



U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

August 1991
Division 4
Task DG-4002

DRAFT REGULATORY GUIDE

Contact: D.P. Cleary (301)492-3936

DRAFT REGULATORY GUIDE DG-4002

Proposed Supplement 1 to
Regulatory Guide 4.2

GUIDANCE FOR THE PREPARATION OF SUPPLEMENTAL ENVIRONMENTAL
REPORTS IN SUPPORT OF AN APPLICATION TO RENEW
A NUCLEAR POWER STATION OPERATING LICENSE

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received complete staff review and does not represent an official NRC staff position.

Public comments are being solicited on the draft guide (including any implementation schedule) and its associated regulatory analysis or value/impact statement. Comments should be accompanied by appropriate supporting data. Written comments may be submitted to the Regulatory Publications Branch, DFIPS, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Copies of comments received may be examined at the NRC Public Document Room, 2120 L Street NW., Washington, DC. Comments will be most helpful if received by November 29, 1991.

Requests for single copies of draft guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, DC 20555, Attention: Director, Division of Information Support Services.

CONTENTS

	<u>Page</u>
A. INTRODUCTION	1
B. GENERAL GUIDANCE TO APPLICANTS	4
C. STANDARD FORMAT AND CONTENT OF SUPPLEMENTAL ENVIRONMENTAL REPORTS . .	12
CHAPTER 1. PLANT REFURBISHMENT, OPERATION, AND MAINTENANCE	12
1.1 Refurbishment	12
1.2 Operation and Maintenance Under License Renewal	13
CHAPTER 2. REVIEW OF NEPA ISSUES	14
2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish	15
2.2 Effects of Cooling Ponds on Groundwater Quality	18
2.3 Groundwater Use Conflicts	20
2.4 Effects of Refurbishment on Important Plant and Animal Habitats	21
2.5 Effects of Refurbishment on Surface Water Quality	24
2.6 Effects of License Renewal on Housing	25
2.7 Electric Shock from Transmission-Line-Induced Currents	28
2.8 Health Effects of Thermophilic Organisms	30
2.9 Low-Level Radioactive Waste Storage and Disposal	32
2.10 Demonstration of Cost Advantage of License Renewal	34
2.11 Threatened or Endangered Species	37
2.12 Transportation Impacts of Refurbishment	39
CHAPTER 3. ASSESSMENT OF OVERALL BENEFIT-COST DETERMINATION	43
REFERENCES	44
APPENDIX A - SUMMARY OF FINDINGS ON NEPA ISSUES FOR LICENSE RENEWAL OF NUCLEAR POWER PLANTS	A-1
REGULATORY ANALYSIS	RA-1
FIGURE	
1. NEPA Issues Flowchart	11
TABLES	
1. Category 2 and Category 3 Environmental Issues	7
2. Threshold Operational Cost Criteria for Capital cost Categories at 50%, 60%, and Capacity Factors	36

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

A. INTRODUCTION

The National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190, 83 Stat. 852) is implemented by the NRC pursuant to regulations contained in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." Applications for license renewal for nuclear power plants submitted under the proposed Part 54, "Nuclear Power Plant License Renewal," would include, in response to 10 CFR 51, assessments of a number of specific NEPA issues.

This guide supplements Regulatory Guide 4.2, Revision 2, "Preparation of Environmental Reports for Nuclear Power Stations" (NUREG-0099) (Ref. 1). Regulatory Guide 4.2 details the information that should be included in an application for a construction permit regarding the environmental impact of construction and operation of the proposed plant and associated facilities. This guide supplements Regulatory Guide 4.2 by describing information the NRC staff would need from a supplemental environmental report (ER) for license renewal. By using the format in this guide, applicants can help ensure the completeness of the information provided, assist the NRC staff and others in locating the information, and help reduce the time needed for the review process. Where identical conditions exist and no substantial changes in environmental impact can be identified, the applicant may incorporate by reference any information previously submitted to the NRC or records of decisions previously prepared.

Amendments to 10 CFR 51 would reduce the scope of the environmental review and the level of detail required for renewal of an operating license from that required at the initial licensing stage. The reduced environmental review resulted from the preparation of NUREG-1437 (Ref. 2), a generic environmental impact statement (GEIS) that reviewed all NEPA issues for the nuclear power plants that may be candidates for license renewal. The U.S. Nuclear Regulatory Commission (NRC) amendments to 10 CFR 51 for license renewal would include a generic assessment of the impact of all potential NEPA issues that may be associated with the renewal of the operating license of an individual nuclear power plant. The environmental review for license renewal of an individual nuclear power plant would be restricted to those issues not resolved generically. For license renewal,

1 the focus of the review, in both the GEIS and the individual plant assess-
2 ments, is on the impacts associated with up to 20 additional years of plant
3 operation and any refurbishment necessary for that additional period.

4 The GEIS identifies changes to plants and their operations that could
5 result under 10 CFR 54, assesses the potential impacts of implementing
6 these changes, assesses the potential impacts of operating the plants for
7 up to an additional 20 years, and compares these impacts with those of the
8 alternative means for generating electricity. These findings have been
9 codified in the NRC's environmental protection regulations in 10 CFR 51.

10 After docketing a license renewal application and receiving an
11 applicant's supplemental ER, the NRC staff will prepare an environmental
12 assessment (EA) on the limited set of potential environmental issues
13 specified in 10 CFR 51. If, after reviewing the applicant's supplemental
14 ER and conducting any independent reviews it believes necessary, the staff
15 finds no significant environmental impacts associated with any of the
16 issues, the NRC will issue a finding of no significant impact (FONSI). The
17 environmental review would be complete at that point. However, if the
18 staff finds significant adverse impacts that would preclude the issuance of
19 a FONSI, the NRC would have to prepare a supplemental environmental impact
20 statement (EIS).

21 NUREG-1429, "Environmental Standard Review Plan for the Review of
22 License Renewal Applications for Nuclear Power Plants" (Ref. 3), provides
23 guidance for the NRC staff's review of supplemental ERs submitted by
24 applicants. The primary purpose of NUREG-1429 is to ensure the quality and
25 uniformity of staff reviews and to ensure that these reviews are focused on
26 those NEPA concerns associated with license renewal. NUREG-1429 is
27 available to licensees, the public, and other parties and provides informa-
28 tion about the regulatory process and the review of environmental issues
29 associated with license renewal.

30 After considering the individual issues, the NRC staff will evaluate
31 in the EIS whether the findings will overturn the Commission's conditional
32 generic determination on the benefits and costs of renewing an individual
33 nuclear power plant operating license. This conditional determination,

1 codified in 10 CFR 51, Subpart A, Appendix B, states that the renewal of an
2 operating license for up to 20 years should have accrued benefits that
3 outweigh the economic, environmental, and social costs of license renewal.
4 Table B.1 of 10 CFR 51, Subpart A, Appendix B (reproduced as Appendix A to
5 this guide), summarizes the findings on all environmental issues covered by
6 the GEIS.

7 Any information collection activities mentioned in this draft
8 regulatory guide are contained as requirements in the proposed amendments
9 to 10 CFR Part 51 that would provide the regulatory basis for this guide.
10 The proposed amendments have been submitted to the Office of Management and
11 Budget for clearance that may be appropriate under the Paperwork Reduction
12 Act. Such clearance, if obtained, would also apply to any information
13 collection activities mentioned in this guide.

1 assessed. The scope of those issues reflects the potential effects of
2 plant refurbishment associated with license renewal up to an additional 20
3 years of plant operation and possible changes in the plant's environmental
4 setting. All of the issues identified were consolidated into 104 issues.
5 For each type of impact, generic findings encompassing as many nuclear
6 power plants as possible were made.

7 Findings on each of the 104 issues were placed in a framework of
8 three categories:

- 9 • Category 1: A generic conclusion on the impact has been reached
10 for all affected nuclear power plants.
- 11 • Category 2: A generic conclusion on the impact has been reached
12 for affected nuclear power plants that fall within defined
13 bounds.
- 14 • Category 3: A generic conclusion on the impact was not reached
15 for any nuclear power plant.

16 Findings were also made on the significance of impacts for each of
17 the issues:

- 18 • "Small" impacts are so minor that they warrant neither detailed
19 investigation nor consideration of mitigative actions when such
20 impacts are negative.
- 21 • "Moderate" impacts are likely to be clearly evident and usually
22 warrant consideration of mitigation alternatives when such
23 impacts are negative.
- 24 • "Large" impacts involve either a severe penalty or a major
25 benefit and mitigation alternatives are always considered when
26 such impacts are negative.

27 Small impacts result in a finding of no significant impact (FONSI) by
28 the NRC staff. Moderate and large impacts are considered significant.

1 Commitments made in a license renewal application may enable a FONSI to be
2 made if implementing such commitments would reduce moderate impacts to
3 small impacts.

4 Appendix A, a reproduction of Table B.1 from 10 CFR 51, summarizes
5 all issues and the generic findings on their categories and the level of
6 impact. Of the 104 issues for which findings were made, 80 were
7 categorized as Category 1. These 80 issues require no further treatment.
8 The staff categorized 22 issues as Category 2; these require further
9 analysis in each application. The first step of the analysis is to examine
10 certain plant, site, or community characteristics to determine if bounding
11 conditions are met. If these conditions are met, no further analysis is
12 required. If they are not met, further analysis is required. Two issues
13 were categorized as Category 3; they must be assessed in every license
14 renewal application. Figure 1 summarizes the entire process. Chapter 2
15 provides guidance on the analysis required for the 22 issues in Category 2
16 and the two issues in Category 3.

17 Table 1 lists the Category 2 and Category 3 issues from Appendix A
18 and identifies the sections of the GEIS (NUREG-1437) (Ref. 2) in which
19 these issues are treated.

Table 1
Category 2 and Category 3 Environmental Issues

Name from Table B-1 Appendix B 10 CFR 51 (Appendix A to this guide)	Location in Chapter 2 of this Document	Location in GEIS
BENEFITS		
Avoided costs	2.10 Demonstration of Cost Advantage of License Renewal	9.4.5 Economic Analysis 7.3.6 Economic Impacts
COSTS		
Refurbishment	2.10 Demonstration of Cost Advantage of License Renewal	9.4.5 Economic Analysis 7.3.6 Economic Impacts
Fuel	2.10 Demonstration of Cost Advantage of License Renewal	9.4.5 Economic Analysis 7.3.6 Economic Impacts
Operation and maintenance	2.10 Demonstration of Cost Advantage of License Renewal	9.4.5 Economic Analysis 7.3.6 Economic Impacts
ENVIRONMENTAL IMPACTS		
Effects of refurbishment on surface water quality	2.5 Effects of Refurbishment on Surface Water Quality	3.4.1 Surface Water
Entrainment of fish and shellfish early life stages (once-through cooling)	2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish	4.2.3.1.2 Entrainment of fish and shellfish

Table 1 (Continued)

<p align="center">Name from Table B-1 Appendix B 10 CFR 51 (Appendix A to this guide)</p>	<p align="center">Location in Chapter 2 of this Document</p>	<p align="center">Location in GEIS</p>
<p>Impingement of fish and shellfish</p>	<p>2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish</p>	<p>4.2.3.1.3 Impingement of Fish and Shellfish</p>
<p>Heat shock</p>	<p>2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish</p>	<p>4.2.3.1.4 Heat Shock</p>
<p>Impingement of fish (cooling pond cooling)</p>	<p>2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish</p>	<p>4.4.4 Aquatic Ecology</p>
<p>Entrainment of fish early life stages (cooling pond cooling)</p>	<p>2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish</p>	<p>4.4.4 Aquatic Ecology</p>
<p>Heat shock (cooling pond cooling)</p>	<p>2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and Shellfish</p>	<p>4.4.4 Aquatic Ecology</p>
<p>Groundwater use conflicts (potable and service water - operation)</p>	<p>2.3 Groundwater Use Conflicts</p>	<p>4.2.2.1.1 Potable and Service Water</p>

Table 1 (Continued)

<p>Name from Table B-1 Appendix B 10 CFR 51 (Appendix A to this guide)</p>	<p>Location in Chapter 2 of this Document</p>	<p>Location in GEIS</p>
<p>Groundwater use conflicts (water pumped for dewatering - operation)</p>	<p>2.3 Groundwater Use Conflicts</p>	<p>4.2.2.1.2 Operational Dewatering Systems</p>
<p>Groundwater use conflicts (Ranney wells - operation)</p>	<p>2.3 Groundwater Use Conflicts</p>	<p>4.2.2.1.4 Use of Groundwater for Cooling Tower Makeup</p>
<p>Groundwater quality degradation (cooling ponds - operation)</p>	<p>2.2 Effects of Cooling Ponds on Groundwater Quality</p>	<p>4.4.3 Groundwater</p>
<p>Refurbishment impacts (terrestrial resources)</p>	<p>2.4 Effects of Refurbishment on Important Plant and Animal Habitats</p>	<p>3.6 Terrestrial Ecology</p>
<p>Threatened or endangered species</p>	<p>2.11 Threatened or Endangered Species</p>	<p>3.5 Aquatic Ecology 3.6 Terrestrial Ecology 4.2.1.1 Environmental Statutes</p>
<p>Microbiological organisms (public health - operation)</p>	<p>2.8 Health Effects of Thermophilic Organisms</p>	<p>4.3.6 Human Health</p>
<p>Electromagnetic fields, acute effects (electric shock - operation)</p>	<p>2.7 Electric Shock from Transmission-Line-Induced Currents</p>	<p>4.5.4.1 Acute Effects</p>

Table 1 (Continued)

Name from Table B-1 Appendix B 10 CFR 51 (Appendix A to this guide)	Location in Chapter 2 of this Document	Location in GEIS
Housing impacts of refurbishment	2.6 Effects of License Renewal on Housing	3.7.2 Housing
Housing impacts of license renewal term	2.6 Effects of License Renewal on Housing	4.7.2 Housing
Transportation impacts of refurbishment	2.12 Transportation Impacts of Refurbishment	3.7.4.2 Transportation
Low-level radioactive waste storage	2.9 Low-Level Radioactive Waste Storage and Disposal	6.3.2 On-Site Storage
Low-level radioactive waste storage	2.9 Low-Level Radioactive Waste Storage and Disposal	6.3.3 Disposal and LLW Compacts

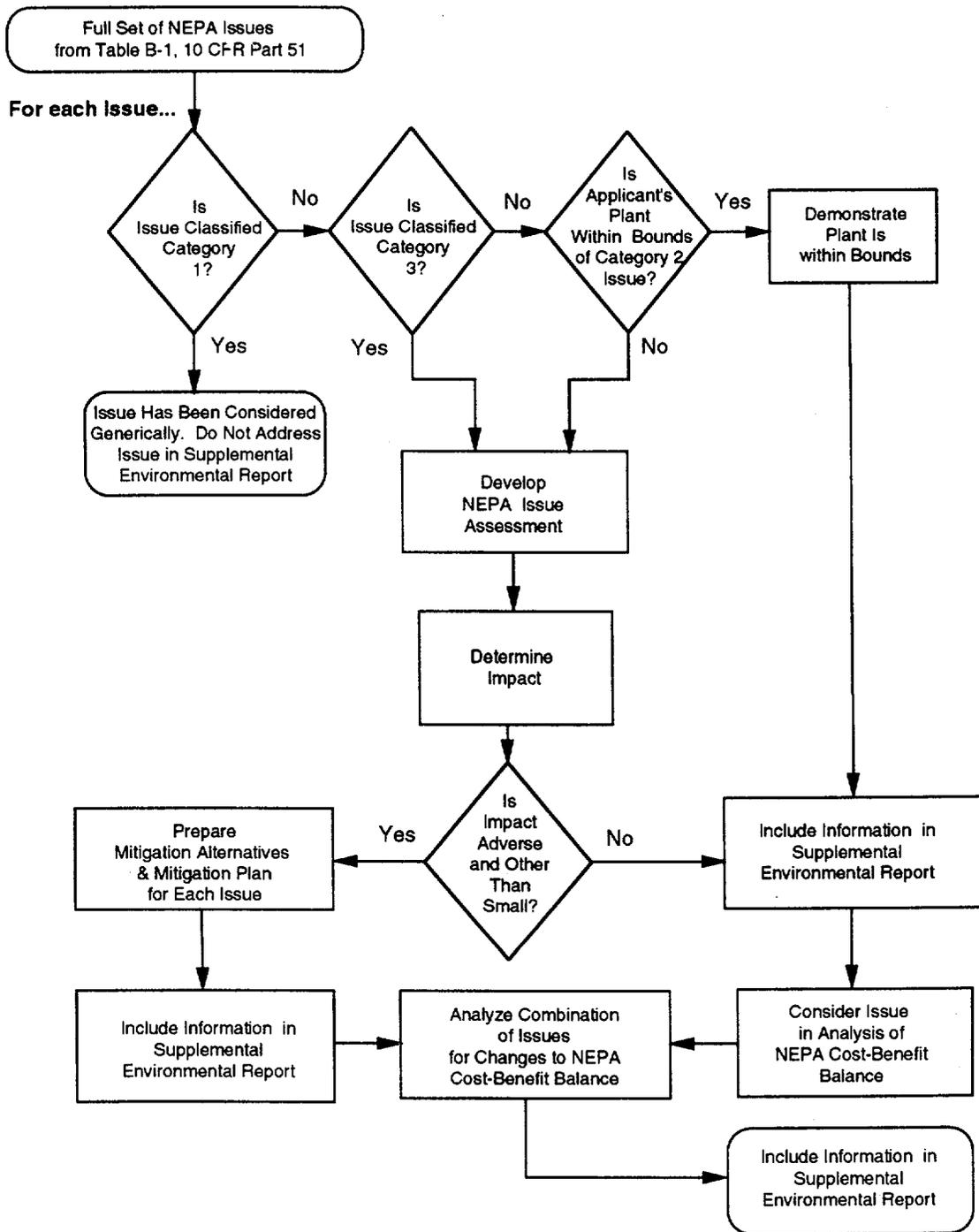


Figure 1 NEPA Issues Flowchart

1 C. STANDARD FORMAT AND CONTENT OF
2 SUPPLEMENTAL ENVIRONMENTAL REPORTS

3 CHAPTER 1. PLANT REFURBISHMENT, OPERATION, AND MAINTENANCE

4 License renewal may necessitate modifications to a plant, its
5 operations, and its procedures for administrative control. Chapter 1 of a
6 supplemental environmental report should describe those activities that
7 will be taken to prepare the plant for operations under license renewal and
8 describe any changes in operation and maintenance that will take place
9 during the renewal term. The information provided should focus on modifi-
10 cations directly affecting the environment or affecting plant effluents
11 that affect the environment. Such information should be provided in
12 sufficient detail to give a clear understanding of the sources of environ-
13 mental effects that must be covered in Chapter 2.

14 1.1 Refurbishment

15 Plant modifications and refurbishment activities undertaken for
16 license renewal should be generally characterized in this section. These
17 activities may be compared to refurbishment activities that occur during
18 regularly scheduled plant outages under the current license. Applicants
19 should follow the informational requirements in Chapter 2 to determine the
20 emphasis and level of detail needed in describing plant modifications.
21 Major refurbishment outages associated with license renewal and extended
22 operation should be characterized with regard to duration; change in on-
23 site labor force; affected systems; affected structures and components;
24 land use for parking, laydown areas, structures, or any other construction
25 activities. In the context of this guidance, major refurbishment outages
26 are those that last considerably longer than a refueling outage and are
27 generally comparable to or longer than an outage for replacing a steam
28 generator.

1 1.2 Operation and Maintenance Under License Renewal

2 This section should generally characterize the changes in plant
3 operating practices, inspections, maintenance activities, and administra-
4 tive control procedures during the renewal term. This description should
5 include changes relevant to the issues addressed in Chapter 2. Applicants
6 should follow the requirements in Chapter 2 to determine the emphasis and
7 level of detail needed in describing plant operations.

1 CHAPTER 2. REVIEW OF NEPA ISSUES

2 The GEIS analyzes a range of environmental issues for license renewal
3 and reaches conclusions on their impact. Table B-1 of 10 CFR 51 (Appendix
4 A to this guide) provides findings for each of 104 National Environmental
5 Policy Act issues associated with license renewal. The supplemental
6 environmental report submitted as part of each license renewal application
7 would be required, under 51.53(c), to address each of the Category 2 and
8 Category 3 environmental issues identified in Table B-1 of 10 CFR 51.

9 Table 1 of this regulatory guide contains the Category 2 and Category
10 3 issues from Appendix B of 10 CFR 51 and identifies the section of the
11 GEIS and of this chapter where each issue is addressed. It should be noted
12 that the 22 Category 2 issues in Table B-1 are consolidated into 10 of the
13 12 topics treated in Chapter 2. Treatment of each of the Category 2 issues
14 should depend on whether a demonstration can be made on bounding and on the
15 level of impact. The treatment of the issue-specific environmental
16 assessments for Category 2 and 3 issues is summarized below.

17 A. Category 2 issues

18 1. If the issue given in 51.53(c)(3)(ii) is demonstrated to be
19 within the bounds, no further analysis is required.

20 2. If the issue is outside the given bounds, an assessment of the
21 environmental impact is required.

22 B. Category 3 issues

23 Applicants must provide an assessment of the impact
24 (51.53(c)(3)(iii)).

25 C. Category 2 and Category 3 issues

26 When an assessment indicates an adverse moderate or large impact, the
27 assessment should describe the mitigation measures that will be used.

1 The supplemental ER is required to evaluate whether the overall cost-
2 benefit balance determination in Appendix B of 10 CFR 51 is changed by the
3 individual plant-specific assessment (51.53(c)(4)).

4 The remainder of this chapter provides specific guidance for each
5 environmental issue identified as either a Category 2 or a Category 3 issue
6 in Table B-1. The issues in Sections 2.1 through 2.12 should be addressed
7 in the supplemental environmental report.

8 2.1 Heat Shock, Impingement, and Entrainment Effects on Fish and
9 Shellfish

10 The proposed 51.53(c)(3)(ii)(A) would require that the supplemental
11 environmental report demonstrate that:

12 "The nuclear power plant uses only cooling towers for primary
13 condenser cooling or that the license renewal applicant holds current
14 Clean Water Act 316(b) determinations and if necessary a 316(a)
15 variance in accordance with 40 CFR Part 125, or equivalent State
16 permits. If no such demonstration can be made, an assessment of the
17 impact of the individual nuclear power plant license renewal on fish
18 and shellfish resources resulting from heat shock [Clean Water Act
19 316(a)] and impingement and entrainment [Clean Water Act 316(b)] must
20 be provided."

21 This Category 2 issue is a combination of six related items described
22 in Sections 4.2.3.1.2, 4.2.3.1.3, 4.2.3.1.4 and 4.4.4 of the GEIS. The
23 purpose of this section is to provide guidance for preparing the
24 applicant's assessment of license renewal impacts on the aquatic
25 environment and biota at and in the vicinity of the site.

26 Impingement and entrainment are effects related to the cooling system
27 intake that are considered by EPA or State water quality agencies during
28 the development of National Pollutant Discharge Elimination System (NPDES)
29 permits and Clean Water Act 316(b) determinations. Applicants holding
30 approved 316(b) determinations need not address entrainment or impingement.

1 Applicants without approved 316(b) determinations should describe the
2 reasons why such a determination has not been made, provide an assessment
3 of the character and magnitude of any entrainment and impingement problems,
4 and describe actions taken to resolve the problems.

5 The potential for heat shock is also a factor in granting NPDES
6 permits. Under the Clean Water Act, applicants must comply with State
7 mixing zone criteria and thermal discharge limits or, if unattainable,
8 obtain site-specific variances. These site-specific variances take the
9 form of Clean Water Act 316(a) demonstrations. Applicants having approved
10 316(a) demonstrations need not evaluate heat shock in their application.
11 Applicants not meeting required limits and without an approved 316(a)
12 variance should describe the reasons why a variance has not been granted,
13 provide an assessment of the character and magnitude of the heat shock
14 problem, and describe actions taken to resolve the problem.

15 2.1.1 Information and Analysis Content

16 The types of data and information to be submitted will be affected by
17 site- and plant-specific factors and the degree of detail should be
18 modified according to the anticipated magnitude of the impacts. The
19 following data or information and analyses should be provided:

20 A. A description of the condenser cooling system. If the condenser
21 cooling system uses only cooling towers for heat dissipation and
22 neither a 316(a) variance nor a 316(b) determination is required, no
23 further information on this issue need be provided. Otherwise, the
24 applicant must provide copies of a current 316(a) variance or a
25 316(b) determination, or both, as required. If the required
26 documents are available, item C may be omitted. If either of these
27 documents is required but not available, further evaluation of the
28 issue should be provided.

- 1 B. Recent data and information on the site and vicinity¹:
- 2 1. Location and value of the commercial and sport fisheries for both
- 3 finfish and shellfish.
- 4 2. Distribution and abundance of "important"² species of fish or
- 5 shellfish and identification of critical life support areas such
- 6 as spawning areas, nursery grounds, feeding areas, wintering
- 7 areas, and migration routes.
- 8 3. Presence of endangered or threatened species of fish or shellfish
- 9 and their habitat preference, as well as fishery restriction
- 10 efforts being undertaken or planned by Federal and State
- 11 agencies.
- 12 C. Estimates of the amount and effect of impingement of fish and
- 13 shellfish and entrainment of fish and shellfish in early life stages.
- 14 Of particular concern are effects on threatened or endangered species
- 15 and on restoration efforts for anadromous fish. Also provide
- 16 estimates of the magnitude of the impact on those important species
- 17 of fish and shellfish having commercial or recreational value that
- 18 are affected. These estimates may be expressed in terms of dollars,
- 19 lost opportunity for recreational pursuits, percent reduction in
- 20 harvest, percent loss of habitat, or other appropriate quantifiers.
- 21 If impacts are adverse, the applicant should identify actions that
- 22 can be taken to mitigate the impacts and should describe specific
- 23 plans for mitigation, if any.

24 ¹For the purpose of reviewing this issue, inclusion of waters within a five-

25 mile radius defines "vicinity."

26 ²For the purposes of these environmental reviews, a species of fish or

27 shellfish is "important" if a specific causal link can be identified

28 between the proposed project and the species and if one or more of the

29 following criteria applies: (a) the species is commercially or

30 recreationally valuable, (b) the species is threatened or endangered (Pub.

31 Law 93-205, 87 Stat. 884), (c) the species affects the well-being of some

32 important species within criteria (a) or (b), or (d) the species is

33 critical to the structure and function of the ecological system.

1 D. The effect of heat shock on species of fish and shellfish. Provide
2 estimates of the amount and effect of impingement of fish and
3 shellfish and entrainment of fish and shellfish in early life stages.
4 Of particular concern are effects on threatened or endangered species
5 and on restoration efforts for anadromous fish. If impacts are
6 adverse, the applicant should identify actions that can be taken to
7 mitigate the impacts and should describe specific plans for
8 mitigation, if any.

9 2.2 Effects of Cooling Ponds on Groundwater Quality

10 The proposed 51.53(c)(3)(ii)(B) would require that the supplemental
11 environmental report demonstrate that:

12 "The nuclear power plant is not located at an inland site or does not
13 have cooling ponds. If no such demonstration can be made, an
14 assessment of the impact of the individual nuclear power plant
15 license renewal on groundwater quality must be provided."

16 This Category 2 issue is discussed in Section 4.4.3 of the GEIS.

17 The purpose of this section is to provide guidance to the applicant
18 for identification and assessment of the impacts of groundwater degradation
19 resulting from seepage of cooling pond water. If the applicant cannot
20 demonstrate that the plant is not located at an inland site or does not use
21 cooling ponds, an assessment should be provided.

22 2.2.1 Information and Analysis Content

23 The following types of information and analyses should generally be
24 provided to assess the potential for groundwater quality degradation
25 resulting from seepage of cooling pond water during operation for sites
26 with cooling ponds. In performing assessments, significant consideration
27 should be given to actual experience of the plant over the past 20 or more
28 years of operation. Data based on operational experience is considered
29 more reliable than data based on predictions.

- 1 A. The use of closed-cycle cooling ponds. If such a pond is not used,
2 the information called for in items B through J may be omitted.
- 3 B. The location of the plant. If the plant site is not located inland,
4 the information called for in items C through J may be omitted.
- 5 C. Cooling pond characteristics (e.g., use of liners, use of impermeable
6 materials, impermeable natural soils) that would prevent infiltration
7 into local aquifers.
- 8 D. Types and concentrations of impurities in the cooling pond water and
9 chemistry of soils along pathways to local aquifers.
- 10 E. Characteristics, including quality of water of local aquifers, that
11 could be affected by infiltration of cooling pond water.
- 12 F. Federal, State, and local groundwater quality requirements with
13 emphasis on any changes to these requirements that have occurred
14 during the plant's operational period.
- 15 G. Identification and characterization of all off-site groundwater users
16 who could be affected by degradation of aquifers.
- 17 H. Mitigation measures proposed by the applicant to avoid or minimize
18 any impacts from groundwater degradation.
- 19 I. If an assessment is required, a determination of whether cooling pond
20 water can contaminate the groundwater. This determination should be
21 based primarily on the concentration of contaminants in the cooling
22 pond water and characteristics of intervening soils and rock. If
23 contamination of groundwater is determined to be highly unlikely, the
24 analysis may be considered complete and the following step may be
25 omitted.
- 26 J. Assessment of the types and magnitudes of contamination introduced
27 into the aquifer. Estimated contamination levels should be compared
28 with Federal and State groundwater quality standards and with water

1 quality requirements of other potentially affected groundwater users.
2 If Federal and State standards are met and other groundwater users
3 are not affected, the analysis should be considered complete.

4 2.3 Groundwater Use Conflicts

5 The proposed 51.53(c)(3)(ii)(C) would require that the supplemental
6 environmental report demonstrate that:

7 "The nuclear power plant does not use Ranney wells and either does
8 not pump 100 or more gallons per minute of groundwater or does not
9 have private wells located within the cones of depression of the
10 nuclear power plant wells. If no such demonstration can be made, an
11 assessment of the impact of the individual nuclear power plant
12 license renewal on groundwater-use conflicts must be provided."

13 This Category 2 issue is a combination of three related issues discussed in
14 Sections 4.2.2.1.1, 4.2.2.1.2 and 4.2.2.1.4 of the GEIS.

15 This section provides guidance to the applicant for identification
16 and assessment of the environmental impacts of groundwater withdrawal and
17 use during the license renewal period. If the applicant cannot demonstrate
18 that the plant does not use Ranney wells and either does not pump 100 or
19 more gallons per minute of groundwater or does not have private wells
20 located within the cones of depression of the plant wells, the supplemental
21 environmental report should provide an assessment of the impact of
22 groundwater use conflicts.

23 2.3.1 Information and Analysis Content

24 The following types of information and analyses should generally be
25 provided to assess the presence and magnitude of groundwater use conflicts
26 during operation.

27 A. Identification of any operational groundwater uses or operational
28 dewatering activities. If none, the information called for in items B
29 through G may be omitted.

- 1 B. Locations of on-site wells, depths of wells, and operational pumping
2 capacities and durations. If pumping rates are less than 100 gpm and
3 Ranney wells are not used, the information called for in items C
4 through G may be omitted.
- 5 C. Descriptions of groundwater aquifers under the site, including
6 characteristics needed to determine the size of cones of depression
7 associated with on-site wells.
- 8 D. Determination of sizes of cones of depression of on-site wells.
- 9 E. Locations of any off-site wells (existing and known future) within
10 the cones of depression of on-site wells and the depths, pumping
11 capacities, and water needs for the wells. If no such off-site wells
12 are identified, items F and G may be omitted.
- 13 F. Any mitigation measures proposed to avoid or minimize groundwater use
14 conflicts.
- 15 G. A determination of the extent to which operational groundwater use or
16 dewatering activities will affect off-site groundwater users (current
17 and known future users). This determination should be based on the
18 amount of water withdrawn on site, the recharge capabilities of the
19 aquifer, locations and elevations of off-site wells, and water needs
20 of other water users.

21 2.4 Effects of Refurbishment on Important Plant and Animal Habitats

22 The proposed 51.53(c)(3)(ii)(D) would require that the supplemental
23 environmental report demonstrate that:

24 "Construction activities that are related to license renewal to be
25 undertaken that involve additional on-site land use will not affect
26 important plant and animal habitats. If no such demonstration can be
27 made, an assessment of the impact of the individual plant license
28 renewal on important plant and animal habitats must be provided."

1 This Category 2 issue is discussed in Section 3.6 of the GEIS.

2 An applicant whose plans for license renewal involve construction of
3 new structures or involve laydown areas on previously undisturbed land
4 should briefly describe the activities involved and the areas to be
5 disturbed and state whether important plant and animal habitats will be
6 affected. Particularly important resources include wetlands, habitats used
7 by threatened or endangered species, staging or resting areas for large
8 numbers of waterfowl, rookeries, restricted wintering areas for wildlife,
9 communal roost sites, strutting or breeding grounds of gallinaceous birds,
10 and rare plant community types. The applicant should identify alternative
11 courses of action available to avoid or reduce possible impacts, evaluate
12 the level of impacts and justify the proposed course of action.

13 If important plant and animal habitats occur on a plant site but it
14 is shown that they would be avoided during the course of refurbishment
15 activities, the impacts are considered insignificant and no further
16 evaluation is necessary. If this demonstration cannot be made, the
17 supplemental environmental report should provide an assessment of the
18 impact of on-site land use on important plant and animal habitats.
19 Assessments should be conducted in sufficient detail to project both the
20 potential impacts and provide mitigative measures to control the level of
21 impact.

22 2.4.1 Information and Analysis Content

23 The kinds of information and analyses that should be provided will be
24 affected by site- and plant-specific factors, and the degree of detail
25 should be modified according to the anticipated magnitude of the potential
26 impacts. The following information and analyses should usually be
27 provided:

- 28 A. Identification of important plant and animal habitats on the site or
29 in the vicinity. If none, items B and C do not apply.

- 1 B. Identification of any construction activities that will involve
2 additional on-site land use that may affect important plant and
3 animal habitats. If none, item C does not apply.
- 4 C. For the plant site and vicinity:
- 5 1. A map of the site and vicinity showing the area and boundaries of
6 major wetland communities, special habitats (e.g., spring seeps,
7 bogs, sink holes, rare or unique habitats), and any habitats used
8 by "important" species.
- 9 2. A list of "important" terrestrial wetland vertebrate species
10 known to occur and lists of invertebrate wetland species of local
11 importance or concern as disease vectors or pests.
- 12 3. Estimates of the relative abundance of both commercially and
13 recreational important wetland game and nongame vertebrates.
- 14 4. Any proposed refurbishment activities expected to affect wetland
15 communities that have been defined as rare or unique or that
16 support threatened or endangered species.
- 17 5. Estimates of the impact magnitude on these important species
18 having commercial or recreational value. The estimates may be
19 expressed in terms of dollars, lost opportunity for recreational
20 pursuits, percent reduction in harvest, percent loss of habitat,
21 or other appropriate quantifiers.
- 22 6. A description of proposed mitigation measures to minimize the
23 impacts described above.
- 24 7. A list of threatened or endangered wetland species that are known
25 to occur, their site-specific habitat, and estimates of their
26 population.

27 Mitigation is discussed in Section 3.6 of the GEIS.

1 2.5 Effects of Refurbishment on Surface Water Quality

2 The proposed 51.53(c)(3)(ii)(E) would require that the supplemental
3 environmental report demonstrate that:

4 "No major construction activities associated with the nuclear power
5 plant license renewal will take place at the site. If no such
6 demonstration can be made, a construction impact control program that
7 will mitigate potential impacts on the aquatic environment from soil
8 erosion or spills must be implemented and a description of this
9 program must be provided."

10 This Category 2 issue is discussed in Section 3.4.1 of the GEIS.

11 Those applicants whose plans for license renewal and plant life
12 extension involve construction of new structures or involve laydown areas
13 on previously undisturbed land should briefly describe the activities
14 involved, the areas to be disturbed, and commitments to minimize potential
15 impacts from soil erosion or spills. Impacts that might otherwise be
16 considered moderate or large may be rated as small by the staff if
17 applicants demonstrate that approved "best management practice" will be
18 employed to control soil erosion and spills. If this demonstration cannot
19 be made, the supplemental environmental report should provide an assessment
20 of soil erosion impacts and spill impacts.

21 This assessment should evaluate the impacts of refurbishment
22 construction activities. These impacts should include building or
23 expanding on-site storage capability for spent fuel. The impact evaluation
24 should be limited to the construction activities themselves and the time
25 period during which the construction is accomplished.

26 2.5.1 Information and Analysis Content

27 The following information and analyses usually should be provided:

- 1 A. A discussion of what, if any, major construction activities (e.g.,
2 the construction of on-site spent fuel storage facilities) will be
3 needed as part of license renewal. If none, the following items may
4 be omitted.

- 5 B. A description of the facilities to be provided or expanded and the
6 associated construction activities.

- 7 C. A description of the magnitude of potential impacts associated with
8 the proposed construction activities and how those impacts will be
9 mitigated, including a description of the construction-impact-control
10 program and its implementation.

- 11 D. A description of the best management practices to be used to control
12 soil erosion and spills consistent with Section 319 of the Clean
13 Water Act.

14 Mitigation measures to help protect surface water quality from
15 refurbishment impacts are discussed in Section 3.4.1 of the GEIS.

16 2.6 Effects of License Renewal on Housing

17 The proposed 51.53(c)(3)(ii)(F) would require that the supplemental
18 environmental report demonstrate that:

19 "The nuclear power plant is in a medium or high population area* and
20 not in an area where growth-control measures that limit housing
21 development are in effect. If no such demonstration can be made, an

22 "*An area is considered to have a medium or high population if any one of
23 the following conditions is satisfied:
24 (a) the plant is within 20 miles of a city of 25,000;
25 (b) the plant is within 50 miles of a city of 100,000;
26 (c) the population of the area within 20 miles of the plant is
27 75,000 or more; or
28 (d) the population of the area within 50 miles of the plant is
29 1,500,000 or more; or
30 (e) the population of the area within 20 miles of the plant is
31 50,000 or more and, within 50 miles of the plant, the
32 population is 400,000 or more."

1 assessment of the impact of the individual nuclear power plant
2 license renewal on housing availability must be provided."

3 This Category 2 issue is a combination of two related issues discussed in
4 Sections 3.7.2 and 4.7.2 of the GEIS.

5
6 If the required demonstration cannot be made, an assessment of how
7 housing availability would be affected by any increased on-site labor force
8 associated with license renewal should be made.

9 The applicant should provide demographic data based on the current
10 decade census and, where available, more recent census data.

11 This assessment should consider incremental on-site labor, peak
12 number of workers and duration of the peak, the number of workers expected
13 to commute daily, the number of workers expected to require temporary and
14 permanent housing, and the inventory of rental and of permanent housing
15 within 50 miles of the site. The incremental demands for housing should be
16 compared to the total inventory of housing, and an assessment of the level
17 of impact (small, moderate, or large) should be made.

18 A similar analysis should be performed to assess the level of impact
19 of the incremental labor force during refueling and maintenance outages on
20 housing availability.

21 2.6.1 Information and Analysis Content

22 The particular kinds of information and analyses that should be
23 provided will be affected by site- and plant-specific factors, and the
24 degree of detail will be modified according to the anticipated magnitude of
25 the potential impacts. The following housing-related information, which
26 may be obtained from the environmental report and supplemented as necessary
27 from appropriate Federal, State, and local agencies and housing-related
28 business entities, should be provided:

29 A. Population density and city size data (current decade census or more
30 recent data when available) to demonstrate whether the plant is

1 situated in a medium or high population area. Information required
2 is population within 20 miles of the plant, population within 50
3 miles of the plant, and a map showing any cities of 25,000 or more
4 within 20 miles of the plant and any cities of 100,000 or more within
5 50 miles of the plant.

6 B. Existence of growth controls that limit housing development. If
7 information provided in A and B indicate that the nuclear power plant
8 is in a medium or high population area and not in an area where
9 growth control measures that limit housing development are in effect,
10 item C may be omitted.

11 C. Number, types, and locations of housing units, including year-round
12 homes, seasonal homes, mobile homes, hotel/motels, and public housing
13 units, as well as housing characteristics such as the vacancy rates
14 for such units, monthly median gross rentals and costs, site of
15 units, quality, etc.

16 D. Population change or economic development that could affect vacancy
17 rates, rental prices, and potential for inflation.

18 E. Locations of existing and projected housing and trailer parks;
19 current temporary worker housing patterns; location, type, and value
20 of current housing units; and forecast location preferences of new
21 personnel.

22 F. Potential for conversion of housing units.

23 G. The number of workers and duration of assignment for the
24 refurbishment period and for periodic refueling and maintenance
25 outages.

26 H. Estimates of peak transient population within 10 miles of the plant
27 and identification on a map of any major facilities accounting for
28 transient population.

- 1 I. A screening of housing characteristics in the region of the site to
2 determine potentially affected subregions and communities. At least
3 the following factors should be considered:
- 4 • Forecast location preferences of new personnel,
 - 5 • Forecast number of personnel and duration of assignment during
6 plant refurbishment and refueling maintenance outages,
 - 7 • Location of existing and projected rental housing markets in
8 region,
 - 9 • Transportation accessibility,
 - 10 • Number and types of housing units,
 - 11 • Locally enacted measures that limit housing development.
- 12 J. An assessment of affected areas of the region, if any, and the
13 associated communities and forecasts of the extent and magnitude of
14 impacts in terms of housing availability, inflation, changes in
15 housing stock, accessibility to resident population, and levels of
16 impact during the refurbishment and refueling/maintenance outages.
- 17 K. A description of any proposed mitigation measures to minimize the
18 potential impacts described above.

19 2.7 Electric Shock from Transmission-Line-Induced Currents

20 The proposed 51.53(c)(3)(ii)(G) would require that the supplemental
21 environmental report demonstrate that:

22 "The design of the transmission lines of the nuclear power plant
23 meets the recommendations of the National Electric Safety Code for
24 preventing electric shock from induced currents. If no such

1 demonstration can be made, an assessment of the impact of the
2 individual nuclear power plant license renewal on the potential
3 electric shock hazard from the transmission lines of the plant must
4 be provided."

5 This Category 2 issue is discussed in Section 4.5.4.1 of the GEIS.

6 The potential for electric shock from induced current should be
7 reviewed with respect to the National Electric Safety Code (NESC)
8 recommendation if (1) no NESC review was performed in the NEPA review for
9 the initial operating license, (2) a change in voltage has been made since
10 the initial operating license and no NESC review was performed, or (3) land
11 use features have changed since the original operating license resulting in
12 possible hazardous conditions. Wherever the potential for severe shock
13 exists, the applicant should take action to reduce the potential. The
14 results of any analyses and subsequent actions should be reported in the
15 supplemental environmental report.

16 This issue concerns those portions of the operating high voltage
17 transmission lines (HVTLs) that connect the plant with the regional
18 electric transmission grid. The scope includes only acute shock effects.
19 Other HVTL issues, including the issue of chronic health effects from HVTL
20 electric and magnetic fields, have been identified as Category 1 issues.
21 Mitigation for this issue is mentioned in Section 4.5.4.1.1 of the GEIS.

22 2.7.1 Information and Analysis Content

23 Data and information provided for evaluating the existence of or
24 potential for electric shock from HVTLs should include:

- 25 A. A demonstration that the HVTLs meet the National Electric Safety
26 Code. If this demonstration can be made, the impact of this issue is
27 bounded by Appendix B of 10 CFR 51, and the following information may
28 be omitted.
- 29 B. National Electric Safety Code (current edition) recommendations and
30 requirements as well as applicable State standards.

- 1 C. HVTL electrical design and operating parameters, including operating
2 voltage, operating current, line capacity, conductor type, conductor
3 configuration and spacing, conductor clearances, and electric and
4 magnetic fields at the center and edge of the right-of-way.

- 5 D. Description of complaints received by the applicant or by the
6 relevant regulatory authority concerning electric shock from objects
7 near HVTLs.

- 8 E. Descriptions, including photos and maps, of large or linear metal
9 objects near HVTLs, including buildings, fences, railroad tracks, and
10 irrigation pipes.

- 11 F. Grounding procedures for stationary objects along the rights-of-way.

- 12 G. Changes made since initial licensing, including operating voltage
13 changes and nearby land use changes.

- 14 H. Potential for electric shock from large vehicles stopped under the
15 HVTL.

- 16 I. The magnitude of potential impacts on health from the above-described
17 shock hazard during the license renewal term.

- 18 J. A description of proposed mitigation measures to minimize the
19 potential impact described above.

20 2.8 Health Effects of Thermophilic Organisms

21 The proposed 51.53(c)(3)(ii)(H) would require that the supplemental
22 environmental report demonstrate that:

23 "The nuclear power plant does not use a cooling pond, lake, or canal
24 and does not discharge water to a small river. If no such
25 demonstration can be made, an assessment of the impact of
26 thermophilic organisms in the affected water on the health of
27 recreational users must be provided."

1 This Category 2 issue is discussed in Section 4.3.6 of the GEIS.

2 Plants using cooling ponds, lakes, or canals and those discharging to
3 small rivers (average flow less than 2830 m³/s) have the potential to
4 influence thermophilic microorganisms (e.g., Salmonella sp., Shigella sp.,
5 Pseudomonas aeruginosa, Legionella sp., Naegleria, Acanthamoeba, and
6 thermophilic fungi). Health questions related to public use of affected
7 waters should be addressed by the applicant in the form of consultation
8 with the State health department prior to application for license renewal.
9 If the applicant cannot demonstrate that the plant does not use cooling
10 ponds, lakes, or canals and does not discharge into a small river, the
11 supplemental environmental report should provide an assessment of the
12 potential for health effects and the results of the consultation with the
13 State health department.

14 2.8.1 Information and Analysis Content

15 Information and analyses provided for the evaluation of the existence
16 and potential for deleterious impacts of thermophilic microorganisms should
17 include:

- 18 A. Whether the plant uses a cooling pond, lake, or canal or uses once-
19 through cooling systems with discharge to a small river (flow rate
20 less than 2830 m³/s). If not, this issue is bounded by Appendix B,
21 10 CFR 51, and the information called for in items B through I may be
22 omitted.
- 23 B. Results of the tests for the occurrence of the cited pathogens and
24 factors germane to their presence in aquatic environs.
- 25 C. Temperature increases of aquatic environs subject to thermal
26 discharges.
- 27 D. Information on the concentration levels of these organisms that are
28 considered hazardous to public health. Note: OSHA or other legal
29 standards for exposure to microorganisms do not exist at present.

- 1 E. Information on potential control measures.
- 2 F. Results of analyses made for the presence of deleterious thermophilic
3 microorganisms. These include the enteric pathogens Salmonella sp.
4 and Shigella sp. as well as Pseudomonas aeruginosa and thermophilic
5 fungi. In addition, analyses for the presence of unusually high
6 concentrations of the normally present Legionella sp. (Legionnaires'
7 disease bacteria) and the free-living amoebae of the genera Naegleria
8 and Acanthamoeba should be cited.
- 9 G. An evaluation of the data concerning the occurrence and
10 concentrations of any of the listed deleterious thermophilic
11 microorganisms and whether or not any of them are present under
12 conditions that might be harmful to members of the public who come in
13 contact with them. Consultation with State health departments should
14 be utilized for this evaluation.
- 15 H. A determination of the magnitude of potential impacts of thermophilic
16 organisms on public health during the license renewal term.
- 17 I. A description of proposed mitigation measures to minimize the
18 potential impacts described above.

19 2.9 Low-Level Radioactive Waste Storage and Disposal

20 The proposed 51.53(c)(3)(ii)(I) would require that the supplemental
21 environmental report demonstrate that:

22 "The nuclear power plant will have access to a low-level radioactive
23 waste disposal facility through a low-level waste compact or an
24 unaffiliated State. If no such demonstration can be made, a
25 presentation of capability and plans for interim waste storage must
26 be provided with an assessment of potential ecological habitat
27 destruction caused by construction activities."

28 This is a Category 2 issue that covers two issues under "Solid Waste
29 Management" in Table B-1 of Part 51 (Appendix A of this guide). These

1 issues are low-level radioactive waste storage and low-level radioactive
2 waste disposal. They are addressed in Sections 6.3.2 and 6.3.3 of the
3 GEIS.

4 The applicant should demonstrate access to off-site disposal
5 facilities for low-level radioactive waste through a low-level waste
6 compact or an unaffiliated State during the full term of the renewed
7 operating license. If this demonstration is made, no further information
8 is required. If this demonstration is not made, applicants must
9 demonstrate that they have examined their capabilities and plans for on-
10 site storage, storage by off-site contractor, and special waste reduction
11 contingencies or other waste management methods. On-site storage of low-
12 level waste for up to 3 years is considered normal and does not require
13 further analysis. If prolonged on-site storage of low-level waste is
14 required, the potential for disturbance of plant and animal habitat should
15 be evaluated.

16 2.9.1 Information and Analysis Content

17 The kinds of information and analyses that should be provided will be
18 affected by site- and plant-specific factors, and the degree of detail
19 should be modified according to the anticipated magnitude of the potential
20 impacts. The following information usually should be provided:

- 21 A. A demonstration that the applicant will have access to a low-level
22 radioactive waste disposal facility through a low-level waste compact
23 or an unaffiliated State. If such a demonstration is provided, the
24 following items may be omitted.
- 25 B. A description of the plans for both temporary and permanent storage,
26 including a description of the interim waste storage systems to be
27 generated during the renewal term.
- 28 C. The anticipated quantity and characteristics of the wastes.

1 D. An assessment of the magnitude of potential disruption to plant and
2 animal habitat resulting from the construction of interim waste
3 storage systems.

4 E. A description of proposed actions to mitigate any moderate to large
5 impacts.

6 2.10 Demonstration of Cost Advantage of License Renewal

7 The proposed 51.53(c)(3)(ii)(J) would require a demonstration that:

8 "The replacement of equivalent generating capacity by a coal-fired
9 plant has no demonstrated cost advantage* over the individual nuclear
10 power plant license renewal. If no such demonstration can be made, a
11 justification for choosing the license renewal alternative must be
12 provided. For nuclear power plants located in California, Oregon,
13 Washington, or Arizona, applicants to renew a license must also
14 provide an assessment of geothermal generating capacity as an
15 alternative to license renewal in addition to the cost demonstration
16 results."

"* In performing the cost demonstration, costs of refurbishment,
construction, fuel, operation, and maintenance must be considered."

17 This Category 2 issue is a combination of four related issues discussed in
18 Sections 7.3.6 and 9.4.5 of the GEIS.

19 Under a wide set of circumstances, nuclear power plant refurbishment
20 and operation during a license renewal period is expected to be economical.
21 However, plants with a history of significantly lower-than-average capacity
22 or higher-than-average operating and maintenance costs may not be economic
23 to relicense. License renewal of plants with high refurbishment costs may
24 be less economical than building new generating plants. In the States of
25 California, Oregon, Washington, and Arizona, geothermal energy may be a
26 source of baseload power with economic and environmental advantages over
27 renewing the license of a nuclear power plant. In these states, nuclear

1 power plant license renewal applicants must compare the costs and
2 environmental impacts of license renewal with geothermal generation.

3 Appendix H to NUREG-1437 (Ref. 2) provides an acceptable simplified
4 screening tool for separating those cases for which a formal economic
5 analysis is necessary from those for which it is not. Combinations of
6 break-even capital costs and future operating costs for license renewal are
7 developed. Refurbishment costs are equivalent to capital costs for this
8 methodology, and future fuel, operation and maintenance (O&M), and interim
9 capital costs compose the future operating costs. No credit is taken in
10 the threshold analysis for the delay of decommissioning.

11 2.10.1 Information and Analysis Content

12 Table 2 shows threshold criteria developed by the staff for capital
13 and operational costs of license renewal. The development of these
14 criteria was based on combinations of capital and operational costs for
15 which license renewal would have a margin of economic advantage over the
16 costs of a new conventional coal plant. The margin of advantage for
17 license renewal was built into the criteria by performing a break-even
18 economic analysis between nuclear refurbishment and conventional coal while
19 making economically advantageous assumptions about coal (relative to the
20 reference-case cost comparison). First, this analysis was based on cost
21 relationships between NUPLEX and new coal plants, beginning in 2000 instead
22 of 2020. Because of the cost escalation assumption made about coal fuel,
23 the threshold values are more advantageous to coal than if using the
24 reference case assumptions. Second, in developing the threshold criteria,
25 a new coal plant is assumed to have a 70 percent capacity factor instead of
26 a 60 percent capacity factor. Third, no credit for the delay of decommis-
27 sioning is included for nuclear plants. Thus, changing the fuel cost
28 assumptions, assuming a 70 percent capacity factor for coal plants (instead
29 of 60 percent in the reference case), and giving no decommissioning credit
30 to nuclear plants results in a "buffer" or margin for uncertainty in the
31 analysis. Uncertainties include possible underestimates of refurbishment
32 capital costs and the possibility of higher than historical operating costs
33 during decommissioning. If an applicant's projected capital and operation-
34 al costs can break even based on the above assumptions, license renewal is

1 deemed to have met the threshold test. Further, by instituting cost
 2 comparisons as of the year 2000, the threshold analysis will be most
 3 relevant to initial license renewal applications.

4 **Table 2 Threshold Operational Cost Criteria for Capital Cost Categories at 50%,**
 5 **60%, and 70% Capacity Factors^a**

6	For Capital Cost (1989\$/kW)		Operational Cost Maximum (1989\$/kW), for Capacity Factor of:		
	7 Greater than	Less than or equal to	50%	60%	70%
8	0	100	188	227	267
9	100	200	180	219	259
10	200	400	164	203	243
11	400	600	148	187	226
12	600	800	132	171	210
13	800	1,000	115	155	194

14 ^aThe operational cost criteria represent the maximum that the historical
 15 operational costs may be for the corresponding capacity factor and capital
 16 refurbishment costs. Instead of using this table, a licensee may use the general
 17 formula for calculating an operational cost maximum using a particular capacity
 18 factor and capital refurbishment cost:

19 operational cost maximum = $-1.61 + (394.60 \times CF/100) - (0.0802 \times CC)$,

20 where CF is the capacity factor, expressed as a percentage, and CC is the
 21 estimated refurbishment capital costs. Refurbishment capital costs must include
 22 overnight construction costs, AFUDC, and the present values of energy replacement
 23 and increased regulatory costs.

24 Given the modified assumptions, the staff was able to identify the
 25 combinations of operational and capital costs that supported the economics
 26 of license renewal over a 20-year period. Some of these combinations are
 27 presented in Table 2 for plants that operated at capacity factors of 50,
 28 60, or 70 percent. If an applicant can demonstrate that a plant can meet
 29 any of the combinations of operational and capital threshold values

1 presented in Table 2 for the capacity factor at or above which the plant
2 operates, the plant meets the threshold criteria and the applicant need not
3 supply additional economic justification for license renewal.
4 Alternatively, a plant can pass the threshold criteria if it can be
5 demonstrated that it meets any combination of break-even operational and
6 capital threshold values implied by the formula in Table 2. This formula
7 can be used with any combination of capacity factor and estimated capital
8 costs to find the operational cost threshold value.

9 If an applicant cannot provide this demonstration using the
10 simplified analysis methodology of Appendix H to NUREG-1437 (Ref. 2), a
11 detailed cost analysis should be provided, showing that plant license
12 renewal is the most cost-effective option compared to the most reasonable
13 alternative source of baseload electricity generation, which may be fired
14 by coal, oil, or gas, or by a new nuclear plant. Sections 9.3.8 through
15 9.3.10 of the GEIS discuss the alternatives.

16 If an assessment is required, an applicant should determine the most
17 reasonable alternative source of baseload electricity generation and should
18 compare its cost-effectiveness with the license renewal alternative.
19 Estimates of the cost associated with the most reasonable alternative
20 source of generation should be provided. Detailed breakdowns should be
21 provided for cost components such as overnight investment, allowance for
22 funds used during construction, interim investment, operation and
23 maintenance, and fuel.

24 2.11 Threatened or Endangered Species

25 The proposed 51.53(c)(3)(iii)(A) would require that the supplemental
26 environmental report contain an assessment of:

27 "The impact of renewing the license for the nuclear power plant on
28 threatened or endangered species."

29 This Category 3 issue is addressed in Sections 3.5, 3.6 and 4.2.1.1 of the
30 GEIS.

1 Applicants should review the current Federal Register and State
2 listings of threatened or endangered species and consult with the
3 appropriate regional office of the U.S. Fish and Wildlife Service and the
4 National Marine Fisheries Service and the appropriate State agencies to
5 identify those threatened or endangered species that have been observed in
6 the site area. Applicants should also identify those threatened or
7 endangered species that could be expected within the site area based on
8 area range classification, even though sightings have not been documented.

9 If threatened or endangered species are identified as occurring or
10 expected to occur in the site area, applicants should assess the mitigative
11 actions to be taken in license renewal with regard to plant modifications,
12 refurbishment, and renewed operation to determine the potential for direct
13 impact on the identified species or their habitat.

14 2.11.1 Information and Analysis Content

15 Each supplemental environmental report submitted as part of an
16 application for license renewal should include an environmental assessment
17 of threatened or endangered species. This assessment should include the
18 following information and analyses:

- 19 A. Lists of endangered, threatened, and candidate species that have been
20 identified for the area of the plant and the area immediately
21 surrounding the plant based on consultation with the U.S. Fish and
22 Wildlife Service, the National Marine Fisheries Service, and
23 appropriate State agencies.
- 24 B. Documentation of any consultations during the operating lifetime of
25 the plant between the plant personnel and the appropriate Federal and
26 State agencies to identify any new endangered, threatened, or
27 candidate species;
- 28 C. Copies of biological assessments prepared to meet the requirements of
29 the Endangered Species Act;

1 D. Records of additional actions taken by the applicant to meet the
2 requirements of the Endangered Species Act;

3 E. Description of impacts on endangered, threatened, and candidate
4 species; the magnitude of such impacts; and proposed mitigative
5 measures, if any, to minimize the potential for impact on any of
6 these species or their habitat.

7 2.12 Transportation Impacts of Refurbishment

8 The proposed 51.53(c)(3)(iii)(B) would require that the supplemental
9 environmental report contain an assessment regarding:

10 "The impact of renewing the license for the nuclear power plant on
11 local transportation during periods of license-renewal-related
12 refurbishment activities."

13 This Category 3 issue is discussed in Section 3.7.4.2 of the GEIS.

14 In assessing the transportation impacts of refurbishment activities,
15 applicants should consider the increase in traffic associated with
16 additional workers and local road and traffic control conditions.

17 Applicants should determine the extent to which the service levels on
18 roads within 10 miles of the site will be degraded by increased traffic
19 during periods of refurbishment. Close attention should be given to
20 identifying and assessing potential congestion points such as
21 intersections, narrow bridges, and segments of roads with low speed limits
22 or numerous traffic signals or that are under construction. Whenever the
23 service level will be degraded to below category B for one or more
24 locations for more than one month, the applicant should consult with the
25 appropriate highway authorities to determine whether alternatives are
26 available and warranted to reduce traffic impacts. Category B is a level
27 of service defined by the Transportation Board indicating that existing
28 roadways can accommodate traffic without substantial delays even if no
29 improvements are made. Alternatives may include staggered work shifts,

1 shift hours that do not coincide with normal heavy traffic hours, carpool
2 incentives, and additional police or traffic control personnel.

3 2.12.1 Information and Analysis Content

4 Applicants should provide the following information and analyses on
5 transportation in the region around the site. This information may be
6 obtained from the environmental report supplemented as necessary from
7 appropriate Federal, State, and local agencies.

8 A. A description of the magnitude, origins, and routes of workers during
9 the proposed plant refurbishment outage, including the duration of
10 the outage.

11 B. Significant changes that have occurred (and are projected to occur
12 prior to refurbishment) to regional and local highway systems since
13 the operating license was issued. This includes changes in flow and
14 constraint, commuting patterns, and conditions of roads and highways.

15 C. Residential and nonresidential development that has occurred (and is
16 projected to occur prior to refurbishment) since the operating
17 license was issued.

18 D. Type, availability, and usage of public transportation.

19 E. Refurbishment modifications that might affect traffic flow to and
20 from the plant site.

21 F. A characterization of historical and current transportation
22 conditions in the site region to establish the baseline conditions.
23 Use all transportation attributes reflected by the information on the
24 site region and the actions that may be affected by refurbishment
25 activities. Provide appropriate frequency distributions, cross-
26 tabulations, and graphic representations of the data as appropriate.

1 G. A projection of baseline conditions without refurbishment, using
2 historic and projected trends coupled with factors other than
3 refurbishment that may affect transportation.

4 H. A comparison of demand factors with "supply" factors such as the
5 availability and condition of transportation infrastructure and
6 roadways and the management experience, personnel, and equipment of
7 the transportation system. Also, a determination of transportation
8 impacts by examining, for example, traffic congestion, community
9 satisfaction or frustration with community transportation systems,
10 and financial and nonfinancial pressures on local and State
11 jurisdictions to mitigate impacts. Transportation impacts will be
12 influenced by such "demand" factors as the number of commuting
13 workers, the number of workers per vehicle, availability and use of
14 public transportation or contractor-provided van pooling, and use of
15 transportation systems by secondary workers and dependents.

16 The applicant should focus on potential highway impacts but also
17 recognize that impacts can occur with air, river, and rail systems and that
18 transportation may involve the movement of goods as well as people.
19 Relevant public concerns for transportation-related issues such as traffic
20 noise and pollution should also be considered.

21 For a best estimate of transportation impacts, the applicant should
22 assume that the additional migrants will settle in the same communities and
23 proportions as current site workers with similar characteristics, taking
24 into account their expressed location preferences. For the maximum impact
25 estimate, assume that all additional migrants will choose housing in one of
26 the smaller communities, thereby concentrating the transportation impacts.

27 Anticipated transportation impacts should be reported in such terms
28 as anticipated traffic congestion by location, declines in levels of
29 service, required infrastructure improvements, increased potential for
30 accidents, accelerated deterioration of roadway beds and surfaces, system
31 costs, and public concerns.

1 For transportation impacts that have been identified, the duration of
2 the impacts and the affected areas and communities of the region should be
3 discussed. Describe minor transportation impacts in qualitative terms.
4 For adverse impacts (i.e., impacts that should be mitigated or avoided),
5 the applicant should conduct a more detailed analysis and, when practical,
6 make quantitative estimates of the magnitude of the impacts and plans for
7 their mitigation.

1 CHAPTER 3. ASSESSMENT OF OVERALL BENEFIT-COST DETERMINATION

2 The proposed 51.53(c)(4) states:

3 "The supplemental report must contain an analysis of whether the
4 assessment required by paragraphs 51.53(c)(3)(ii)-(iii) of this
5 section changes the findings documented in Table B-1 of Appendix B of
6 Subpart A of this part that the renewal of any operating license for
7 up to 20 years will have accrued benefits that outweigh the economic,
8 environmental, and social costs of license renewal."

9 The applicant's evaluation should determine whether the new
10 information presented in the supplemental environmental report changes the
11 Commission's conditional generic determination on the benefit-cost balance
12 as stated in Appendix B of 10 CFR 51. The conditional determination is
13 that the renewal of an operating license for up to 20 years will have
14 accrued benefits that outweigh the economic, environmental, and social cost
15 of license renewal. The applicant should consider the overall magnitude of
16 impacts for the set of environmental issues described in Chapter 2 that are
17 applicable to the plant after applying all proposed mitigative measures.
18 If the applicant concludes either (1) that all issues identified in Chapter
19 2 are irrelevant to its plant or (2) that any environmental impacts are so
20 small that further consideration of mitigative measures is not warranted,
21 no further analysis is required. However, if adverse impacts that are
22 moderate or large are identified, the applicant must determine the
23 collective effect of the impacts on the conditional NRC finding on the
24 benefit-cost balance. The applicant should also consider the magnitude of
25 any unavoidable impacts, the required commitment of resources, and the
26 relationship between short-term use and long-term productivity.

27 In making this overall evaluation of costs and benefits, applicants
28 may consider those areas in which the impacts of the individual plant
29 license renewal are clearly less or the benefits clearly greater than those
30 found generically in the GEIS. A detailed description of any such
31 counterbalancing factors, the weighting of these factors, and the basis for
32 using plant-specific data in the overall evaluation process should be
33 provided.

REFERENCES

1. U.S. Nuclear Regulatory Commission, "Preparation of Environmental Reports for Nuclear Power Stations," Regulatory Guide 4.2, Revision 2 (NUREG-0099), July 1976.
2. U.S. Nuclear Regulatory Commission, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants," Draft Report for Comment, NUREG-1437,* August 1991.
3. U.S. Nuclear Regulatory Commission, "Environmental Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants," Draft Report for Comment, NUREG-1429,* August 1991.

* Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Office of Administration, Distribution and Mail Services Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants

Issue	Category ¹	Findings ²
PART I. NEED FOR GENERATING CAPACITY		
Need for generating capacity via license renewal	1	LARGE BENEFIT. License renewal of an individual nuclear power plant will be needed to meet generating capacity requirements in the service area and to avoid constructing and operating new generating facilities which would otherwise be necessary to replace the retired nuclear plant.
PART II. IMPACTS OF ALTERNATIVES		
Advantages of alternatives to license renewal	1	NO ADVANTAGE. License renewal of an individual nuclear power plant is found to be preferable to replacement of the generating capacity with a new facility to the year 2020. License renewal is found to be preferable, both environmentally and economically ³ to either new fossil-fuel or new nuclear capacity. Wind, solar photovoltaic cells, solar thermal power, hydropower, and biomass are found to be not preferable to license renewal because of technological limitations, availability, and economics. Geothermal power could be competitive in areas where geothermal resources are readily available. These areas are in the states of California, Oregon, Washington, and Arizona.
PART III. BENEFITS/COST ASSESSMENT		
BENEFITS		
Direct Economic		
Generating capacity	1	LARGE BENEFIT. Will provide from 72×10^3 to 1270×10^3 net kW(e) reflecting the smallest to the largest plant.
Electric energy	1	LARGE BENEFIT. Will provide from 391×10^6 to 6898×10^6 kWh/yr reflecting the smallest to the largest plant.
Avoided costs	2 ³	SMALL TO LARGE BENEFIT. Compared to replacement of electric generating capacity with a new coal-fired plant, license renewal offers savings under a diverse set of conditions.
Indirect		
Local taxes Refurbishment	1	SMALL BENEFIT. Tax revenues will increase due to capital improvements.
Local taxes Renewal term	1	SMALL BENEFIT. The impact of tax revenues may vary from small to large depending on the total tax base of the taxing jurisdictions.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Employment Refurbishment	1	SMALL BENEFIT. Impacts on regional employment will be small to moderate depending on the total employment base of the region, and will be short-lived.
Employment Renewal term	1	SMALL BENEFIT. Impacts on regional employment will be small to large depending on the total employment base of the region.
COSTS Direct Economic³		
Refurbishment	2	MODERATE COST. Refurbishment costs will vary widely depending on specific plant requirements. In general, costs will be significantly lower relative to the capital cost of new coal-fired plants.
Fuel	2	SMALL COST. Fuel costs will be much lower than for a new coal-fired plant.
Operation and maintenance	2	LARGE COST. O&M costs will vary widely depending on specific plant performance but on the average they will be significantly more that for a new coal-fired plant.
Environmental and Socioeconomic		
Surface Water Quality, Hydrology, and Use (for all plants)		
Effects of refurbishment on surface-water quality	2	SMALL COST. Impacts are expected to be minor and insignificant during refurbishment if there are no major construction activities associated with the individual plant license renewal or if best management practices (BMPs) are employed to control soil erosion and spills; applicant must provide evidence of approved BMPs in license renewal application.
Effects of refurbishment on surface-water use	1	SMALL COST. Water use during refurbishment will not change or will be reduced during reactor outage.
Altered current patterns at intake and discharge structures	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Altered salinity gradients	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Altered thermal stratification of lakes	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Temperature effects on sediment transport capacity	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Scouring caused by discharged cooling water	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Eutrophication	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Discharge of chlorine or other biocides	1	SMALL COST. Effects are readily controlled through National Pollutant Discharge Elimination System (NPDES) permit and periodic modifications, if needed, and is not expected to be a problem during the license renewal term.
Discharge of sanitary wastes	1	SMALL COST. Effects are readily controlled through NPDES permit and periodic modifications, if needed, and is not expected to be a problem during the license renewal term.
Discharge of other chemical contaminants (e.g., metals)	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems. Has been satisfactorily mitigated at other plants. It is not expected to be a problem during the license renewal term.
Water-use conflicts	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems. The issue has been a concern at two nuclear power plants with cooling ponds and at two plants with cooling towers, but it will be resolved with appropriate state or regional regulatory agencies outside of NRC license renewal actions. It is not expected to be a problem during the license renewal term.
Refurbishment	1	<p data-bbox="704 1587 886 1650">Aquatic Ecology (for all plants)</p> <p data-bbox="721 1671 1406 1795">SMALL COST. During plant shutdown and refurbishment there will be negligible effects on aquatic biota due to a reduction of entrainment and impingement of organisms or reduced release of chemicals.</p>

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Accumulation of contaminants in sediments or biota	1	SMALL COST. Has been a concern at a single nuclear power plant with a cooling pond, but has been satisfactorily mitigated. Has not been found to be a problem at operating nuclear power plants with cooling towers or once-through cooling systems, or a cooling pond, except for one plant. It was successfully mitigated at that plant. It is not expected to be a problem during the license renewal term.
Entrainment of phytoplankton and zooplankton	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Cold shock	1	SMALL COST. Has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems and has not endangered fish populations. Has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds. It is not expected to be a problem during the license renewal term.
Thermal plume barrier to migrating fish	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Premature emergence of aquatic insects	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Gas supersaturation (gas bubble disease)	1	SMALL COST. Previously a concern at a small number of operating nuclear power plants with once-through cooling systems, but has been satisfactorily mitigated. Has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds. It is not expected to be a problem during the license renewal term.
Low dissolved oxygen in the discharge	1	SMALL COST. Has been a concern at one nuclear power plant with a once-through cooling system, but issue will be monitored in the NPDES permit renewal process. Has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds. It is not expected to be a problem during the license renewal term.
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Stimulation of nuisance organisms (e.g., shipworms)	1	SMALL COST. Has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where it was a problem. Has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds. It is not expected to be a problem during the license renewal term.
Aquatic Ecology (for plant with once-through heat dissipation systems)		
Entrainment of fish and shellfish in early life stages	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Licensees of plants that do not have an approved Clean Water Act 316(b) determination or equivalent State permit at the time of license renewal application must evaluate the entrainment issue in the license renewal application.
Impingement of fish and shellfish	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Licensees, of plants that do not have an approved Clean Water Act 316(b) determination or equivalent State permit if required at the time of license renewal application must evaluate the impingement issue in the license renewal application.
Heat shock	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected the problem during license renewal term. Licensees of plants that do not have an approved Clean Water Act 316(a) determination or equivalent State permit, if required, at the time of license renewal application must evaluate the heat shock issue in the license renewal application.
Aquatic Ecology (for plants with cooling-tower-based heat dissipation systems)		
Entrainment of fish and shellfish in early life stages	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Impingement of fish and shellfish	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Heat shock	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.
Aquatic Ecology (for plants with cooling pond heat dissipation systems)		
Impingement of fish	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Licensees of plants that do not have an approved Clean Water Act 316(b) determination or equivalent State permit at the time of license renewal application must evaluate the impingement issue in the license renewal application.
Entrainment of fish in early life stages	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Licensees of plants that do not have an approved Clean Water Act 316(b) determination or equivalent State permit at the time of license renewal application must evaluate the entrainment issue in the license renewal application.
Heat shock	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Licensees of plants that do not have an approved Clean Water Act 316(a) determination or equivalent State permit, if required at the time of license renewal application must evaluate the heat shock issue in the license renewal application.
Groundwater Use and Quality, Impacts of Refurbishment		
Groundwater-use and quality	1	SMALL COST. Extensive dewatering during the original construction on some sites will not be repeated during refurbishment on any sites. Any plants wastes produced during refurbishment will be handled in the same manner as in current operating practices and is not expected to be a problem during the license renewal term.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Groundwater Use and Quality, Impacts of Operation		
Groundwater-use conflicts (potable and service water)	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Plants pumping 100 or more gpm <u>and</u> having private wells located within cones of depression of reactor wells are required to assess for use conflict during the license renewal term.
Groundwater-use conflicts (water pumped for dewatering)	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. Plants pumping 100 or more gpm <u>and</u> having private wells located within cones of depression of plant wells are required to assess for use conflict during the license renewal term.
Groundwater-use conflicts (surface water used as makeup water—potentially affecting aquifer recharge)	1	SMALL COST. Water use conflicts are small and will be resolved as necessary through surface water regulatory mechanism outside of NRC license renewal process and is not expected to be a problem for any plant during the license renewal term.
Groundwater-use conflicts (Ranney wells)	2	SMALL COST. Ranney wells can result in potential groundwater depression beyond site boundary. Impacts of large groundwater withdrawal for cooling tower makeup at nuclear power plants using Ranney wells must be evaluated at the time of application for license renewal.
Groundwater-quality degradation (Ranney wells)	1	SMALL COST. Groundwater quality at river sites may be degraded by induced infiltration of poor-quality river water into an aquifer that supplies large quantities of reactor cooling water. However, the lower quality infiltrating water would not preclude the current uses of groundwater and is not expected to be a problem during the license renewal term.
Groundwater-quality degradation (saltwater intrusion)	1	SMALL COST. Nuclear power plants do not contribute significantly to saltwater intrusion.
Groundwater-quality degradation (cooling ponds)	2	SMALL COST. Sites with closed-cycle cooling ponds may degrade groundwater quality. This is not an issue for those plants located in salt marshes. However, for those plants located inland, the quality of the groundwater in the vicinity of the ponds must be shown to be adequate to allow continuation of current uses.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Terrestrial Resources		
Refurbishment impacts	2	SMALL COST. Insignificant impact if no loss of important plant and animal habitat occurs. If important plant and animal habitats are affected the potential impact will be assessed at the time of license renewal.
Cooling tower impacts on crops	1	SMALL COST. Salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Cooling tower impacts on native plants	1	SMALL COST. Salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Birds colliding with cooling towers	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Cooling pond impacts on terrestrial resources	1	SMALL COST. No significant damage to vegetation has been observed as a result of fogging, icing, or increased relative humidity at nuclear reactor cooling ponds. The low levels of water contaminants in cooling ponds are not a threat to wildlife using the ponds. No significant impact is expected at any nuclear power plant during the license renewal term.
Power line right - of - way management (cutting and herbicide application)	1	SMALL COST. Periodic vegetation control causes cyclic changes in the density of wildlife populations dependent on the right-of-way, but long-term densities appear relatively stable. Numerous studies show neither significant positive nor negative effects of power line rights-of-way on wildlife. No significant impact is expected at any nuclear power plant during the license renewal term.
Birds colliding with power lines	1	SMALL COST. Has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Impacts of electromagnetic fields (EMFs) on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	SMALL COST. No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified and is not expected to be a problem during the license renewal term.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Floodplains and wetland on power line right - of - way	1	SMALL COST. Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. On rare occasions when heavy equipment may need to enter a wetland to repair a power line, impacts can be minimized through the use of standard practices. No significant impact is expected at any nuclear power plant during the license renewal term.
Threatened or Endangered Species (for all plants)		
Threatened or endangered species	3	Generally, reactor refurbishment and continued operation is not expected to adversely affect threatened or endangered species. However, consultation with appropriate agencies must occur to determine if, in fact, threatened or endangered species are present and if they will be adversely affected.
Air Quality		
Air quality	1	SMALL COST. Air quality impacts from reactor refurbishment associated with license renewal are expected to be small.
Land Use		
Onsite land use	1	SMALL COST. Projected on-site land use changes required during refurbishment and the renewal period would be a small fraction of any nuclear power plant site.
Human Health, Impacts of Refurbishment		
Radiation exposures to the public	1	SMALL COST. During refurbishment, the gaseous effluents would result in doses well below the natural background dose. Applicable regulatory dose limits to the public are not expected to be exceeded.
Occupational radiation exposures	1	SMALL COST. Average occupational doses from refurbishment are expected to be within the range of annual average doses experienced for pressurized-water reactors and boiling-water reactors. Upper-limit cancer and genetic risks from radiation exposure from the incremental doses from refurbishment are expected to be less than 1% of the natural cancer and genetic risks.
Human Health, Impacts of Operation During License Renewal		
Microbiological organisms (occupational health)	1	SMALL COST. Occupational health questions are expected to be resolved using industrial hygiene principles to minimize worker exposures.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Microbiological organisms (public health)	2	SMALL COST. Has not been found to be a problem at most operating plants and is not expected to be a problem during the license renewal term. At the time of license renewal of plants using cooling ponds, lakes, or canals and plants discharging to small rivers applicants will assess the impact of thermophilic organisms on the health of recreational users of affected water.
Noise	1	SMALL COST. Has not been found to be a problem at operating plants and is not expected to be a problem at any reactor during the license renewal term.
Electromagnetic fields, acute effects (electric shock)	2	SMALL COST. Has not been found to be problem at most operating plants and is not expected to be a problem during the license renewal term. If it cannot be found at the time of license renewal that the transmission lines of the plant meets the National Electric Safety Code recommendations regarding the prevention of shock from induced currents then an assessment of the potential electric shock hazard from the transmission lines of the plant must be provided.
Electromagnetic fields, chronic effects	1	SMALL COST. Biological and physical studies of 60-Hz electromagnetic fields have not found consistent evidence linking harmful effects with field exposures.
Radiation exposures to public	1	SMALL COST. Present radiation doses to the public are very small with respect to natural background radiation; and doses from refurbishment are expected to be similar in magnitudes.
Occupational radiation exposures	1	SMALL COST. Projected maximum occupational doses during the license renewal term are within the range of doses experienced and are considerably below the 5 rem exposure limit.
Socioeconomics		
Housing impacts of refurbishment	2	SMALL COST. Not expected to be a problem at any plant located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Housing impacts of the workforce associated with refurbishment will be assessed at the time of license renewal for plants located in sparsely populated areas or in areas with growth control measures that limit housing development.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Housing impacts of license renewal term	2	SMALL COST. Not expected to be a problem at any plant located in a medium or high population area and not in an area where growth control measures that limit housing development are in effect. Housing impacts of the workforce associated with refueling/maintenance outages will be assessed at the time of license renewal for plants located in sparsely populated areas or in areas with growth control measures that limit housing development.
Public service impacts of refurbishment	1	SMALL COST. Refurbishment induced population growth will be small and will not strain local infrastructure at any plant.
Transportation impacts of refurbishment	3	Impacts are generally expected to be small, however, they must be assessed for each plant to consider the increase in traffic associated with the additional workers and the local road and traffic control conditions.
Public service (including transportation) impacts during license renewal term	1	SMALL COST. No significant impacts are expected during the license renewal term.
Offsite land-use impacts of refurbishment	1	SMALL COST. Impacts will not be significant at any plant because plant-induced population growth will have little effect on land use patterns.
Offsite land-use impacts of license renewal term	1	SMALL COST. Changes in land use would be associated with population and tax revenue changes resulting from license renewal of a plant. These changes are expected to be small for all plants.
Historic resources impacts of refurbishment	1	SMALL COST. No significant impacts are expected during refurbishment.
Historic resources impacts of license renewal term (transmission lines)	1	SMALL COST. No significant impacts are expected during the license renewal term.
Historic resources impacts of license renewal term (normal operations)	1	SMALL COST. No significant impacts are expected during the license renewal term.
Aesthetic impacts of refurbishment	1	SMALL COST. No significant impacts are expected during refurbishment.
Aesthetic impacts of license renewal term	1	SMALL COST. Impacts will be small to moderate depending on the visual intrusiveness of the plant on historic and aesthetic resources in the area.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Aesthetic impacts of license renewal term (transmission lines)	1	SMALL COST. No significant impacts are expected during the license renewal term.
		Uranium Fuel Cycle
Radiological and nonradiological Impacts	1	SMALL COST. Impacts on the U.S. population from radioactive gaseous and liquid releases including radon-222 and technetium-99 is small compared with the impacts of natural background radiation. Nonradiological impacts on the environment are small.
		Environmental Impacts of Postulated Accidents
Design-basis accidents	1	SMALL COST. Regulations require that consequences from design basis events remain acceptable for every plant.
Severe accidents (atmospheric releases)	1	SMALL COST. Risk from atmospheric releases is small.
Severe accidents (fallout onto open bodies of water)	1	SMALL COST. Risks from both the drinking water pathway and the aquatic food pathway are small and interdiction can further reduce both sufficiently for all plants.
Severe accidents (releases from groundwater)	1	SMALL COST. Interdiction and the low probability of base mat penetration yield a low risk to the public for all plants.
Severe accidents (economic consequences)	1	SMALL COST. Predicted costs due to postulated accidents range from \$2000/reactor year to \$374,000/reactor-year.
Severe accident mitigation design alternatives	1	SMALL COST. Low risk to the environment from severe accidents.
		Solid Waste Management
Nonradiological waste	1	SMALL COST. No changes to generating systems are anticipated for license renewal. Existing regulations will ensure proper handling and disposal at all plants.
Low-level radioactive waste storage	2	SMALL COST. Impacts will be small for plants having access to offsite disposal space. For those plants denied the use of off-site disposal space due to delayed compact plans, the potential for ecological habitat disturbance due to construction of on-site storage facilities must be evaluated.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Low-level radioactive waste disposal	2	SMALL COST. Off-site disposal facilities are planning to handle refurbishment and normal operations waste streams for an additional 20 years. If implementation of plans is delayed, plants in affected compact regions or unaffiliated states must plan for extended interim storage for an indefinite period of time and evaluate the impacts of such storage.
Mixed waste	1	SMALL COST. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants.
Spent fuel	1	SMALL COST. A 50% greater volume of spent fuel from an additional 20 years of operation can be safely accommodated on-site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage facility is not available.
Transportation	1	SMALL COST. Rail and truck transport corridors can safely accommodate increased shipments of radioactive wastes associated with license renewal. Shipments would result in impacts within the scope of the Table S.4 rule and therefore would result in acceptable impact.
Decommissioning		
Radiation doses	1	SMALL COST. Doses to the public are small regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem due to buildup of long-lived radionuclides during the license renewal term.
Waste management	1	SMALL COST. Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.
Air quality	1	SMALL COST. Air quality impacts of decommissioning are expected to be negligible whether at the end of the current operating term or at the end of the license renewal term.
Water quality	1	SMALL COST. The potential for significant water quality impacts from erosion or spills is no greater if decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.
Ecological resources	1	SMALL COST. Decommissioning after either the initial operating period or after a 20 year license renewal period is not expected to have any direct ecological impacts.

Appendix A. Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants (Continued)

Issue	Category ¹	Findings ²
Socioeconomic impacts	1	SMALL COST. Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

¹ The numerical entries in this column are based on the following category definitions:

- Category 1: A generic conclusion on the impact has been reached for all affected nuclear power plants.
- Category 2: A generic conclusion on the impact has been reached for affected nuclear power plants that fall within defined bounds.
- Category 3: A generic conclusion on the impact was not reached for any affected nuclear power plants.

² The findings in this column apply to Category 1 issues and Category 2 issues if a plant falls within the bounds of the generic analysis. For Part I of this table, the entry in this column indicates the level of need. For Part II of this table, the entry in this column indicates the relative advantages of alternatives to license renewal. For Part III of this table, the entries in this column are benefits or costs, as indicated by the following headings:

- SMALL impacts are so minor that they warrant neither detailed investigation or consideration of mitigative actions when such impacts are negative.
- MODERATE impacts are likely to be clearly evident and usually warrant consideration of mitigation alternatives when such impacts are negative.
- LARGE impacts involve either a severe penalty or a major benefit and mitigation alternatives are always considered when such impacts are negative.

³ The uncertainty associated with the economic cost of license renewal leads to the requirement that an applicant demonstrate for license renewal that no cost advantage exists for replacing the plants equivalent generating capacity by a new coal-fired power plant. If no such demonstration can be made, and applicant shall justify choosing the license renewal alternative. The justification will include an assessment comparing the cost of license renewal to the cost of reasonable alternative replacement generating capacity. Costs considered must include refurbishment and construction, fuel, and operation, and maintenance.

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. The regulatory analysis prepared for amendments to 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," provides the regulatory basis for this guide and examines the costs and benefits of the rule as implemented by the guide. NUREG-1440, "Regulatory Analysis for Proposed Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses: Draft for Comment," is available for inspection and copying for a fee at the NRC Public Document Room, 2120 L Street NW., Washington, D.C.

**UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555**

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

FIRST CLASS MAIL
POSTAGE & FEES PAID
USNRC
PERMIT No. G-67