectation that NRC, EPA, and the States will ensure that disposal will occur in compliance with the applicable regulations.

The Low-Level Radioactive Waste Policy Act of 1980 (LLRWPA) made the States responsible for the disposal of commercially generated LLW. At present, 9 compacts have been formed, representing 42 States. The Texas Compact (Texas, Maine, and Vermont) is pending before the U.S. Congress.

New LLW disposal facilities in the host States of California, North Carolina, and Texas are forecast to be operational between 1997 and 1998. Facilities in the host States of Connecticut, Illinois, Massachusetts, Nebraska, New Jersey, Pennsylvania, and New York are scheduled for operation between 1999 and 2002. Envirocare, in Utah, takes limited types of waste from certain generators.

There are uncertainties in the licensing process and in the length of time needed to resolve technical issues, but in the NRC's view there are no unsolvable technical issues that will inevitably preclude successful development of new sites or other off-site disposal capacity for LLW by the time they will be needed. For example, in California, the proposed Ward Valley LLW disposal facility was unexpectedly delayed by the need to resolve technical issues raised by several scientists independent of the project after the license was issued. These issues

were recently reviewed and largely resolved by an independent review group. In North Carolina, Texas, and Nebraska, the license application review period has been longer than is required by the LLRWPA, but progress continues to be made.

The State's LLW responsibilities include providing disposal capacity for mixed LLW. Mixed waste disposal facility developers face the same types of challenges as LLW site developers plus difficulties with dual regulation and small volumes. However, in the NRC's view there are no technical reasons why offsite disposal capacity for all types of mixed waste should not become available when needed. The NRC and the EPA have developed guidance on the siting of mixed waste disposal facilities as well as a conceptual design for a mixed waste disposal facility. A disposal facility for certain types of mixed waste is operated by Envirocare in Utah. States have begun discussions with the DOE about accepting commercial mixed waste for treatment and disposal at DOE facilities. Although these discussions have yet to result in DOE accepting commercial mixed waste at DOE facilities, it appears that progress is being made toward DOE's eventual acceptance of some portion of commercial mixed waste at its facilities.

While the NRC understands that there have been delays and that uncertainties exist such as those just discussed, it concludes that there is reasonable assurance that sufficient LLW and mixed LLW disposal capacity will be made available when needed so that facilities can be decommissioned consistent with NRC decommissioning requirements. This conclusion, coupled with the expected small impacts from both storage and disposal justify classification of LLW and mixed waste disposal as Category 1 issues.

The GEIS addresses the matter of extended onsite storage of both LLW and mixed waste from refurbishment and operations for a renewal period of up to 20 years. Summary data are provided and radiological and nonradiological environmental impacts are addressed. The analysis considers:

(1) The volumes of LLW and mixed waste that may be generated from license renewal;

(2) Specific requirements under the existing regulatory framework;

(3) The effectiveness of the regulations in maintaining low average doses to members of the public and to workers; and

(4) Nonradiological impacts, including land use, fugitive dust, air quality, erosion, sedimentation, and disturbance of ecosystems.

In addition, under 10 CFR 50.59, licensees are allowed to make changes to their facilities as discussed in the final safety analysis report without NRC permission if the evaluation indicates that a change in the technical specifications is not required or that an unreviewed safety question does not exist. Licensees would have to ensure that any new LLW activities would not represent an unreviewed safety question for routine operations or for conditions that might arise from potential accidents. Both onsite and offsite impacts would have to be considered. If an LLW or mixed waste activity fails either of the two tests in 10 CFR 50.59, a license amendment is required. Subject to the two possible review requirements just noted, the NRC finds that continued onsite storage of both LLW and mixed waste resulting from license renewal will have small environmental impacts and will require no further review within the license renewal proceeding.

The GEIS addresses extended onsite storage of spent fuel during a renewal period of up to 20 years. The NRC has studied the safety and environmental effects of the temporary storage of spent fuel after cessation of reactor operation and has published a generic determination of no significant environment impact (10 CFR 51.23). The environmental data on storing spent fuel onsite in a fuel pool for 10 years before shipping for offsite disposal have been assessed and reported in NUREG-0116, *The Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle* (October 1976), and published in the NRC's regulations (10 CFR 51.51). EAs for expanding the fuel pool storage capacity have been conducted for numerous plants. In each case, a finding of no significant environmental impact was reached.

Radioactive exposures, waste generation, and releases were evaluated and found to be small. The only nonradiological effluent from waste storage is additional heat from the plant that was found to have a negligible effect on the environment. Accidents were evaluated and were found to have insignificant effects on the environment. Dry cask storage at an independent spent fuel storage installation (ISFSI) is another technology used to store spent fuel onsite. The NRC recently amended its regulations in 10 CFR Part 72 to allow power reactor licensees to store spent fuel on site under a general license. The environmental impacts of allowing onsite dry cask storage under a general license were assessed in an EA and found to be insignificant. Further, the NRC has conducted EAs for seven specific licensed ISFSIs and has reached a finding of no significant environmental impact for each site. Each EA addressed the impacts of construction, use, and decommissioning. Potential impacts that were assessed include radiological impacts, land use, terrestrial resources, water use, aquatic resources, noise, air quality, socioeconomics, radiological impacts during construction and routine operation, and radiological impacts of off-normal events and accidents. Trends in onsite spent fuel storage capacity and the volume of spent fuel that will be generated during an additional 20 years of operation are considered in the GEIS. Spent fuel storage capacity requirements can be adequately met by ISFSIs without significant environmental impacts. The environmental impacts of onsite storage of spent fuel at all plants have been adequately assessed in the GEIS for the purposes of an environmental review and agency decision on renewal of an operating license; thus, no further review within the license renewal proceeding is required. This provision is relative to the license renewal decision and does not alter existing NRC licensing requirements specific to onsite storage of spent fuel.

The environmental impacts from the transportation of fuel and waste attributable to license renewal are found to be small when they are within the range of impacts of parameters identified in Table S-4. The estimated radiological effects are within regulatory standards. The nonradiological impacts are those from periodic shipments of fuel and waste by individual trucks or rail cars and thus would result in infrequent and localized minor contributions to traffic density. Programs designed to further reduce risk, which are already in place, provide for adequate mitigation. Recent, ongoing efforts by the DOE to study the impacts of waste transportation in the context of the multi-purpose canister (see 60 FR 45147, August 30, 1995) suggest that there may be unresolved issues regarding the magnitude of cumulative impacts from the use of a single rail line or truck route in the vicinity of the repository to carry all spent fuel from all plants. Accordingly, the NRC declines to reach a Category 1 conclusion on this issue at this time. Table S-4 should continue to be the basis for case-by-case evaluation of transportation impacts of fuel and waste until such time as a detailed

analysis of the environmental impacts of transportation to the proposed repository at Yucca Mountain becomes available.

3.8 Postulated Accidents

Several commenters expressed concerns regarding the appropriateness of the severe accident determination in the draft GEIS (Chapter 5), and the treatment of severe accident mitigation design alternatives (SAMDAs) for license renewal. Several commenters questioned whether the analyses of the environmental impacts of accidents were adequate to make a Category 1 determination for the issue of severe accidents. Their contention was that a bounding analysis would be established only if plant-specific analyses were to be performed for every plant, which was not the case. Instead, they pointed out, the draft GEIS analysis made use of a single generic source term for each of the two plant types. A group of commenters recommended that several issues related to severe accidents be categorized as Category 3. The factors they identified to justify that categorization included the need for site-specific consideration of seismic risks to nuclear power plants, and for a site-specific evaluation of evacuation risks.

The NRC believes that its analysis of the impacts of severe accidents is appropriate. The draft GEIS provided an analysis of the consequences of severe accidents bounding each site in the United States. That analysis adopted standard assumptions about each site for parameters such as evacuation speeds and distances traveled. It also used site-specific estimates for population density and meteorological conditions to develop the exposure index (EI) variable. The site-specific EI is used to estimate the accident risk for a particular plant during the license renewal period. The methods used result in predictions of risk that are adequate to illustrate the general magnitude and type of risks that may occur from reactor accidents. Regarding site evacuations, the radiological risk to persons as they evacuate was taken into account within the individual plant risk assessments that formed the basis for the GEIS. In addition, 10 CFR Part 50 requires that licensees maintain up-to-date emergency plans, and this requirement will apply in the license renewal term as well as in the current licensing term.

In performing the GEIS analysis, use of generic source terms (one set for pressurized water reactors [PWRs] and another for boiling water reactors [BWRs]) is consistent with past practice used and accepted by the NRC on individual plant Final Environmental Impact Statements (FEISs). The purpose of the source term discussion in the GEIS is to assess whether new information on source terms developed since the completion of the last FEISs indicates that the source terms used in the past may underpredict environmental consequences. To the contrary, analysis of the new source term information developed over the past 10 years indicates that the expected frequency and amounts of radioactive release under severe accident conditions are less than those predicted using the generic source terms. A summary of the evolution of this research is provided in NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants* (December 1990), and its supporting documentation. Thus, the analyses performed for the GEIS represent adequate, plant-specific estimates of the impacts from severe accidents, which would generally overpredict rather than underpredict environmental consequences. Therefore, the GEIS analysis of the impacts of severe accidents for license renewal is retained and is considered applicable to all plants.

Based on the evaluation of the comments, however, the NRC has reconsidered its conclusion in the draft GEIS concerning the site-specific mitigation of severe accidents. The

NRC has determined that a site-specific consideration of alternatives to mitigate severe accidents will be required at the time of license renewal unless a previous consideration of such alternatives has been included in a FEIS or related supplement. Since the third criterion for designating an issue a Category 1 requires the generic consideration of mitigation, the issue of severe accidents must be reclassified as Category 2. Thus, the severe accidents issue will require the consideration of alternatives to mitigate severe accidents, provided such consideration has not already been completed. The NRC's reconsideration of severe accident mitigation alternatives for license renewal is based on its NEPA regulations requiring a consideration of mitigation alternatives in the EISs and supplements to EISs, as well as on a previous court decision that required a review of severe accident mitigation alternatives (then referred to as SAMDAs) at the operating license stage (*Limerick Ecology Action v. NRC*, 869 F.2d 719 [3rd Cir. 1989]).

The NRC has considered containment improvements for all plants pursuant to its Containment Performance Improvement (CPI) program, identifying potential containment improvements for site-specific consideration by licensees. Furthermore, the NRC has an ongoing regulatory program whereby licensees identify individual plant vulnerabilities to severe accidents and consider cost-beneficial improvements. However, since these licensee considerations have not been completed, a conclusion that severe accident mitigation alternatives have been considered generically for license renewal is premature.

Nevertheless, based on the insights developed through completion of the CPI program, the review of severe accident mitigation alternatives for several plants, and the results to date from ongoing regulatory programs related to severe accidents, the NRC believes it unlikely that any site-specific consideration of severe accident mitigation alternatives for license renewal will identify major plant design changes or modifications that will prove cost-beneficial for reducing severe accident frequency or consequences. This expectation regarding severe accident mitigation improvements is based on analysis performed to date, which is discussed below.

The NRC's CPI program examined each of five U.S. reactor containment types to determine potential failure modes, potential plant improvements, and the cost-effectiveness of such improvements. As a result of this program, only a few containment improvements were found to be potentially beneficial, and as such were identified either for further NRC research or for individual licensee evaluation.

In response to the Limerick decision, a staff evaluation of SAMDAs was specifically included in the FEIS for Limerick 1 and 2 and Comanche Peak 1 and 2 operating license reviews, and in the Watts Bar supplemental FEIS for an operating license. The alternatives evaluated in these analyses included the items previously considered as part of the CPI Program, as well as improvements identified through other risk studies and analyses. No physical plant modifications were found to be cost-beneficial in any of these SAMDA evaluations; only plant procedural changes were identified as cost-beneficial. Furthermore, the Limerick analysis was for a high-population site. Since risk is generally proportional to the surrounding plant population, the analysis suggests that other sites with populations equal to or less than that of the Limerick site are unlikely to identify significant plant modifications.

Additionally, each licensee is performing an individual plant examination (IPE) to look for plant vulnerabilities to internally initiated events.

Another program involves the individual plant examination of external events (IPEEE), which identifies plant vulnerabilities to externally initiated events. These examinations consider potential improvements to reduce the frequency or consequences of severe accidents on a plant-specific basis, and essentially constitute a broad search for severe accident mitigation alternatives. NRC staff review each plant-specific IPE and IPEEE and any licensee-proposed plant improvements to further reduce accident risk. To date, 22 IPEs have been reviewed by the NRC. These IPEs have resulted in a number of plant procedural or programmatic improvements and some minor plant modifications that will further reduce the risk of severe accidents. However, an IPE has not resulted in any major plant modifications.

Thus, the GEIS analysis of severe accidents and their impacts is adequate; additional plant-specific analysis of those impacts is not required. However, since the ongoing regulatory programs related to severe accident mitigation (i.e., IPE/IPEEE) have not been completed for all plants, and since consideration of severe accident mitigation alternatives has not been included in an EIS or SEIS related to plant operations for all plants, a site-specific review of such alternatives is required at license renewal for those plants for which a review has not been performed. As discussed above, the NRC expects that these reviews will identify only procedural and programmatic fixes (and perhaps minor hardware changes) as being cost-beneficial in reducing severe accident risk. NRC staff evaluations of severe accident mitigation alternatives have already been completed and included in an EIS or SEIS for Limerick, Comanche Peak, and Watts Bar; therefore, they need not be reassessed as part of the license renewal review for these plants. The NRC notes that upon completion of its IPE/IPEEE program, it may revisit the issue of severe accident mitigation for license renewal and consider, by separate rulemaking, reclassifying severe accidents as a Category 1 issue.

It is also important to note that the NRC does not intend to prescribe, by rule, the scope of an acceptable consideration of severe accident mitigation alternatives for license renewal nor does it intend to mandate consideration of alternatives identical to those evaluated previously. In general, the NRC expects that significant efficiency could be gained by using site-specific IPE and IPEEE results in the consideration of alternatives. The IPEs and IPEEEs use level 1 (identification of probabilities of core damage) and level 2 (identification of probabilities of fission product releases) probabilistic risk assessments (PRAs). Although level 3 PRAs (identification of probabilities of latent and acute fatalities due to off-site releases of fission products) have been used in SAMDA analyses to generate site-specific off-site dose estimates in order to determine the costs and benefits of mitigation alternatives, the NRC does not believe that such PRA is necessary for the consideration of mitigation alternatives for license renewal. Licensees can use other quantitative approaches for assigning site-specific risk significance to IPE or IPEEE results and judging whether an alternative provides sufficient reduction in the frequency of core damage or fission product release. For example, the licensee could use information provided in the GEIS analysis of accidents (exposure indices, wind frequencies, and demographics) to translate the dominant contributors to core damage frequency and large release frequencies from the IPE/IPEEE results into dose estimates so that a cost-benefit determination can be made. On the other hand, in some instances, a consideration of the frequency of core damage or fission product release (i.e., no conversion to dose estimate) may be sufficient to conclude that no significant reduction in off-site risk would be provided, and therefore mitigation is not warranted. In any event, the NRC will review each severe accident

mitigation consideration provided by the license renewal applicant on its merits and determine whether it constitutes a reasonable consideration of severe accident mitigation alternatives.

In addition to the concerns on severe accidents discussed above, some commenters also indicated concern that the management of aging through maintenance of the plant's licensing basis will not necessarily maintain the risk of severe accidents at current levels. The NRC thoroughly addressed the issue of aging of plant systems in the final rule for Nuclear Power Plant License Renewal (10 CFR Part 54). Continued safe operation of a commercial nuclear power plant requires that structures, systems, and components that perform or support safety-related functions continue to perform in accordance with the applicable requirements in the licensing basis of the plant. The license renewal rule requires that each renewal applicant perform an integrated plant assessment of the effects of aging, and ensure that the effects of aging will be managed to maintain the current licensing basis during the license renewal period. Additionally, the NRC has in place programs to control and manage aging effects, as required by the maintenance rule (10 CFR 50.65). Utilities must monitor the performance or condition of structures and systems, and establish goals to provide reasonable assurance that they are capable of performing their intended functions. The NRC has and is continuing to fund an extensive research program to assess aging phenomena and to develop effective measures for dealing with aging. The combined effects of these programs will provide high confidence that significant increases in risk to the public will not arise as a result of aging.

3.9 Decommissioning

Chapter 7 of the draft GEIS examined the differences between decommissioning a plant after 40 years of operation and decommissioning it after an additional 20 years of operation. Several commenters requested further clarification of the NRC's position regarding decommissioning requirements, in particular whether the total impacts address returning the site to green-field conditions.

The analysis presented in the GEIS does not serve as the generic analysis of the environmental impacts associated with decommissioning nor does it establish decommissioning requirements. The expected environmental impacts of decommissioning were previously analyzed and reported in NUREG-0586, *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities* (August 1988). Using the same methods used in NUREG-0586, the GEIS for license renewal finds that the physical requirements and attendant effects of decommissioning after a 20-year license renewal term (i.e., 60 years of operation) would not differ from those of decommissioning at the end of 40 years of operation.

With regard to the concern about returning the site to green field condition, the NRC defines decommissioning as the safe removal of a nuclear facility from service, reduction of residual contamination to a level that permits release of the property for unrestricted use, and termination of the license. Therefore, the question of restoring land to a green field condition, which would require additional demolition and site restoration beyond addressing residual contamination and radiological effects, is outside the current scope of the decommissioning requirements. Moreover, returning the site to preconstruction conditions is an activity common to decommissioning after 40 years of operation and to decommissioning after a 20-year renewal period. Hence, returning the site to preconstruction condition is beyond the scope of license renewal review.

Several commenters also expressed concern that, because a residual radioactivity rule is still not in place, the LLW estimates should be reexamined. The NRC has criteria in place for the release of nuclear facilities to unrestricted access following decommissioning. These include (1) the criteria in Regulatory Guide 1.86, "Termination of Operating Licenses of Nuclear Reactors" (provides guidance for surface contamination), (2) the dose rate limits from gamma-emitting radionuclides included in plant technical specifications, and (3) the requirements for keeping residual contamination as low as reasonably achievable (ALARA) given in 10 CFR Part 20. Moreover, a proposed rule dated August 22, 1994 would codify radiological criteria for unrestricted release of reactors and other nuclear facilities and for termination of a facility license following decommissioning. The draft GEIS for the proposed rule on radiological criteria (NUREG-1496) includes analyses of a range of radiological criteria and confirmed the earlier conclusions that waste volumes from decommissioning of reactors are not sensitive to the residual radiological criteria likely to be selected. Therefore, the NRC concludes that the contribution of license renewal to the environmental impacts of decommissioning is small and the impacts are not likely to change significantly as a result of the ongoing rulemaking on the radiological criteria for unrestricted release of nuclear reactors and facilities following decommissioning.

3.10 Need for Generating Capacity

Chapter 8 of the draft GEIS examined the need for generating capacity for 11 regions in the United States from 1995 to 2030. It examined this issue from the perspective of regional generation requirements and demand in individual utility service areas. In addition to the major procedural concern about the treatment of need for generating capacity (discussed in Section 2.3), several commenters expressed concern about the demand projections used in the GEIS. Some commenters noted that the determination of need quickly becomes dated, and therefore demand for and the source of electrical power cannot be accurately predicted at the time of license renewal. Moreover, they believe that the NRC's analysis is not definitive enough to remain unchallenged for 40 years. Another commenter criticized the analysis because it focused only on energy requirements, without making appropriate distinctions among energy and peak capacity requirements, plant availability, and capacity factors.

The NRC has determined that a detailed consideration of the need for generating capacity is inappropriate in the context of considering the environmental impacts of license renewal. Thus, the NRC will limit its NEPA review of license renewal applications to consideration of the environmental impacts of license renewal as compared with those of alternative energy sources. Hence, the concerns regarding demand projections used in the draft GEIS are no longer an issue.

3.11 Alternatives to License Renewal

Chapter 9 of the draft GEIS examined various alternative energy sources and concluded that the only reasonable alternatives for replacing retired nuclear capacity are new coal-fired plants and new nuclear power plants. However, because of uncertainties associated with the economic costs of license renewal, the proposed rule would have required each license renewal applicant to submit, as part of its application, an analysis to show that the plant meets the economic threshold criterion.

In addition to the procedural concern about the treatment of alternative energy sources (discussed in Section 2.3), several commenters expressed concern about the comparison and analysis of alternative energy sources, as well as

the economic analysis approach used in the draft GEIS. Consistent with their arguments against the Category 1 designation, the commenters questioned the approach adopted in the GEIS, i.e., the one-to-one comparison of alternatives. They believe that the NRC's failure to consider a mix of alternatives ignores the potential of other alternative power sources that are available to various regions of the nation, such as demand-side management, cogeneration, purchased power from Canada, biomass, natural gas, solar energy, and wind power. They feel that this approach also neglects a utility's ability to serve its customers with a portfolio of supply that is based on load characteristics, cost, geography, and other considerations, and fails to consider the collective impact of the alternatives. Furthermore, the possible technological advances in renewable energy sources over the next 40 years are not addressed.

One commenter argued that designating the issue of alternative energy sources as Category 1 allows a license applicant not to consider the additional requirement for an economic threshold analysis. Relative to economic analysis of the alternatives to license renewal, another commenter questioned the proposed requirement for the license renewal applicant to demonstrate that the "replacement of equivalent generating capacity by a coal-fired plant has no demonstrated cost advantage over the individual nuclear power plant license renewal." This requirement, according to the commenter, would force the applicant to perform an economic analysis of an alternative to license renewal. The commenter further argued that NEPA does not require economic analysis.

In response to these concerns, the final rule no longer requires a cost-benefit balancing of alternative energy sources relative to license renewal. Furthermore, the alternative energy sources discussed in the revised GEIS include energy conservation and energy imports. An analysis of the environmental impacts of alternative energy sources is included in the GEIS, but is not codified in the Part 51 rule.

The NRC believes its consideration of alternatives in the GEIS is sufficiently representative of the technologies available and the associated environmental impacts. With regard to consideration of a mix of alternative energy sources, the NRC recognizes that combinations of various alternatives may be used to replace the power generated by extending the operating life of nuclear power plants beyond 40 years. However, the NRC believes that a consideration of the environmental impacts of individual alternatives is more appropriate, and their environmental impacts necessarily bound the impacts from combinations or mixes of alternatives.

3.12 License Renewal Scenario

The purpose of the license renewal scenario analysis in the draft GEIS (Chapter 2) is to identify the various activities associated with the refurbishment of a nuclear power plant in conjunction with license renewal. NRC staff developed an upper-bound scenario of refurbishment activities and costs that covers all 118 plants considered in the GEIS. Several commenters expressed concerns relating to the license renewal scenario methodology. The fundamental issues raised were the degree of conservatism built into the scenario, and the appropriateness of an upper-bound approach for characterizing refurbishment activities (and associated costs) in light of NEPA requirements to determine reasonable estimates of the environmental impacts of Federal actions.

Regarding concerns that the refurbishment schedules and scenarios developed for the GEIS were too conservative, several commenters indicated that many of the activities slated for completion during the extended refurbishment

prior to license renewal would actually be completed by many facilities during the course of the current licensing term. The effect of having only one major outage instead of levelizing work over three or four outages could lead to an overestimate of the refurbishment activities and costs that any particular plant would expect to encounter. In response to this concern, the NRC revised the GEIS to include two license renewal program scenarios. The first refers to a "typical" license renewal program and is intended to be representative of the type of programs most plants seeking license renewal might implement. The second scenario retains the original objective of establishing an upper bound of the impacts likely to be generated at any particular plant. The typical scenario is useful for estimating impacts at plants that have been reasonably well maintained and have already undertaken most major refurbishment activities necessary for operation beyond the current licensing term. The conservative scenario estimates continue to be useful for estimating the maximum impacts likely to result from license renewal.

The revised approach of providing two separate license renewal scenarios also alleviates the concern about the use of a bounding scenario for license renewal activities. The NRC acknowledges that some applicants for license renewal may not be required to perform certain major refurbishment or replacement activities, and therefore may have fewer or shorter outages. However, the two scenarios described in the GEIS are neither unrealistic nor overly conservative in representing the range of activities that could be expected for license renewal, and the possible schedule for performing these activities.

3.13 Air Quality

The draft GEIS (Chapters 3, 4, and 7) examined any impacts on air quality resulting from refurbishment activities, normal plant operations, and decommissioning. It concluded that, during refurbishment, the only potential sources of impact would be fugitive dust from excavation and grading activities when necessary, and emissions from motorized equipment and workers' vehicles. Air quality impacts during normal operations are primarily from the small amounts of pollutants produced by transmission lines. Air quality impacts during decommissioning are expected to be minimal because the majority of decommissioning activities would be conducted inside the containment, auxiliary, and fuel-handling buildings, where possible releases would be clearly controlled.

One commenter suggested that, to the extent that relicensing a nuclear power plant may cause or contribute to violations of the Clean Air Act (CAA), the issue should be discussed in the GEIS. The NRC believes that relicensing of a nuclear power plant is not expected to cause or contribute to any new violation, or increase the frequency or severity of any existing violation, related to the CAA. Any construction activities associated with renovation of the facilities during relicensing would contribute only minor emissions of fugitive dust, and exhaust emissions from construction equipment and vehicles. As a mitigation measure, sprinkler trucks would spray roads and construction areas to minimize fugitive dust. During operation of facilities following relicensing, air emissions are expected to be minimal and nearly identical to emissions experienced during the initial operating license period. However, based on the new definition of issue categories, the issue of air quality during refurbishment activities has been reclassified as Category 2 (instead of Category 1) because emissions from sites located in nonattainment and maintenance areas (as defined in the CAA regulations) must be determined if they exceed the threshold levels for criteria pollutants. If air emissions exceed the threshold, then, as part of its plant-specific

NEPA review, the NRC will have to prepare a written conformity analysis with respect to compliance with CAA requirements.

3.14 Comments on Other Supporting Documents

Several comments were received on the other supporting documents: (1) *Regulatory Analysis of Proposed Amendments to Regulations Concerning the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses*, NUREG-1440; (2) Supplement to Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations,* DG-4002; and (3) *Environmental Standard Review Plan—License Renewal,* NUREG-1429.

Comments on the draft regulatory analysis relate primarily to the question of whether the two alternative actions analyzed (i.e., amending or not amending Part 51 to allow for generic resolution of environmental issues relating to license renewal) provide the same benefits of full and open public participation in the license renewal process. The regulatory analysis has been revised to reflect the actions taken in the final rule and GEIS. The action taken by the NRC to treat certain environmental issues generically does not reduce the opportunity for public participation at license renewal proceedings for individual plants.

Comments on the draft supplement to Regulatory Guide 4.2 and the draft environmental standard review plan were primarily editorial in nature. Those comments will be taken into account when the documents are revised. These documents will be issued at a later date following issuance of the final rule and GEIS.

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10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

THIS REPORT DOCUMENTS THE NUCLEAR REGULATORY COMMISSION (NRC) STAFF REVIEW OF PUBLIC COMMENTS PROVIDED IN RESPONSE TO THE NRC'S PROPOSED AMENDMENTS TO 10 CODE OF FEDERAL REGULATIONS (CFR) PART 51, WHICH ESTABLISH NEW REQUIREMENTS FOR THE ENVIRONMENTAL REVIEW OF APPLICATIONS FOR THE RENEWAL OF OPERATING LICENSES OF NUCLEAR POWER PLANTS. THE PUBLIC COMMENTS INCLUDE THOSE SUBMITTED IN WRITING, AS WELL AS THOSE PROVIDED AT PUBLIC MEETINGS THAT WERE HELD WITH OTHER FEDERAL AGENCIES, STATE AGENCIES, NUCLEAR INDUSTRY REPRESENTATIVES, PUBLIC INTEREST GROUPS, AND THE GENERAL PUBLIC. THIS REPORT ALSO CONTAINS THE NRC STAFF RESPONSE TO THE VARIOUS CONCERNS RAISED, AND HIGHLIGHTS THE CHANGES MADE TO THE FINAL RULE AND THE SUPPORTING DOCUMENTS IN RESPONSE TO THESE CONCERNS.

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