



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

July 1998
Division 4
Draft DG-4005

DRAFT REGULATORY GUIDE

Contact: D.P. Cleary (301)415-3903

DRAFT REGULATORY GUIDE DG-4005 (Supersedes DG-4002)

PREPARATION OF SUPPLEMENTAL ENVIRONMENTAL REPORTS FOR APPLICATIONS TO RENEW NUCLEAR POWER PLANT OPERATING LICENSES

FOR COMMENT

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 Rules and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. 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 **October 23, 1998**.

Requests for single copies of draft or active regulatory 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 20555-0001, Attention: Printing, Graphics, and Distribution Branch; or by fax to (301)415-2289; or by email to GRW1@NRC.GOV.

A public meeting will be held on Friday, September 25, 1998, to answer questions about DG-4005 and to take comments on how it may be improved. The meeting will begin at 9:00 AM and end at 5:00 PM or earlier. It will be held in the NRC Auditorium at Two White Flint North, 11545 Rockville Pike, Rockville, MD 20852-2738. Individuals wishing to comment at the meeting are encouraged to inform Mr. Donald Cleary by September 18, 1998. Individuals not preregistered to speak will be given the opportunity to do so as time permits. Mr. Cleary's telephone number is (301)415-3903, his e-mail address is dpc@nrc.gov, and his mail address is U.S. Nuclear Regulatory Commission, O-11E1, Washington, DC 20555-0001.

CONTENTS

A. INTRODUCTION	1
B. STANDARD FORMAT AND CONTENT OF ENVIRONMENTAL REPORTS	6
CHAPTER 1. PURPOSE OF AND NEED FOR ACTION	6
CHAPTER 2. SITE AND ENVIRONMENTAL INTERFACES	6
CHAPTER 3. THE PROPOSED ACTION	8
3.1 General Plant Information	9
3.2 Refurbishment Activities	9
3.3 Programs and Activities for Managing the Effects of Aging	9
3.4 Employment	9
CHAPTER 4. ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS	10
4.1 Water Use Conflicts	11
4.2 Entrainment of Fish and Shellfish in Early Life Stages	14
4.3 Impingement of Fish and Shellfish	16
4.4 Heat Shock	18
4.5 Ground-water Use Conflicts (Plants Using >gpm Ground Water)	20
4.6 Ground-water Use Conflicts (Plants Using Cooling Towers Withdrawing Make-up Water from a Small River)	21
4.7 Ground-water Use Conflicts (Plants Using Ranney Wells)	22
4.8 Degradation of Ground-water Quality	23
4.9 Impacts of Refurbishment on Terrestrial Resources	24
4.10 Threatened or Endangered Species	25
4.11 Air Quality During Refurbishment (Nonattainment Areas)	28
4.12 Impact on Public Health of Microbiological Organisms	31
4.13 Electric Shock from Transmission-Line-Induced Currents	32
4.14 Housing Impacts	33
4.15 Public Utilities: Public Water Supply Availability	35
4.16 Education Impacts from Refurbishment	36
4.17 Offsite Land Use	37
4.18 Transportation	41
4.19 Historic and Archaeological Resources	42
4.20 Severe Accident Mitigation Alternatives	44
4.21 Transportation of Radiological Waste	45
4.22 Environmental Justice	46
Chapter 5. ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION	46
Chapter 6. SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS	47
6.1 License Renewal Impacts	47
6.2 Mitigation	47

6.3	Unavoidable Adverse Impacts	47
6.4	Irreversible or Irretrievable Resource Commitments	47
6.5	Short-term Use Versus Long-term Productivity of the Environment	48
Chapter 7.	ALTERNATIVES TO THE PROPOSED ACTION	48
7.1	No-action Alternative	49
7.2	Alternatives that Meet System Generating Needs	49
Chapter 8	COMPARISON OF ENVIRONMENTAL IMPACT OF LICENSE RENEWAL WITH THE ALTERNATIVES	50
Chapter 9	STATUS OF COMPLIANCE	50
	REGULATORY ANALYSIS	51

1
2
3
4
5
6
7
8
9
10
11
12
13

A. INTRODUCTION

This regulatory guide is being developed to provide guidance on the format and content of an environmental report (ER) to be submitted as part of an application for the renewal of a nuclear power plant operating license submitted pursuant to 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." This guide is being developed to supplement Revision 2 of Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Stations," July 1976.¹ Regulatory Guide 4.2 provides guidance on the information that should be included in an application for a construction permit to address the environmental impacts of construction and operation of the proposed plant and associated facilities. Use of this guide will help ensure the completeness of the information provided, will assist the NRC staff and others in locating the information, and will shorten the review process. Conformance with the suggested format, however, is not required and is provided for guidance only.

14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31

This regulatory guide explains how the provisions for the environmental review for renewal of nuclear power plant operating licenses, found in NRC's 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," may be met. Part 51 implements section 102(2) of the National Environmental Policy Act of 1969 (NEPA), as amended. The license renewal provisions of Part 51 were promulgated on December 18, 1996, in 61 FR 66537, and became effective on January 17, 1997. The rule was developed with the intent of improving the efficiency of the environmental review process for renewal of nuclear power plant operating licenses. These provisions codify the analyses conducted for and reported in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," May 1996.² Applicants should become familiar with the content of NUREG-1437 as the ER is developed. NUREG-1437 addresses 92 environmental issues; the analyses in NUREG-1437 found 68 of these issues to be adequately addressed. These issues are identified as Category 1 issues, and additional assessment is not required in a plant-specific review. There are 22 Category 2 issues, which require additional plant-specific assessment. Two issues are not categorized. An applicant should provide adequate information to support an environmental justice review by the NRC (see Section 4.22 of this guide). Applicants are not required to submit information on the chronic human health effects of transmission line electric and magnetic fields.

32

ENVIRONMENTAL REVIEW PROCESS

33
34

After receiving an applicant's Environmental Report—Operating License Renewal Stage (ER), the NRC staff will perform an acceptance review to determine whether the information is

¹ Single copies of regulatory guides, both active and draft, may be obtained free of charge by writing the Reproduction and Distribution Services Section, Office of the Chief Information Officer, USNRC, Washington, DC 20555-0001, or by fax at (301)415-5272. Active guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161.

² Copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20402-9328 (telephone (202)512-2249); or from the National Technical Information Service by writing NTIS at 5285 Port Royal Road, Springfield, VA 22161. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

1 sufficiently complete to begin the NEPA review. After reviewing and independently assessing
2 the analyses provided in the ER, the NRC will prepare a supplemental environmental impact
3 statement (SEIS) that incorporates and supplements the analyses presented in NUREG-1437.
4 The NRC staff review and the NRC staff preparation of the SEIS will be guided by
5 Supplement 1, "Operating License Renewal for Nuclear Plants," to NUREG-1555.³ The SEIS
6 is the NRC's independent analysis of the environmental impacts of the proposed action (the
7 renewal of the operating license of the specific nuclear power plant) and the alternatives to
8 the proposed action. The SEIS will contain, within the context of the NEPA review, the
9 recommendation of the NRC staff regarding the proposed action. These recommendations,
10 along with the findings from the 10 CFR Part 54 review, will be considered in the NRC record
11 of decision.

12 The NRC NEPA review process for an environmental impact statement involves the following
13 actions required of the NRC by 10 CFR Part 51.

- 14 ● Publish a notice of intent to prepare an SEIS in the *Federal Register* (see 10 CFR
15 51.27 and 51.95(c)) and send copies of the notice to appropriate Federal, State, and
16 local agencies; affected Native American tribal agencies; State, regional, and
17 metropolitan clearinghouses; and any interested persons upon request. The notice is
18 to explain the scoping process, state the locations of copies of the ER that are
19 available for public inspection, and invite public participation in the scoping process.
- 20 ● Conduct scoping (see 10 CFR 51.28 and 51.29). The scoping process includes
21 identifying and inviting appropriate agencies, groups, and persons to participate in
22 the process. With respect to license renewal, the focus of scoping is to allow other
23 parties to raise environmental issues that they believe are significant and yet are not
24 addressed or not adequately addressed in the ER. Parties may raise issues at the
25 public scoping meeting held in the vicinity of the plant and in written comments.
26 The scoping process also includes a staff site visit to the plant and communication
27 with local, regional, and State officials and representatives of organizations. As a
28 result of scoping, the staff may request additional information from the applicant.
- 29 ● Prepare a draft SEIS (see 10 CFR 51.7 and 51.95(c)). In developing the draft SEIS,
30 the NRC staff will independently evaluate the information provided by the applicant
31 and others, as well as information independently identified by the staff.
- 32 ● Distribute the draft SEIS for comment (see 10 CFR 51.73). A notice of the SEIS's
33 availability will be published in the *Federal Register* and copies of the draft SEIS will
34 be distributed to the Environmental Protection Agency (EPA); other appropriate
35 Federal agencies; affected Native American tribal agencies; appropriate State,
36 regional, and local agencies; organizations and individuals who have expressed
37 interest in the review, and any other parties requesting a copy.

³ The Draft of NUREG-1555 was issued in August 1997 and it will be issued soon in final form. Single copies of NUREG-1555 may be obtained free of charge, to the extent of supply, by writing the Reproduction and Distribution Services Section, Office of the Chief Information Officer, USNRC, Washington, DC 20555-0001, or by fax at (301)415-5272. Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

- 1 ● Prepare a final SEIS (see 10 CFR 51.95(c)). In developing the final SEIS, the NRC
2 staff will consider comments received on the draft, prepare responses, and modify
3 the SEIS as warranted. The staff will determine whether such comments identify
4 new and significant information not considered in NUREG-1437 nor addressed in the
5 applicant's ER. After considering the environmental impacts associated with license
6 renewal and with the alternatives to license renewal, the staff will reach a
7 conclusion as to whether or not the adverse environmental impacts of license
8 renewal are so great that preserving the option of license renewal for energy-
9 planning decisionmakers would be unreasonable.

- 10 ● Hold a hearing on the license renewal application if requested. In accordance with
11 10 CFR 2.105(a)(10), a notice of opportunity for hearing will be issued as soon as
12 practicable after the application has been docketed. Any person whose interest may
13 be affected by the action may request a hearing. (See also 10 CFR 51.104.)

- 14 ● Provide a Record of Decision (see 10 CFR 51.103). The Record of Decision will
15 discuss the alternatives considered in the SEIS, the measures taken to minimize
16 environmental harm, and any licensing conditions adopted in connection with
17 mitigation measures. In making a final decision on license renewal, the NRC will
18 determine whether or not the adverse environmental impacts of license renewal are
19 so great that preserving the option of license renewal for energy-planning
20 decisionmakers would be unreasonable.

21 GENERAL GUIDANCE TO APPLICANTS

22 Use of Regulatory Guides

23 Regulatory guides are issued to describe to the public methods acceptable to the NRC staff
24 for implementing specific parts of the NRC's regulations, to explain techniques used by the
25 staff in evaluating specific problems or postulated accidents, and to provide guidance to
26 applicants. Regulatory guides are not substitutes for regulations, and compliance with
27 regulatory guides is not required. Regulatory guides are issued in draft form for public
28 comment to involve the public in developing the regulatory positions. Draft regulatory guides
29 have not received complete staff review; they therefore do not represent official NRC staff
30 positions.

31 Environmental Reports - General Guidance

32 An ER should contain sufficient information to support analyses and findings. While other
33 documents (e.g., the original ER or SAR) may be referenced, information used in analyses
34 should be summarized. In preparing the ER, the applicant should be guided by the general
35 requirements set out in 10 CFR 51.45 and 51.55 in addition to the provisions of 10 CFR
36 51.53(c) specific to operating license renewal.

37 Treatment of Category 1 Issues

38 According to 10 CFR 51.53(c)(3)(i), the environmental report for the operating license
39 renewal stage is not required to contain analyses of the environmental impacts of the license

1 renewal issues identified as Category 1 issues in Appendix B to Subpart A of 10 CFR Part 51.
2 The ER should list those Category 1 issues that incorporate by reference in the ER the
3 findings in NUREG-1437 and identify the Category 1 issues that do not apply to the plant.

4 **New and Significant Information**

5 According to 10 CFR 51.53(c)(3)(iv), the environmental report must contain any new and
6 significant information regarding the environmental impacts of license renewal of which the
7 applicant is aware. An assessment of the significance of the new information should be
8 provided in the ER. New and significant information is (1) information that identifies a
9 significant environmental issue not covered in NUREG-1437 and codified in Appendix B to
10 Subpart A of 10 CFR Part 51 or (2) information that was not considered in the analyses
11 summarized in NUREG-1437 and which leads to an impact finding different from that codified
12 in 10 CFR Part 51. The intent of 10 CFR 51.53(c)(3)(iv) is that an applicant need not present
13 an analysis of Category 1 issues in the ER if it is unaware of new and significant
14 information; however, the staff expects that the applicant will have a process in place that
15 would result in the identification of new and significant information that exists concerning
16 Category 1 issues and issues not listed in Appendix B to Subpart A of 10 CFR Part 51. This
17 process should be briefly described. The process might include a systematic consideration of
18 the Category 1 issues in view of ongoing monitoring programs, special studies and surveys,
19 compliance with Federal, State, and local environmental regulations and programs, and
20 consultations with Federal, State, and local environmental, natural resource, and land use
21 agencies. An applicant who is not aware of new and significant information should state so
22 in the ER.

23 **Impact Findings**

24 Impacts are to be discussed in proportion to their significance. In assessing the magnitude or
25 significance of environmental impacts, the applicant should conform to the following general
26 definitions of significance level used in NUREG-1437 and in Appendix B to Subpart A of
27 10 CFR Part 51.

- 28 • Small: For the issue, environmental effects are not detectable or are
29 so minor that they will neither destabilize nor noticeably alter any
30 important attribute of the resource. For the purposes of assessing
31 radiological impacts, the Commission has concluded that those
32 impacts that do not exceed permissible levels in the Commission's
33 regulations are considered small.
- 34 • Moderate: For the issue, environmental effects are sufficient to alter
35 noticeably, but not to destabilize, important attributes of the
36 resource.
- 37 • Large: For the issue, environmental effects are clearly noticeable and
38 are sufficient to destabilize important attributes of the resource.

39 **Mitigation of Adverse Effects**

40 When adverse environmental effects are identified, 10 CFR 51.45(c) requires consideration of
41 alternatives available for reducing or avoiding these adverse effects. Any ongoing mitigation

1 should be identified and the potential for additional mitigation should be discussed. Mitigation
2 alternatives are to be considered no matter how small the adverse impact; however, the
3 extent of the consideration should be proportional to the significance of the impact. The
4 Council on Environmental Quality in its regulations at 40 CFR 1508.20 identifies five types of
5 mitigative actions.

- 6 (1) Avoiding the impact altogether by not taking a certain action or parts
7 of an action.
- 8 (2) Minimizing impacts by limiting the degree or magnitude of the action
9 and its implementation.
- 10 (3) Rectifying the impact by repairing, rehabilitating, or restoring the
11 affected environment.
- 12 (4) Reducing or eliminating the impact over time by preservation and
13 maintenance operations during the life of the action.
- 14 (5) Compensating for the impact by replacing or providing substitute
15 resources or environments.

16 These mitigations are used by the NRC in accordance with 10 CFR 51.14(b).

17 **Cumulative, Direct, and Indirect Impacts**

18 Environmental impacts, or effects, include direct effects, indirect effects, and cumulative
19 effects. Each type of effect is to be considered in the assessment of environmental issues.
20 Definitions of the three types of effects are given in the Council on Environmental Quality
21 regulations, 40 CFR Part 1508. Cumulative impact is defined in 40 CFR 1508.7.

22 "Cumulative impact" is the impact on the environment which results from
23 the incremental impact of the action when added to other past, present,
24 and reasonably foreseeable future actions regardless of what agency
25 (Federal or non-Federal) or person undertakes such other actions.
26 Cumulative impacts can result from individually minor but collectively
27 significant actions taking place over a period of time.

28 Direct and indirect effects are defined in 40 CFR 1508.8.

29 "Effects" include:

- 30 (1) Direct effects, which are caused by the action and occur at the same
31 time and place.
- 32 (2) Indirect effects, which are caused by the action and are later in time or
33 further removed in distance, but are still reasonably foreseeable.

34 These definitions are used by NRC in accordance with 10 CFR 51.14(b).

35 **OMB Clearance**

36 The information collections contained in this draft regulatory guide are covered by
37 the requirements of 10 CFR Part 51, which were approved by the Office of Management and
38 Budget, approval number 3150-0021. The NRC may not conduct or sponsor, and a person is
39 not required to respond to, a collection of information unless it displays a currently valid OMB
40 control number.

B. STANDARD FORMAT AND CONTENT OF ENVIRONMENTAL REPORTS

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

This chapter should briefly describe the purpose of a need for the proposed action. The Commission identified the purpose of and need for the proposed action in 61 FR 28467 and in NUREG-1437 on pages 1-2; this statement should be included in the applicant's ER.

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

CHAPTER 2. SITE AND ENVIRONMENTAL INTERFACES

The information in this chapter is intended to allow the reviewer to understand the overall character of the site and local environment. This chapter should describe the plant's setting and the environment affected. The description should give particular attention to information required to address the environmental issues designated Category 2 and environmental justice and to new and significant information that has been identified. Guidance on the treatment of these issues is provided in Chapter 4 of this regulatory guide.

The following information should be included in this chapter of the ER.

- Site location: State, county, latitude and longitude Universal Transverse Mercator (UTM) coordinates, township, range, and sections.
- A map of the site showing site boundaries; exclusion area; site structures and facilities; major land uses (with land use classifications consistent with the USGS categories)⁴; and transportation routes adjacent to the site.
- A map or maps of the site vicinity within about a 10-km (6-mi) radius of the plant showing county and local municipality boundaries; place names; residential areas; airports; industrial and commercial facilities; roads; railroads; major land uses (with land use classifications consistent with the USGS categories); utility rights-of-way; rivers; other bodies of water; wetlands; trust lands; historic sites; archaeological sites; Native American lands; military reservations; and designated Federal, State, and local parks and natural areas. Orient true north at the top of the map.
- A map of the region within about an 80-km (50-mi) radius of the plant showing major civil divisions; highways; transmission corridors serving the plant; rivers; other bodies of water; Native American lands; military reservations; designated Federal,

⁴ U.S. Geological Survey (USGS). "USGS Land Use and Land Cover Data," USGS Earth Resources Observation Data Center, Sioux Falls, South Dakota, 1997. This reference is also on the web at http://edcwww.cr.usgs.gov/glis/hyper/guide/1_250_lulc#lulc16.

1 State, and local parks and natural areas and nonattainment and maintenance areas
2 defined under the Clean Air Act, as amended (Title 42 U.S.C. 7401, et seq.). Orient
3 true north at the top of the map.

4 To the extent any information provided on a map relates to an issue in Chapter 4,
5 "Environmental Consequences of the Proposed Action and Mitigating Actions," that requires
6 analysis, or to any new and significant information, that information should be developed in
7 sufficient depth in textual, tabular, and graphic form to support the analysis. The information
8 should be presented under the following topics that correspond to the issues identified in
9 Chapter 4 to be addressed in the ER. The level of information provided on each of these
10 topics should be commensurate with the extent of the analysis required. The information
11 identified below should be represented on the maps identified above; separate maps or tables
12 may be used if they better support the analysis specified in Chapter 4.

- 13 • Aquatic and riparian ecological communities that may be affected by a once-through
14 or cooling pond heat dissipation system.
- 15 • Ground-water resources that may be subject to use conflicts or quality degradation.
- 16 • Critical and important terrestrial (plant and animal) habitat that may be disturbed by
17 power plant refurbishment activities or changes in plant operation. Critical habitat
18 are listed and described in 50 CFR 17.95 (fish and wildlife) and 17.96 (plants).⁵
- 19 • Threatened or endangered and special concern species identified on the site or
20 within the site vicinity. These species include those:
21 - listed at 50 CFR 17.11 (fish and wildlife) or 50 CFR 17.12 (plants)
22 - listed as a threatened, endangered, or other species of concern by the host State.
23 - proposed for listing, or are current candidates for the listing in the *Federal Register*.
24
- 25 • Regional demography, based on the most current (updated) U.S. Census data:
26 population by city, town, and county for those jurisdictions lying fully or partially
27 within 80 km (50 mi) of the plant.
28
- 29 • Information related to the area's economic base, including construction industry and
30 construction labor force, total regional labor force, unemployment levels, and future
31 economic outlook.
- 32 • Housing information, including the sales and rental markets in the region, number
33 and types of units, turnover and vacancy rates, and trends in additions.

⁵ Important habitat that may be adversely affected but has not been designated critical habitat is defined as follows.

- Wildlife sanctuaries, refuges, or preserves
- Habitats identified by the State Natural Heritage Program, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service as unique, rare, or of priority for protection
- Wetlands (Executive Order 11990), floodplain (Executive Order 11988), or other resources specifically protected by Federal regulations or Executive Orders, or by State regulations

- 1 • Information about the local educational system (regional primary and secondary
2 schools and higher institutions), including capacity and present percentage of
3 utilization.
 - 4 • Public and private recreational facilities and opportunities, including present and
5 projected capacity and percentage of utilization.
 - 6 • Regional tax structure and distribution of the present revenues to each jurisdiction
7 and district.
 - 8 • Local plans concerning land use and zoning that are relevant to population growth,
9 housing, and changes in land use patterns.
 - 10 • Social services and public facilities.
 - 11 • A general description of the location of low-income and minority populations within
12 the region surrounding the site. The description must give the percentage of the
13 population for each minority within the impact site and the proportion of households
14 below the poverty line. This description should be accompanied by two maps that
15 highlight the location of low-income and minority populations, respectively. These
16 maps should be based on the most recent Census of Population, supplemented by
17 other information if available.⁶
 - 18
 - 19 • Data on local and regional meteorology and air quality.
 - 20 • Historic and archaeological resources.
- 21 Known and reasonably foreseeable Federal and non-Federal projects and other actions in the
22 vicinity of the site that may contribute to the cumulative environmental impacts of license
23 renewal and extended plant operation should be identified and described.

24 CHAPTER 3. THE PROPOSED ACTION

25 The proposed action is described in 10 CFR 51.53(c)(2):

26 The report must contain a description of the proposed action,
27 including the applicant's plans to modify the facility or its
28 administrative control procedures as described in accordance
29 with § 54.21 of this chapter. This report must describe in
30 detail the modifications directly affecting the environment or
31 affecting plant effluents that affect the environment.

⁶ A minority population exists if, separately or in combination, minority groups' proportions of the population at the environmental impact site exceed the comparable proportions in the region by 10% or more, or if the minority groups constitute at least 50% of the population. A low-income population is assumed to be present if the percentage of households below the poverty line exceeds the proportion in the region by 10% or more.

1 The proposed action is renewal of an operating license and continued operation of the plant
2 during the renewal term, including all attendant activities. In addition to continuing operation
3 and maintenance activities, attendant activities include refurbishment to allow for extended
4 plant operation and changes to surveillance, on-line monitoring, inspections, testing, trending,
5 and recordkeeping (SMITTR). Refurbishment and SMITTR activities may be undertaken as a
6 result of the 10 CFR Part 54 aging management review, or they may be undertaken for other
7 reasons, such as opportunities for improved economic operation and maintenance during the
8 term of the renewed license. This chapter of the ER should identify those activities attendant
9 to license renewal that can affect the environment external to the plant. Possible activities
10 attendant to license renewal are discussed in Chapter 2 of NUREG-1437.

11 **3.1 General Plant Information**

12 Briefly describe the major features of the plant and the operation and maintenance practices
13 directly related to operations under license renewal. Information presented in this section
14 should include descriptions of

- 15 • Reactor and containment systems
- 16 • Cooling and auxiliary water systems
- 17 • Radioactive waste treatment processes (gaseous, liquid, and solid)
- 18 • Transportation of radioactive materials
- 19 • Nonradioactive waste systems
- 20 • Maintenance, inspection, and refueling activities
- 21 • Power transmission systems.

22 **3.2 Refurbishment Activities**

23 Facility refurbishments performed in support of license renewal should be described in this
24 section. These descriptions should identify the major structures and components that will be
25 replaced or modified. The section should identify where materials will be stored between
26 their arrival on the site and installation in the plant, and between their removal from the plant
27 and disposal. If refurbishment activities that directly or indirectly affect the environment will
28 be required, the locations and nature of those activities should be described. This section
29 should identify the schedule for the refurbishment work and describe how it would be
30 integrated with refueling and other maintenance activities. Applicants should ensure that the
31 information in this section meets the information requirements of Chapter 4.

32 **3.3 Programs and Activities for Managing the Effects of Aging**

33 This section should characterize any changes planned in the plant's operating practices,
34 inspections, maintenance activities, systems, and administrative control procedures during
35 the renewal term that are designed to manage the effects of aging. Any specific changes
36 that may lead to environmental impacts should be identified and discussed in detail.

37 **3.4 Employment**

38 Provide current estimates of full-time and occasional onsite (refueling) employment. Provide
39 projections of the incremental onsite workforce required for major refurbishment activities or
40 outages associated with license renewal. The employment figures for refurbishment and
41 outages should be presented by the month. Provide projections of any changes anticipated in

1 the full-time and occasional workforce during the license renewal term and identify changes
2 in the workforce arising from changes in SMITTR activities.

3 Provide an estimate of the indirect employment resulting from changes in the full-time and
4 the temporary workforces. This section should address any employment multipliers that
5 were used and the source or sources of the multipliers, with any additional information
6 needed to verify the appropriateness of the multipliers. Using an estimate of average
7 household size for the region, estimate the change in total population associated with license
8 renewal.

9 Estimate the residential distribution of the incremental permanent and temporary populations
10 by government jurisdiction or community (e.g., county, city, or town). Absent better
11 assumptions, it may be assumed that the residential pattern will be the same as that of the
12 current and occasional workforce.

13 **CHAPTER 4. ENVIRONMENTAL CONSEQUENCES OF THE** 14 **PROPOSED ACTION AND MITIGATING ACTIONS**

15 NUREG-1437 analyzed 92 environmental issues for license renewal and reached conclusions
16 about the impacts of refurbishment and operation during the license renewal period. For
17 most issues, the GEIS concluded that the impacts were such that the issue met the definition
18 of Category 1 (refer to Table B-1 in Appendix B to Subpart A of 10 CFR Part 51). Part 51
19 does not require the ER to contain any analyses of Category 1 issues; however, the rule
20 requires that licensees report on any new and significant information that may bear on the
21 applicability of conclusions of NUREG-1437 on Category 1 issues at their plants or on issues
22 not previously identified. The definition of and the process for identifying new and
23 significant information is provided in the Introduction section of this regulatory guide. The
24 applicant may adopt the findings for the codified Category 1 issues, unless the need for
25 additional analysis is triggered by knowledge of new and significant information. Such
26 analysis should be developed according to Section 4.3, "Assessment of New and Significant
27 Information," of this guide.

28 The sequence of the Category 2 issues covered in this section follows that of Table B-1 in
29 Appendix B to Subpart A of 10 CFR Part 51. Reference is also made to the specific
30 requirements stated in 10 CFR 51.53(c)(3)(ii). The steps for reviewing each Category 2 issue
31 are (1) using the criteria given in 10 CFR 51.53(c)(3)(ii), determine whether the issue is
32 applicable to the plant, (2) if not applicable, provide a short statement of why, and (3) if the
33 issue is applicable, provide the information and analysis specified in the appropriate section
34 below. The information and analysis should be sufficient to determine the magnitude and
35 significance of impacts associated with the issue.

36 Impacts may be adverse or beneficial and of small, moderate, or large significance. These
37 impact significance levels are defined in Table B-1 of 10 CFR Part 51 and in NUREG-1437 and
38 are explained in the Introduction to this guide.

39 Direct, indirect, and cumulative effects should be analyzed. The cumulative or indirect effects
40 of the action may be of moderate or large significance even when the direct effect is of small
41 significance. These effects are defined in the Introduction to this guide.

1 Mitigation measures to eliminate or reduce the level of adverse impacts should be considered
2 for each Category 2 issue. The applicant's effort to identify possible mitigation measures and
3 assess the efficacy of those measures should be in proportion to the significance of the
4 impact. If no suitable mitigation measures are identified, the basis of that finding should be
5 provided. For suitable mitigation measures, the applicant should describe the benefits and
6 costs of each of the measures and indicate which measures, if any, would be implemented if
7 the license is renewed. If none of the suitable mitigation measures will be implemented, the
8 applicant should explain why. Mitigation measures are defined in the Introduction to this
9 guide.

10 **4.1 Water Use Conflicts**

11 This section applies to plants with cooling ponds or cooling towers using makeup water from
12 a small river with low flow.

13 Table B-1 notes that the impacts of this issue are anticipated to be small or moderate and
14 that

15 The issue has been a concern at nuclear power plants with
16 cooling ponds and at plants with cooling towers. Impacts on
17 instream and riparian communities near these plants could be
18 of moderate significance in some situations.

19 Specifically, 10 CFR 51.53(c)(3)(ii)(A) requires, in part, that

20 If the applicant's plant utilizes cooling towers or cooling ponds
21 and withdraws makeup water from a river whose annual flow
22 rate is less than 3.15×10^{12} ft³/year (9×10^{10} m³/year), an
23 assessment of the impact of the proposed action on the flow
24 of the river and related impacts on instream and riparian
25 ecological communities must be provided.

26 This issue is discussed in Sections 4.3.2.1 and 4.4.2.1 of NUREG-1437.

27 If the plant does not use cooling towers or cooling ponds, the ER should note this fact; no
28 additional information is needed with reference to these issues.

29 If the plant takes its makeup water for the cooling towers or cooling ponds from a river with
30 an annual flow greater than 3.15×10^{12} ft³/year (9×10^{10} m³/year), the licensee should
31 report this fact. The method used to determine the annual flow should be provided and
32 explained, and no further information is needed with reference to these issues. If the plant
33 does not meet the above conditions, the information and analysis described below in
34 Sections 4.1.1 and 4.1.2 must be responsive to the requirements of 10 CFR 51.53(c)(3)(ii)(A)
35 specified above.

1 **INFORMATION AND ANALYSIS CONTENT**

2 **4.1.1 Instream Ecological Communities**

3 Consumption of water by the plant may significantly reduce the amount of habitat available
4 to aquatic organisms, either year-round or seasonally. Increasing water demand (e.g., as a
5 result of population growth) may result in additional impacts to aquatic habitats that were
6 not anticipated during the initial licensing. Information and analysis requirements for this
7 issue may be restricted to consideration of impacts on one or a few aquatic species, as
8 appropriate. As needed, existing and potential measures to mitigate losses of aquatic
9 habitats from cooling water withdrawals should be described, and the effects of these
10 measures should be estimated. The following process for developing and presenting
11 information should be used.

- 12 1. Document any consultations with regulatory agencies (e.g., U.S. Environmental
13 Protection Agency (EPA), State water resources control boards) and resource
14 agencies (e.g., National Marine Fisheries Service, U.S. Fish and Wildlife Service,
15 State fish and wildlife agencies) related to the issue of consumptive water use and
16 its effects on instream communities. Summarize the results of such consultations,
17 identifying agreements that describe (a) the nuclear power plant's priority for
18 makeup water withdrawals or (b) the criteria for reducing the withdrawal of makeup
19 water in order to protect instream habitats and aquatic biota during low flow
20 periods. If the regulatory and resources agencies concur that these agreements or
21 criteria are sufficiently protective of instream communities, further considerations of
22 the issue of effects of water use conflicts on instream communities may be omitted.
23 If further analysis of water use conflicts is needed, and consultation with regulatory
24 and resource agencies indicates concerns about only one or a few aquatic species,
25 the information and analysis required in the following items may be restricted to only
26 that needed to address effects on those species. Identify and unambiguously define
27 the resource or resources of concern.
- 28 2. Describe the fish and shellfish community in the source water body in Chapter 2.
29 Lists of species and estimates of the numbers of fish and shellfish that are present
30 in the portion of the water body affected by consumptive water use should be
31 included. The distribution and value of commercial and sport fisheries should be
32 discussed. The locations of important habitats for fish and shellfish (e.g., spawning
33 areas, nursery grounds, feeding areas, wintering areas, and migration routes) within
34 the area affected by consumptive water use should be fully described.
- 35 3. Include estimates of the quantities and timing of cooling water withdrawals and
36 discharges in Chapter 3. Estimate consumptive water use during the initial license
37 period and during the license renewal period.
- 38 4. Compare the consumptive water used by the heat-dissipation system to flows in the
39 source water body (i.e., the stream from which water is withdrawn for cooling
40 tower or cooling pond makeup water). This comparison should be based on records
41 of the initial license period and, if expected to be different, projected consumptive
42 use and stream flows during the license renewal period.
- 43 5. Estimate the quantities of other ongoing water withdrawals and consumptive water
44 uses in the portion of the water body affected by the applicant's plant and indicate
45 whether these withdrawals or uses are expected to change during the license
46 renewal period.

- 1 **6.** Estimate the effects of consumptive water use by the nuclear power plant on
2 aquatic habitats in the water body and discuss the significance of these effects in
3 terms of changes in populations of individual species. Describe the techniques used
4 to estimate the habitat changes that result from water withdrawals.
- 5 **7.** Estimate the total (cumulative) effects of all water withdrawals on aquatic habitats
6 and populations of individual species in the water body (i.e., the effects of power
7 plant withdrawals during the license renewal period in combination with other
8 existing and foreseeable future withdrawals).
- 9 **8.** Describe mitigative measures (e.g., limiting withdrawals during droughts) that have
10 been used to reduce the adverse impacts on aquatic habitats of consumptive water
11 use and the mitigative measures that are expected to be used during the license
12 renewal period. Briefly explain the reasons for not implementing any measures that
13 were considered but rejected.

14 **4.1.2 Riparian Ecological Communities**

15 The primary impacts expected are reduction in the areal extent or species composition of
16 riparian communities. Consumption of water by the plant may significantly reduce the
17 amount of habitat available to riparian ecological communities, either year-round or
18 seasonally. Increasing water demand (e.g., as a result of population growth) may result in
19 additional impacts to riparian ecological communities that were not anticipated during the
20 initial licensing. The methods used to determine the characteristics and magnitude of impacts
21 should be explained and documented. As needed, existing and potential measures to mitigate
22 adverse impacts on riparian ecological communities should be described, and the effects of
23 these measures should be estimated. The following process for developing and presenting
24 information should be used.

- 25 **1.** Document any consultations with regulatory agencies (e.g., EPA, State water
26 resources control boards) and resource agencies (e.g., National Marine Fisheries
27 Service, U.S. Fish and Wildlife Service, State fish and wildlife agencies) related to
28 the issue of consumptive water use and its effects on stream-related habitat and
29 riparian ecological communities. Summarize the results of such consultations,
30 identifying agreements that describe (a) the nuclear plant's priority for makeup water
31 withdrawals or (b) the criteria for reducing the withdrawal of makeup water in order
32 to protect stream-related habitat and riparian ecological communities during low-flow
33 periods. If the regulatory and resource agencies concur that these agreements or
34 criteria are sufficiently protective of riparian communities, further consideration of
35 the issue of water use conflicts on riparian ecological communities may be omitted.
36 If further analysis is needed, and consultation with regulatory and resource agencies
37 indicates concerns about only one or a few types of riparian ecological communities
38 or species in these communities, the information and analyses required in the
39 following items may be restricted to only that needed to address effects on those
40 community types or species. Identify and unambiguously define the resource or
41 resources of concern.
- 42 **2.** Describe the riparian ecological community in the source water body in Chapter 2.
43 For the portions of the water body affected by consumptive water use, describe the
44 associated riparian ecological community types, including (a) their extent and
45 locations, (b) lists of plant and animal species they contain, and (c) estimates of the
46 abundance of those species.

- 1 **3.** Include estimates of the quantities and timing of cooling water withdrawals and
2 discharges in Chapter 3. Estimate consumptive water use during the initial license
3 period and during the license renewal period.
- 4 **4.** Compare the use of consumptive water use by the heat-dissipation system to flows
5 in the source water body (i.e., the stream from which water is withdrawn for cooling
6 tower or cooling pond makeup water). This comparison should be based on records
7 of the initial license period and, if expected to be different, projected consumptive
8 use and stream flows during the license renewal period.
- 9 **5.** Estimate the quantities of other ongoing water withdrawals and consumptive water
10 uses in the portion of the water body affected by the licensee's plant and indicate
11 whether these withdrawals or uses are expected to change during the license
12 renewal period.
- 13 **6.** Provide an explanation of the mechanisms by which the riparian ecological
14 communities that are present would be likely to be affected by the loss of flow
15 attributed to makeup water (e.g., depression of the water table or loss of nutrient
16 replenishment because of decreased floods).
- 17 **7.** Estimate the effects of consumptive water use by the nuclear power plant on the
18 riparian ecological communities associated with the water body. Describe the
19 techniques used to estimate the changes in these communities that result from
20 water withdrawals. The estimates should be expressed in units appropriate to the
21 particular resources under consideration (e.g., percent loss of habitat, number of
22 plants or animals affected, number of acres affected, percent reduction in harvest).
- 23 **8.** Describe mitigative measures (e.g., limiting water withdrawals during droughts) used
24 to reduce the adverse impacts of consumptive water use on riparian ecological
25 communities and the mitigative measures that are expected to be used during the
26 license renewal period. Briefly explain the reasons for not implementing measures
27 that were considered but rejected.

28 **4.2 Entrainment of Fish and Shellfish in Early Life Stages**

29 This section applies to plants with once-through cooling or cooling pond heat dissipation
30 systems. Table B-1 notes that

31 The impacts of entrainment are small at many plants but may be moderate
32 or even large at a few plants with once-through and cooling-pond cooling
33 systems. Further, ongoing efforts in the vicinity of these plants to restore
34 fish populations may increase the numbers of fish susceptible to intake
35 effects during the license renewal period, such that entrainment studies
36 conducted in support of the original license may no longer be valid.

37 Specifically, 10 CFR 51.53(c)(3)(ii)(B) requires, in part, that

38 If the applicant's plant utilizes once-through cooling or cooling
39 pond heat dissipation systems, the applicant shall provide a
40 copy of current Clean Water Act 316(b) determinations . . . or
41 equivalent State permits and supporting documentation. If the
42 applicant can not provide these documents, it shall assess the
43 impact of the proposed action on fish and shellfish resources
44 resulting from . . . entrainment.

1 This issue is discussed in Sections 4.2.2.1.2, 4.3.3, and 4.4.3 of NUREG-1437.

2 If a plant does not use once-through cooling or cooling pond heat dissipation systems, the ER
3 should note this fact and no additional information is needed for this issue.

4 If the applicant's plant uses a once-through or cooling pond heat dissipation system and the
5 applicant holds a current Clean Water Act Section 316(b) determination, copies of the
6 determination, supporting documentation, and relevant correspondence with the water quality
7 permitting agency (EPA or permitted State agency) should be provided to the NRC. Information
8 about how mitigation measures were considered during the permit process, and any
9 commitment to mitigation measures, should be provided.

10 If (a) the applicant's plant utilizes a once-through or cooling pond heat dissipation system and
11 (b) the applicant does not possess a current Clean Water Act Section 316(b) determination,
12 the issue of entrainment of fish and shellfish in early life stages must be considered in the ER;
13 this information is outlined below.

14 **Information and Analysis Content**

15 Sufficient information should be provided in the ER to put into perspective the loss to
16 entrainment of fish and shellfish in their early life stages, not only in terms of the overall
17 numbers of eggs, larvae, and juveniles in the water body, but also in terms of the numbers of
18 adult fish and shellfish that these losses represent. Existing and potential new measures to
19 mitigate entrainment losses should also be fully described, and the effects of these measures
20 should be estimated. The following process for developing and presenting information should
21 be used.

- 22 1. Document any consultations with regulatory agencies (e.g., EPA or other water
23 quality permitting agencies) and resource agencies (e.g., National Marine Fisheries
24 Service, U.S. Fish and Wildlife Service, State fish and wildlife agencies) regarding the
25 issue of entrainment. Provide a copy of any Clean Water Act Section 316(b)
26 demonstration. If a determination has not been made that the "location, design,
27 construction, and capacity of cooling water intake structures reflect the best
28 technology available for minimizing adverse environmental impact," discuss the
29 outstanding issues. If consultation with regulatory and resource agencies indicates
30 concerns about only one or a few aquatic species, the information and analysis
31 required in the following items may be restricted to only that needed to address
32 effects on those species. Identify and unambiguously define the resource or resources
33 of concern.
- 34 2. Describe the fish and shellfish resources in Chapter 2. Include lists of species and
35 estimates of the numbers of entrainable fish and shellfish in the water body. The
36 distribution and value of commercial and sport fisheries should be discussed.
37 Locations of important habitats for entrainable fish and shellfish (e.g., spawning
38 areas, nursery grounds, feeding areas, wintering areas, and migration routes) should
39 be described.
- 40 3. Describe in Chapter 3 the cooling system, including the rates of water withdrawal,
41 the flow rates or volume of the water body from which cooling water is withdrawn,
42 and the location of water withdrawal. The intake structure and any structural or
43 operational measures used to reduce entrainment of fish and shellfish should be
44 described in detail.

- 1 4. Provide estimates of the species and numbers of fish and shellfish entrained on a
2 daily, monthly, and annual basis.
- 3 5. Provide estimates of the mortality of entrained fish and shellfish in early life stages.
- 4 6. Provide estimates of the numbers of adult fish and shellfish that are lost to the water
5 body because of entrainment in early life stages. Provide full documentation of
6 analytical or modeling techniques that were used to extrapolate local entrainment
7 losses to resulting long-term, far-field effects. As appropriate, compare these
8 "equivalent adult" losses to the total estimated numbers of adults in the water body
9 and commercial and recreational harvests.
- 10 7. If aquatic resources have been monitored, provide an analysis of time trends in the
11 data that might indicate whether fish and shellfish populations have increased,
12 decreased, or remained stable during the initial period of operation. Possible causes
13 for these time trends should be discussed.
- 14 8. Identify and, to the extent possible, quantify losses of fish and shellfish from other
15 sources (e.g., other water withdrawals, temperature and water quality problems,
16 impingement of juveniles and adults) in order to assess possible cumulative effects of
17 power plant entrainment losses when combined with other losses.
- 18 9. Describe mitigative measures that have been used to reduce the adverse impacts of
19 entrainment during the initial license period. Identify additional mitigative measures
20 that could be used to reduce entrainment impacts during the license renewal period.
21 Explain the rationale for accepting or rejecting additional mitigative measures.
22 Describe in detail the additional mitigative measures that are expected to be used
23 during the license renewal period and their expected effects on entrainment losses.

24 4.3 Impingement of Fish and Shellfish

25 This section applies to plants with once-through and cooling pond heat dissipation systems.
26 Table B-1 notes that

27 The impacts of impingement are small at many plants but may be moderate
28 or even large at a few plants with once-through and cooling pond cooling
29 systems.

30 Specifically, 10 CFR 51.53(c)(3)(ii)(B) requires, in part, that

31 If the applicant's plant utilizes once-through cooling or cooling pond heat
32 dissipation systems, the applicant shall provide a copy of current Clean
33 Water Act 316(b) determinations . . . or equivalent State permits and
34 supporting documentation. If the applicant can not provide these
35 documents, it shall assess the impact of the proposed action on fish and
36 shellfish resources resulting from . . . impingement

37 This issue is discussed in Sections 4.2.2.1.3, 4.3.3, and 4.4.3 of NUREG-1437.

38 If the plant does not use a once-through cooling or cooling pond heat dissipation system, the
39 ER should note this fact and no additional information is needed for this issue.

40 If the applicant's plant uses a once-through or cooling pond heat dissipation system and the
41 applicant holds a current Clean Water Act Section 316(b) determination, copies of the
42 determination, supporting documentation, and relevant correspondence with the water quality

1 permitting agency (EPA or permitted State agency) should be provided to the NRC. Information
2 about how mitigation measures were considered during the permit process, and any
3 commitment to mitigation measures, should be provided.

4 If (a) the applicant's plant utilizes a once-through or cooling pond heat dissipation system and
5 (b) the applicant does not possess a current Clean Water Act Section 316(b) determination,
6 the issue of impingement of fish and shellfish must be considered in the ER. Information that
7 should be provided to the NRC for review and analysis of the impingement issue is outlined
8 below.

9 **Information and Analysis Content**

10 Sufficient information should be provided in the ER to put the loss of fish and shellfish to
11 impingement mortality in perspective, not only in terms of the overall numbers of juveniles and
12 adults in the water body, but also in terms of the numbers of adult fish and shellfish that
13 these losses represent. Existing and potential new measures to mitigate impingement losses
14 should also be fully described, and the effects of these measures should be estimated.

- 15 1. Document any consultations with regulatory agencies (e.g., EPA or other water
16 quality permitting agencies) and resource agencies (e.g., National Marine Fisheries
17 Service, U.S. Fish and Wildlife Service, State fish and wildlife agencies) regarding the
18 issue of impingement. Provide a copy of any Clean Water Act Section 316(b)
19 demonstration. If a determination has not been made that the "location, design,
20 construction, and capacity of cooling water intake structures reflect the best
21 technology available for minimizing adverse environmental impact," discuss the
22 outstanding issues. If consultation with regulatory and resource agencies indicates
23 concerns about only one or a few aquatic species, the information and analysis
24 required in the following items may be restricted to only that needed to address
25 effects on those species. Identify and unambiguously define the resource or resources
26 of concern.
- 27 2. Describe in Chapter 2 the fish and shellfish resources, including lists of species and
28 estimates of the numbers of impingeable fish and shellfish in the water body. The
29 distribution and value of commercial and sport fisheries should be discussed.
30 Locations of important habitats for impingeable fish and shellfish (e.g., spawning
31 areas, nursery grounds, feeding areas, wintering areas, and migration routes) should
32 be described.
- 33 3. Describe in Chapter 3 the cooling system, including the rates of water withdrawal,
34 the flow rates or volume of the water body from which cooling water is withdrawn,
35 and the location of water withdrawal. The intake structure, intake screens, and any
36 structural or operational measures used to reduce impingement of fish and shellfish
37 should be described in detail.
- 38 4. Provide estimates of the species and numbers of fish and shellfish impinged on a
39 daily, monthly, and annual basis.
- 40 5. Provide estimates of the mortality of impinged fish and shellfish.
- 41 6. Provide estimates of the numbers of adult fish and shellfish that are lost to the water
42 body because of impingement. Provide full documentation of analytical or modeling
43 techniques that were used to extrapolate localized impingement losses to resulting
44 long-term, far-field effects. As appropriate, express these "equivalent adult" losses in
45 terms of the total estimated numbers of adults in the water body and commercial and
46 recreational harvests.

- 1 7. If aquatic resources have been monitored, provide an analysis of time trends in the
2 data that might indicate whether fish and shellfish populations have increased,
3 decreased, or remained stable during the initial period of operation. Possible causes
4 for these time trends should be discussed.
- 5 8. Identify and, to the extent possible, quantify losses of fish and shellfish from other
6 sources (e.g., other water withdrawals, temperature and water quality problems,
7 entrainment of early life stages) in order to assess possible cumulative effects of
8 power plant impingement losses when combined with other losses.
- 9 9. Describe mitigative measures that have been used to reduce the adverse impacts of
10 impingement during the initial license period. Describe additional mitigative measures
11 that are expected to be used during the license renewal period and their expected
12 effects on impingement losses, and briefly explain the reasons for not implementing
13 any measures that were considered but rejected.

14 4.4 Heat Shock

15 This section applies to plants with once-through and cooling pond heat dissipation systems.
16 Table B-1 notes that

17 Because of continuing concerns about heat shock and the possible need to
18 modify thermal discharges in response to changing environmental conditions,
19 the impacts may be of moderate or large significance at some plants.

20 Specifically, 10 CFR 51.53(c)(3)(ii)(B) requires, in part, that

21 If the applicant's plant utilizes once-through cooling or cooling pond heat
22 dissipation systems, the applicant shall provide a copy of current Clean
23 Water Act 316(b) determinations and, if necessary, a 316(a) variance in
24 accordance with 40 CFR Part 125, or equivalent State permits and
25 supporting documentation. If the applicant can not provide these documents,
26 it shall assess the impact of the proposed action on fish and shellfish
27 resources resulting from heat shock

28 This issue is discussed in Sections 4.2.2.1.4, 4.3.3, and 4.4.3 of NUREG-1437.

29 If the plant does not use a once-through cooling or cooling pond heat dissipation system, the
30 ER should note this fact and no additional information is needed for this issue.

31 If the applicant's plant uses a once-through or cooling pond heat dissipation system and the
32 applicant holds a current NPDES permit that demonstrates that the plant meets State water
33 temperature standards, or a current Clean Water Act Section 316(a) determination, copies of
34 the determination, NPDES permit, supporting documentation, and relevant correspondence
35 with the water quality permitting agency (EPA or permitted State agency) should be provided
36 to the NRC. Information about how mitigation measures were considered during the permit
37 process should be provided, as well as any commitments to mitigation measures.

38 If (a) the applicant's plant uses a once-through or cooling pond heat dissipation system and (b)
39 the applicant does not possess a current NPDES permit that demonstrates that the plant meets
40 State water temperature standards or possess a current Clean Water Act Section 316(a)

1 determination, the issue of heat shock must be considered in the ER. Information that should
2 be provided for review and analysis of the heat shock issue is outlined below.

3 Information and Analysis Content

4 Sufficient information should be provided to the NRC to allow the reviewer to put in
5 perspective the loss of fish and shellfish to heat shock, not only in terms of the overall
6 numbers of eggs, larvae, juveniles, and adults in the water body, but also in terms of the
7 numbers of adult fish and shellfish that these losses represent. Existing and potential new
8 measures to mitigate heat shock losses should also be fully described, and the effects of these
9 measures should be estimated. The following process for developing and presenting
10 information should be used.

- 11 1. Document any consultations with regulatory agencies (e.g., EPA or other water
12 quality permitting agencies) and resource agencies (e.g., National Marine Fisheries
13 Service, U.S. Fish and Wildlife Service, State fish and wildlife agencies) regarding the
14 issue of heat shock. Provide copies of any NPDES permits and Clean Water Act
15 Section 316(a) demonstration. If a current NPDES permit relative to thermal
16 discharges and/or a current Section 316(a) variance from State water temperature
17 standards do not exist, discuss the outstanding issues. If consultation with
18 regulatory and resource agencies indicates concerns about only one or a few aquatic
19 species, the information and analysis required in the following items may be restricted
20 to only that needed to address effects on those species. Identify and unambiguously
21 define the resource or resources of concern.
- 22 2. Describe the fish and shellfish resources, including lists of species and estimates of
23 the numbers of fish and shellfish in the water body that are susceptible to heated
24 discharges, in Chapter 2. The distribution and value of commercial and sport fisheries
25 should be discussed. Locations of important fish and shellfish habitats (e.g.,
26 spawning areas, nursery grounds, feeding areas, wintering areas, and migration
27 routes) should be fully described. The important habitats that could be affected by
28 thermal discharges should be identified.
- 29 3. Describe the cooling system, including heated water discharge rates, the flow rates or
30 volume of the water body into which heated water is discharged, and the location of
31 heated water discharge, in Chapter 3. The discharge structure and any structural or
32 operational measures used to reduce heat shock to fish and shellfish should be
33 described in detail. The location, temperatures, and areal extent of the heated
34 discharge plume should be described; all techniques used to estimate these
35 parameters (e.g., temperature monitoring, simulation monitoring) should be reported.
- 36 4. Provide estimates, on a daily, monthly, and annual basis, of the species and numbers
37 of fish and shellfish susceptible to heat shock.
- 38 5. Provide estimates of the mortality of heat-shocked fish and shellfish.
- 39 6. Provide estimates of the numbers of adult fish and shellfish that are lost to the water
40 body because of heat shock. Provide full documentation of analytical or modeling
41 techniques that were used to extrapolate localized heat shock losses to resulting
42 long-term, far-field effects. As appropriate, express these "equivalent adult" losses in
43 terms of the total estimated numbers of adults in the water body and commercial and
44 recreational harvests.
- 45 7. If aquatic resources have been monitored, provide an analysis of time trends in the
46 data that might indicate whether fish and shellfish populations have increased,

1 decreased, or remained stable during the initial period of operation. Possible causes
2 for these time trends should be discussed.

3 **8.** Identify and, to the extent possible, quantify losses of fish and shellfish from other
4 sources (e.g., other water withdrawals and discharges, temperature and water quality
5 problems, entrainment and impingement) in order to assess possible cumulative
6 effects of heat shock losses when combined with other losses.

7 **9.** Describe mitigative measures that have been used to reduce the adverse impacts of
8 heat shock during the initial license period. Describe additional mitigative measures
9 that could be used during the license renewal period and their expected effects on
10 heat shock losses. Identify mitigation measures that will be implemented, and briefly
11 explain the reasons for not implementing any measures that were considered but
12 rejected.

13 **4.5 Ground-water Use Conflicts (Plants Using > 100 gpm of Ground Water)**

14 This section applies to plants that use more than 100 gpm (6 L/s) of ground water.

15 Table B-1 reports that

16 Plants that use more than 100 gpm may cause ground-water
17 use conflicts with nearby ground-water users.

18 Specifically, 10 CFR 51.53(c)(3)(ii)(C) requires in part that

19 If the applicant's plant . . . pumps more than 100 gallons (total
20 onsite) of ground water per minute, an assessment of the
21 impact of the proposed action on ground-water must be
22 provided.

23 This issue is discussed in Section 4.8.1 of NUREG-1437. This section provides guidance to the
24 applicant for identification and assessment of the environmental impacts of ground-water
25 withdrawal and use during the license renewal period. If the applicant can provide withdrawal
26 records or other evidence that the plant does not pump more than 100 gpm (6 L/s) of ground
27 water, the ER should note this fact, and no additional information is needed on this issue.

28 **Information and Analysis Content**

29 If the applicant's plant pumps more than 100 gpm, the following information and analyses
30 should be provided to assess the magnitude and significance of potential ground-water use
31 conflicts during operation.

- 32 **1.** A description of all groundwater aquifers potentially impacted by operation of on-site
33 wells, including approximate areal extent, thickness, porosities, and hydraulic
34 conductivities of aquifer strata. The descriptions should discuss significant
35 uncertainties and inhomogeneities.
- 36 **2.** A description of existing and known future off-site and on-site wells, including
37 average flowrate, peak flowrate, water use and completion depth.
- 38 **3.** Maps of steady-state piezometric surfaces estimated with on-site and off-site wells at
39 peak pumpage, average pumpage, and no pumpage. These maps should indicate the
40 location of all wells, and should annotate each offsite well with the drawdown of the

- 1 piezometric surface attributable to the onsite wells and with the drawdown of the
2 piezometric surface attributable to the offsite wells. Describe the methods of
3 analysis, including assumptions used.
- 4 4. A description of existing and known future water rights (including tribal water rights).
5 5. A description of any wetlands in the vicinity that might be impacted by a lowered
6 watertable.
7 6. An evaluation of the significance of present and future effects of onsite withdrawal
8 on offsite wells and an assessment of the need for mitigation measures to reduce the
9 adverse impacts, if any.
10 7. If a need for mitigation measures is found, discuss possible measures and whether
11 they will be implemented.

12 **4.6 Ground-water Use Conflicts (Plants Using Cooling Towers Withdrawing Make-up**
13 **Water from a Small River)**

14 This section applies to plants using cooling towers withdrawing makeup water from a small
15 river.

16 Table B-1 reports that

17 Water use conflicts may result from surface water withdrawals
18 from small water bodies during low flow conditions which may
19 affect aquifer recharge, especially if other ground-water or
20 upstream surface water users come on line before the time of
21 license renewal.

22 Specifically, 10 CFR 51.53(c)(3)(ii)(A) requires in part that

23 If the applicant's plant utilizes cooling towers . . . and
24 withdraws make-up water from a river whose annual flow rate is
25 less than 3.15×10^{12} ft³/year (9×10^{10} m³/year) The
26 applicant shall also provide an assessment of the impacts of the
27 withdrawal of water from the river on alluvial aquifers during
28 low flow.

29 This issue is discussed in Section 4.8.1.3 of NUREG-1437.

30 If the applicant can provide evidence in the ER that its plant does not withdraw cooling tower
31 make-up water from a small river [annual flow rate less than 3.15×10^{12} ft³/year
32 (9×10^{10} m³/year)], no additional information is needed on this issue.

33 **Information and Analysis Content**

34 If the plant withdraws cooling tower make-up water from a small river, the following
35 information and analyses should be provided to assess the ground-water use conflicts during
36 operation.

- 37 1. A description of alluvial aquifers near the site that could be affected by surface-water
38 withdrawal, including approximate areal extent, thickness, porosities, and hydraulic
39 conductivities of aquifer strata.

- 1 2. A description of existing and known future off-site and on-site wells, including
2 average flow rate, peak flow rate, water use, and completion depth.
- 3 3. Maps of steady-state piezometric surface estimated with on-site and off-site wells at
4 peak pumpage, average pumpage, and no pumpage. These maps should indicate the
5 location of all wells, and each offsite well should be annotated with the drawdown of
6 the piezometric surface attributable to the onsite wells and with the drawdown of the
7 piezometric surface attributable to the offsite wells.
- 8 4. A description of existing and known future water rights (including tribal water rights).
- 9 5. A description of any wetlands in the vicinity that might be impacted by a lowered
10 water table.
- 11 6. An evaluation of the significance of present and future effects of onsite withdrawal
12 on offsite wells and wetlands, and the need for mitigation measures to reduce the
13 adverse impacts.
- 14 7. Possible mitigation measures, if they are needed, and whether they will be
15 implemented.

16 **4.7 Ground-water Use Conflicts (Plants Using Ranney Wells)**

17 This section applies to plants using Ranney wells for cooling tower make-up water. This
18 section provides guidance to the applicant on identification and assessment of the
19 environmental impacts of ground-water withdrawal and use during the license renewal period.
20 If the plant does not use Ranney wells, the ER should note the fact without further discussion.
21 This issue is a combination of two related issues discussed in Section 4.8.1 of NUREG-1437.

22 Table B-1 reports that

23 Ranney wells can result in potential ground-water depression
24 beyond the site boundary. Impacts of large ground-water
25 withdrawal for cooling tower makeup at nuclear power plants
26 using Ranney wells must be evaluated at the time of application
27 for license renewal.

28 Specifically, 10 CFR 51.53(c)(3)(ii)(C) requires in part that

29 If the applicant's plant uses Ranney wells . . . an assessment of
30 the impact of the proposed action on ground-water use must be
31 provided.

32 If the plant does not use Ranney wells, this fact should be noted in the ER and no further
33 information need be provided.

34 **Information and Analysis Content**

35 If the plant uses Ranney wells, the following information and analyses should be provided to
36 assess the magnitude and significance of potential ground-water use conflicts during
37 operation.

- 38 1. A description of alluvial aquifers near the site that could be affected by surface-water
39 withdrawal, including their approximate areal extent, thickness, porosities, and
40 hydraulic conductivities of aquifer strata.

- 1 2. A description of existing and known future off-site and on-site wells, including
2 average flow rate, peak flow rate, water use, and completion depth.
- 3 3. Maps of steady-state piezometric surface estimated with on-site and off-site wells at
4 peak pumpage, average pumpage, and no pumpage. These maps should indicate the
5 location of all wells, and each offsite well should be annotated with the drawdown of
6 the piezometric surface attributable to the onsite wells and with the drawdown of the
7 piezometric surface attributable to the offsite wells.
- 8 4. A description of existing and known future water rights (including tribal water rights).
- 9 5. A description of any wetlands in the vicinity that might be impacted by a lowered
10 water table.
- 11 6. An evaluation of the significance of present and future effects of onsite withdrawal
12 on offsite wells (including changes in groundwater quality) and wetlands, and the
13 need for mitigation measures to reduce the adverse impacts.
- 14 7. Possible mitigation measures, if they are needed, and whether they will be
15 implemented.

16 4.8 Degradation of Ground-water Quality

17 This section applies to plants at inland sites with cooling ponds.

18 Table B-1 notes that

19 Sites with closed-cycle cooling ponds may degrade ground-
20 water quality. For plants located inland, the quality of the
21 ground water in the vicinity of the ponds must be shown to be
22 adequate to allow continuation of current uses.

23 Specifically, 10 CFR 51.53(c)(3)(ii)(D) requires that

24 If the applicant's plant is located at an inland site and utilizes
25 cooling ponds, an assessment of the impact of the proposed
26 action on ground-water quality must be provided.

27 This issue is discussed in Section 4.8.3 of NUREG-1437.

28 If the applicant's plant does not use cooling ponds or if the cooling ponds are adjacent to salt
29 marshes, the ER should note the fact and no further information need be provided.

30 Information and Analysis Content

31 If the plant uses cooling ponds and is not adjacent to salt marshes, the following information
32 and analyses should be provided to assess the presence and magnitude of ground-water
33 quality degradation during operation.

- 34 1. Cooling pond characteristics (e.g. liners or impermeable materials used, impermeable
35 soils) that would retard or prevent infiltration into local aquifers.
- 36 2. Types and concentrations of impurities in the cooling pond water and chemistry of
37 soils along pathways to local aquifers to determine whether cooling pond water can
38 contaminate the ground water.

- 1 **3.** Water quality and other characteristics of local aquifers that could be affected by
2 infiltration of cooling pond water.
- 3 **4.** Federal, State, and local ground-water quality requirements with emphasis on any
4 changes to these requirements that have occurred during the plant's initial license
5 term and any anticipated changes to those requirements during the license renewal
6 term.
- 7 **5.** Identification and characterization of offsite ground-water users who could be
8 affected by the degradation of aquifers. Characterization should include locations and
9 elevations of off-site wells, their pumping rates, and the water needs of ground-water
10 users.
- 11 **6.** A quantitative description of the cumulative effects of using closed cycle cooling
12 ponds on ground-water quality. This description should include maps of the
13 contaminant plume. Information should be provided on ground-water contamination
14 existing at the time of license renewal application and projected contamination during
15 the license renewal period.
- 16 **7.** The mitigation measures proposed to avoid or minimize ground-water quality
17 degradation and the estimated impact of implementing those measures. Briefly
18 explain the reasons for not implementing any measures that were considered but
19 rejected.

20 **4.9 Impacts of Refurbishment on Terrestrial Resources**

21 Table B-1 notes that

22 Refurbishment impacts are insignificant if no loss of important
23 plant and animal habitat occurs. However, it cannot be known
24 whether important plant and animal communities may be
25 affected until the specific proposal is presented with the license
26 renewal application.

27 Specifically, 10 CFR 51.53 (c)(3)(ii)(E) requires in part that

28 All license renewal applicants shall assess the impact of
29 refurbishment and other license-renewal-related construction
30 activities on important plant and animal habitats.

31 This issue is discussed in Section 3.6 of NUREG-1437.

32 The applicant should describe in Chapter 3 of the ER any activities associated with license
33 renewal that will involve disturbance of any plant or wildlife habitat. If no area will be
34 disturbed, the fact should be noted in Section 4.2.9 of the ER, and no further discussion of
35 the issue is needed. Areas to be disturbed should be described in Chapter 2 of the ER with
36 respect to (1) the amount of land to be disturbed, (2) ecological characteristics of the habitat,
37 (3) species of plants and animals found in the area, and (4) the extent to which the habitat is
38 unique. Note that the information and analysis for this issue overlaps the information and
39 analysis covered in Section 4.10 of this guide for assessing impacts on threatened and
40 endangered species.

1 Information and Analysis Content

2 If any license renewal activities will disturb any plant or wildlife habitat, the following
3 information and analyses should be provided.

- 4 1. The applicant should determine whether any of the plant and animal species are
5 important. Important species are those that either (1) have high public interest or
6 economic value or both or (2) may be critical to the structure and function of the
7 ecosystem or provide a broader ecological perspective of an area. Important habitats
8 are defined as those that support important species.⁷ Specific guidance on
9 identifying important species to be evaluated is found in "U.S. Fish and Wildlife
10 Service Mitigation Policy; Notice of Final Policy."⁸ Federal, State, and regional
11 government agencies with jurisdiction over biological resources, and organizations
12 concerned with such resources like the State office of the Nature Conservancy,
13 should be consulted to assist with the identification of important species and
14 habitats. If no important species are identified, the basis for this finding should be
15 summarized in Section 4.2.9 of the ER, and no further discussion of this issue is
16 needed.
- 17 2. If important plant or animal species are identified, the significance of the loss in
18 population of the species should be assessed with respect to local, regional, and
19 national social, economic, and ecological value.
- 20 3. Mitigation measures that are proposed, considered, or adopted to minimize the
21 adverse impacts should be described. Briefly explain the reasons for not
22 implementing any measures that were considered but rejected. Further guidance on
23 determining the appropriate level of mitigation and methods for accomplishing
24 mitigation can be found in the U.S. Fish and Wildlife Service Mitigation Policy (46 FR
25 7644, January 23, 1981).

26 4.10 Threatened or Endangered Species

27 Table B-1 notes that

28 Generally, plant refurbishment and continued operation are not
29 expected to adversely affect threatened or endangered species.
30 However, consultation with appropriate agencies would be

⁷ Important plant or animal habitats are often characterized by high biological productivity or diversity. Examples include habitats used by Federal or State threatened or endangered species, wetlands, riparian zones, staging or resting areas for large numbers of waterfowl, rookeries, restricted wintering areas for wildlife (e.g., winter deer yards), communal roost sites, strutting or breeding grounds of gallinaceous birds, rare plant community types (e.g., Atlantic white cedar swamps), and other such areas.

⁸ The Notice (46 FR 7644, January 23, 1981) establishes final policy guidance for U.S. Fish and Wildlife Service personnel involved in making recommendations to protect or conserve fish and wildlife resources. Guidance is provided on the definition and identification of "evaluation species," evaluation of direct and indirect effects of a project on the evaluation species, on the levels of mitigation and on the various methods for accomplishing mitigation when adverse effects are identified. The types of species that should be considered are discussed in the Notice at pages 7662 and 7663. In this regulatory guide, the terms "important species" and "evaluation species" are used interchangeably.

1 needed at the time of license renewal to determine whether
2 threatened or endangered species are present and whether they
3 would be adversely affected.

4 Specifically, 10 CFR 51.53(c)(3)(ii)(E) requires, in part, that

5 Additionally, the applicant shall assess the impact of the
6 proposed action on threatened or endangered species in
7 accordance with the Endangered Species Act.

8 This issue is discussed in Sections 2.3.6, 3.9, and 4.1 of NUREG-1437.

9 In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16
10 USC 1531 *et seq.*), Federal agencies must review actions they undertake or support (such as
11 issuing permits and licenses) to determine whether they may jeopardize the continued
12 existence of an endangered species or their habitats. If such review reveals the potential for
13 adversely affecting listed or proposed species, the Federal agency must consult with the U.S.
14 Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS), as
15 appropriate. The interagency cooperation provisions of Section 7 are implemented by the FWS
16 and the NMFS at 50 CFR Part 402. Further, Section 9 of the ESA prohibits certain actions by a
17 Federal agency, licensee, or potential licensee that may hurt an endangered species or its
18 habitat. The prohibited acts provisions of Section 9 are implemented at 50 CFR 17.31(a) and
19 17.71(a).⁹

20 Compliance with the ESA involves determining whether activities associated with license
21 renewal and continued operation are likely to adversely affect the continued existence of any
22 threatened or endangered species or result in the destruction or adverse modification of critical
23 habitat of such species. If it is found that the activities may adversely affect any listed or
24 proposed species, the NRC has an obligation to consult with the FWS or the NMFS to
25 determine the extent of such effect and the alternatives that are available to avoid jeopardy.
26 Although the type of activities that are expected to accompany license renewal will likely not
27 jeopardize endangered species, prudence is required in documenting information, analysis, and
28 conclusions.

29 Information and Analysis Content

30 The ER should include the following.

- 31 1. Reference should be made to threatened or endangered species, or proposed species,
32 and critical habitat that may be found on the site or in its immediate vicinity as
33 identified in Chapter 2. Reference should be made to any license renewal activities
34 that will disrupt any natural areas and to modifications to plant operation, as
35 identified in Chapter 3, that may change the affect on the environment. Reference
36 should be made to FWS or NMFS memoranda describing the protected or proposed
37 species that may be present in the area.

⁹ An explanation of the structure and implementation of the ESA is found in Ray Vaughan, *Endangered Species Act Handbook*, Government Institutes, Inc., Rockville, MD, 1994.

- 1 2. Reference should be made specifically to any adverse impacts on proposed,
2 threatened, or endangered species or critical habitat found in the review of the topics
3 in the following 10 sections of this guide.
- 4 4.1.1 Instream Ecological Communities
5 4.1.2 Riparian Ecological Communities
6 4.2 Entrainment of Fish and Shellfish in Early Life Stages
7 4.3 Impingement of Fish and Shellfish
8 4.4 Heat Shock
9 4.5 Groundwater Use Conflicts (Plants Using > 100 gpm of Groundwater)
10 4.6 Groundwater Use Conflicts (Plants on Small Rivers)
11 4.7 Groundwater Use Conflicts (Plants Using Ranney Wells)
12 4.8 Groundwater Quality Degradation
13 4.9 Refurbishment Impacts on Terrestrial Resources
- 14 3. A determination should be made whether the information from items 1 and 2 can
15 support a conclusion either that there are no proposed, threatened, or endangered
16 species or critical habitat in the site vicinity or that there are no activities associated
17 with license renewal or changes in plant operating conditions that would adversely
18 affect such species or critical habitat, if present. If such a determination can be
19 made, it should be documented in this section, and no further analysis is required. A
20 concurrence letter from the FWS or the NMFS should be referenced to support that
21 conclusion when protected species are found to be present.
- 22 4. If the determination described in item 3 can not be made, a biological assessment
23 should be undertaken to determine whether license renewal is likely to affect
24 endangered species. Guidance on the preparation of a biological assessment is found
25 at 50 CFR 402.12. Early discussions with the State wildlife or fisheries agency, the
26 State's Natural Heritage Program, local field offices of the FWS or NMFS, and the
27 State office of The Nature Conservancy can provide useful information for designing
28 the biological assessment. Discussions with the FWS and the NMFS would constitute
29 "informal consultation" within the meaning of 50 CFR 402.13.
- 30 5. If it is determined from the biological assessment that license renewal will not
31 adversely affect endangered species, the determination should be documented in this
32 section. Documentation should include a description of the biological assessment and
33 contacts with government agencies and private organizations. The biological
34 assessment and findings should be reviewed by the FWS or the NMFS and a
35 preliminary biological opinion requested and included in the application. Concerns
36 raised by these agencies should be resolved, to the extent possible, to minimize the
37 potential for endangered species being an issue during the NRC review and the FWS
38 and NMFS review of the draft SEIS.
- 39 6. If the biological assessment results in a determination of possible adverse effects on
40 endangered species or critical habitat, or if the reviewing State and Federal agencies
41 do not agree with a finding in the biological assessment of no effects, the applicant
42 may request the NRC to initiate formal consultation with the FWS or the NMFS (ESA
43 § 7(a)(3)) prior to or at the time of application. Whether or not requested by the
44 applicant, the NRC staff will consult with the FWS or the NMFS in compliance with
45 the ESA as implemented in 50 CFR 402.13 and 402.14 and will seek a final biological

1 opinion. If a "no jeopardy" opinion is issued, that finding will be documented in the
2 final SEIS.

- 3 7. If a "jeopardy" opinion is issued, the applicant will be responsible for considering and
4 responding, through the NRC, to any alternatives identified. The response must be in
5 accordance with the "incidental take" provisions at 10 CFR 402.14(i).

6 4.11 Air Quality During Refurbishment (Nonattainment Areas)

7 Table B-1 states that

8 Air quality impacts from plant refurbishment associated with
9 license renewal are expected to be small. However, vehicle
10 exhaust emissions could be cause for concern at locations in or
11 near nonattainment or maintenance areas. The significance of
12 the potential impact cannot be determined without considering
13 the compliance status of each site and the numbers of workers
14 expected to be employed during the outage.

15 Specifically, 10 CFR 51.53(c)(3)(ii)(F) requires that

16 If the applicant's plant is located in or near a nonattainment or
17 maintenance area, an assessment of vehicle exhaust emissions
18 anticipated at the time of peak refurbishment workforce must be
19 provided in accordance with the Clean Air Act as amended.

20 The 1990 amendments to the Clean Air Act include a provision that no Federal agency may
21 support any activity that does not conform to a State Implementation Plan (SIP) designed to
22 achieve the National Ambient Air Quality Standards (NAAQS).¹⁰ On November 30, 1993, the
23 EPA issued a final rule implementing the new statutory requirements for this provision (58 FR
24 63214); the rule was effective January 31, 1994.¹¹ The final rule requires that Federal
25 agencies prepare a written conformity analysis and determination for proposed actions in
26 NAAQS nonattainment or maintenance areas for which the total of the action's direct and
27 indirect emissions that contribute to criteria pollutants (i.e., ozone, carbon monoxide, sulfur

¹⁰ Conformity is defined in Section 176(c) of the Clean Air Act as conformity to the SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards, and that such activities will not (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

¹¹ The regulatory requirements are in Subpart W, "Determining Conformity of General Federal Action to State and Federal Implementation Plans," in 40 CFR Part 51.

1 dioxide, nitrogen dioxide, lead, and particulate matter less than 10 microns in diameter) would
2 exceed threshold emission levels shown at 40 CFR 51.853(b).^{12,13}

3 The threshold emission levels serve as a screen to determine whether a conformity analysis
4 should be performed for a proposed action. The threshold levels range from 10 to 100 tons (9
5 to 91 metric tons) per year. The EPA considers it extremely unlikely that emissions below the
6 threshold levels would affect a nonattainment or maintenance area. If the threshold levels are
7 not exceeded, a conformity analysis is not required unless the total direct and indirect
8 emissions comprise 10% or more of a nonattainment or maintenance area's total emissions for
9 that pollutant. Under this latter scenario, the action is defined as a "regionally significant
10 action" and requires a conformity analysis.

11 Information and Analysis Content

12 In support of NRC's responsibility to consider the conformity of its actions with the SIPs, the
13 licensee should provide the following information. The applicant should consult with the
14 appropriate EPA regional office and the State air quality regulatory agency. Discussions with
15 staff at EPA regional offices indicate that there may be some flexibility in the rigor of the
16 analysis that would be acceptable, depending on the particular site, the extent of
17 refurbishment, the pollutants in nonattainment, the severity of the nonattainment, and the
18 State regulatory agency. Such consultations should be documented in the ER.

- 19 1. Identify the positions of nonattainment and maintenance areas relative to the plant
20 and probable areas where workers involved refurbishment activities associated with
21 license renewal will reside. Note the likely commuter routes for the workers. If there
22 are no nonattainment and maintenance areas within 80 km (50 mi) of the plant and
23 residential locations of refurbishment workers, this should be explained in the ER, and
24 no further analysis is required.
- 25 2. Identify the pollutant or pollutants for which the area is in nonattainment or
26 maintenance, as well as the severity of nonattainment.

¹² An area is designated "nonattainment" for a criteria pollutant if it does not meet NAAQS for the pollutant. A maintenance area has been redesignated by a State from nonattainment to attainment; the State must submit to EPA a plan for maintaining NAAQS as a revision to its SIP.

Direct emissions are those emissions caused by or initiated by the Federal action that occur at the same time and place as the action. Indirect emissions are those caused by the Federal action that occur later in time or are located away from the action itself. Only those direct and indirect emissions that are reasonably foreseeable and that the Federal agency can practicably control need be considered. It must also be possible to locate and quantify direct and indirect emissions at the time a conformity determination is made. The Federal agency is not obligated to account for possible emissions that might result from the Federal action but cannot be specifically identified, quantified, or located.

¹³ Note that the final rule issued by EPA implementing the new statutory requirements for this provision (58 FR 63214) only requires that Federal agencies prepare a written conformity analysis and determination for proposed actions in NAAQS nonattainment or maintenance areas. However, proposed actions near nonattainment or maintenance areas may also cause or contribute to nonattainment. Therefore, 10 CFR 51.53(c)(3)(ii)(F) states that the ER should address this issue for facilities located either in or near a nonattainment or maintenance area, and EPA staff have indicated that in the future they may revise the EPA rule similarly. This approach reflects the reality that emissions continue beyond geographical boundaries and is consistent with environmental impact assessments prepared for NEPA.

- 1 **3.** Determine the meteorological conditions typically associated with poor air quality in
2 each nonattainment and maintenance area.
- 3 **4.** Compare the meteorological conditions associated with poor air quality with regional
4 climatology.
- 5 **5.** Estimate onsite and offsite vehicle emissions resulting from refurbishment activities
6 that contribute to the pollutants identified in step 2 (EPA's handbook AP-42,
7 "Compilation of Air Pollutant Emission Factors" is a good reference), and identify the
8 approximate locations of the emissions during the peak employment period. This
9 estimate may be based on the applicant's estimate of vehicle miles associated with
10 refurbishment worker commuting and other activities directly associated with
11 refurbishment and on EPA emission factors found in the handbook AP-42,
12 *Compilation of Air Pollutant Emission Factors*, Vol 2 Appendix H, "Highway Mobile
13 Source Emission Factors Tables" (5th Edition, April 3, 1998).¹⁴
- 14 **6.** Determine whether the emissions related to license renewal activities have a
15 reasonable likelihood of adversely affecting air quality in the nonattainment or
16 maintenance area. Climatological considerations, simple atmospheric dispersion
17 models, and conservative assumptions are appropriate for this screening analysis.
18 For each nonattainment and maintenance area determined to have a reasonable
19 likelihood of being adversely affected, continue the analysis in step 7. No further
20 analysis is required for those areas that were not determined to be adversely
21 affected.
- 22 **7.** **7.a** Compare the total emissions calculated in step 5 with the appropriate threshold
23 emission levels given in 40 CFR 51.853(b). If the threshold levels are exceeded,
24 proceed to step 8. If not, continue the analysis at step 7(b).
25 **7.b** Determine the nonattainment or maintenance area's total emissions of pollutants
26 identified in step 2. These determinations need only be sufficiently accurate to
27 support evaluation of the regional significance of emission levels below the thresholds
28 given in 40 CFR 51.853(b). Potential sources of this information include EPA regional
29 offices, State and local air quality agencies, and final EISs. If an existing estimate of
30 the area's total emissions is not found, estimate the emissions from readily available
31 information, such as population, traffic counts, published emission rates, using
32 reasonable assumptions. Identify the information and the assumptions. Information
33 developed for Section 4.18, Transportation, may be of value in this determination.
34 **7.c** Compare the total emissions from refurbishment estimated in step 5 with the
35 area's total emissions estimated in 7(b). If the total emissions from refurbishment are
36 10 percent of the area's total emissions, proceed to step 8. If not, the emissions are
37 not regionally significant, and no further analysis is required.
- 38 **8.** For those pollutants identified in step 7, use air dispersion modeling to estimate
39 pollutant concentrations in the ambient air, which in turn are used to evaluate the
40 extent to which refurbishment-related emission would cause or increase the
41 frequencies of exceedances during the refurbishment.¹⁵ If analyses based on peak
42 employment period emission indicate potential exceedances of annual air quality
43 limits, the licensee may account for the fact that the refurbishment period is less than

¹⁴ Current tables and associated information can be found at the Modeling Page within the EPA Office of Mobil Sources Web site: <http://www.epa.gov/omswww/models.htm>.

¹⁵ Conditions on air quality models used for conformity analysis are contained in 40 CFR 51.859(c).

1 a year and that peak employment levels would not occur during the entire
2 refurbishment period.

- 3 9. If refurbishment-related emissions would cause or contribute to exceedances, the
4 applicant should identify and analyze the extent to which potential mitigation
5 measures would minimize the adverse impact on air quality and should briefly identify
6 the reasons for not implementing any measures that were considered but rejected.
7 Explain the extent to which mitigation measures directed at air quality will be
8 coordinated with mitigation of transportation impacts discussed in Section 4.18.

9 4.12 Impact on Public Health of Microbiological Organisms

10 With regard to public health effects of thermophilic organisms, Table B-1 states

11 These organisms are not expected to be a problem at most
12 operating plants except possibly at plants using cooling ponds,
13 lakes, or canals that discharge to small rivers. Without site-
14 specific data, it is not possible to predict the effects generically.

15 Specifically, 10 CFR 51.53(c)(3)(ii)(G) requires that

16 If the applicant's plant uses a cooling pond, lake, or canal or
17 discharges into a river having an annual average flow rate of
18 less than 3.15×10^{12} ft³/yr (9×10^{10} m³/yr), an assessment of
19 the impact of the proposed action on public health from
20 thermophilic organisms in the affected water must be provided.

21 Plants that use cooling ponds, lakes, canals, or small rivers [i.e., having an annual average
22 flow rate of less than 3.15×10^{12} ft³/year (9×10^{10} m³/year)] to receive their thermal
23 discharge have a potential to enhance the concentration of thermophilic microorganisms. Of
24 greatest concern is the free-living amoebae of the genera *Naegleria* (*N.*) sp., four species of
25 which have been isolated. To date, only one species *N. fowleri*, has been determined to be
26 pathogenic in humans.

27 Information and Analysis Content

28 If the applicant can show that its plant does not use cooling ponds, lakes, canals, or small
29 rivers to receive its thermal discharge, this fact should be noted in the ER and no further
30 information or analysis is needed. If the plant does use cooling ponds, lakes, canals, or small
31 rivers to receive its thermal discharge, the ER should include the following.

- 32 1. The State agency responsible for environmental health should be consulted as to
33 whether there is a concern about the potential existence and concentration of *N.*
34 *fowleri* in the receiving waters for plant cooling water discharge. The results of this
35 consultation should be documented in the ER.
- 36 2. If the State advises that tests should be conducted for concentration of *N. fowleri* in
37 the receiving waters, the tests should be performed when the facility has been
38 operating at a power level typical of the level anticipated during the license renewal
39 period for at least a month to ensure a steady state population during the sampling.
40 Samples should be taken at locations of potential public use.

- 1 **3.** An evaluation of the data should be performed and a determination made of the
2 magnitude of potential impacts of *N. fowleri* on public health during the license
3 renewal term.
- 4 **4.** Proposed mitigation measures to minimize the exposure to members of the public
5 should be described, if deemed necessary, and the reasons for not implementing any
6 measures that were considered but rejected should be explained.
- 7 **5.** A letter report from the head of the State agency responsible for environmental health
8 stating concurrence with the applicant's risk assessment and the proposed mitigation
9 strategy, if one is required, should be included in the ER.

10 **4.13 Electric Shock from Transmission-Line-Induced Currents**

11 Table B-1 reports that

12 Electrical shock resulting from direct access to energized conductors or from
13 induced charges in metallic structures have not been found to be a problem
14 at most operating plants and generally are not expected to be a problem
15 during the license renewal term. However, site-specific review is required to
16 determine the significance of the electric shock potential at the site.

17 Specifically, 10 CFR 51.23(c)(3)(ii)(H) requires that

18 If the applicant's transmission lines that were constructed for the specific
19 purpose of connecting the plant to the transmission system do not meet the
20 recommendations of the National Electrical Safety Code for preventing
21 electric shock from induced currents, an assessment of the impact of the
22 proposed action on the potential shock hazard from the transmission lines
23 must be provided.

24 This issue is discussed in Section 4.5.4.1 of NUREG-1437, and it concerns transmission lines
25 that were built for the specific purpose of connecting the power plant with the existing
26 transmission and distribution system. Most transmission lines were designed to be in
27 compliance with the National Electric Safety Code (NESC) recommendations for electric shock
28 hazard.¹⁶ However, unless that utility has had an active program of transmission line
29 management aimed at ensuring compliance with the NESC, the line may not meet current
30 NESC recommendations. The recommendations of the NESC have evolved over the years, and
31 the operating characteristics of the transmission line and the uses of the land in the right-of-
32 way may have changed.

33 **Information and Analysis Content**

34 If the transmission lines that were built to connect the plant to the transmission system meet
35 current NESC clearance standards, the applicant should demonstrate that fact in the ER. The
36 demonstration should take one of two forms: (1) a description of an ongoing program of
37 power line right of way supervision and management aimed at ensuring that current electrical

¹⁶ The National Electric Safety Code®, 1997 Edition, by the Institute of Electrical and Electronics Engineers, Inc., New York (1996). Section 23 deals with clearances. Section 232 deals specifically with clearances between above ground-conductors and human activities, equipment, and structures.

1 shock provisions of the NESC are met, or (2) a transmission line survey that develops the
2 following information.

- 3 1. Identification of any sites or areas that do not meet current NESC clearance
4 standards, and any that may not meet the standards after anticipated changes in
5 transmission line operations or reasonably foreseeable changes in land use in the right
6 of way.
- 7 2. Maps, photographs, or drawings indicating the locations of all sites that do not meet
8 the NESC clearance standards.
- 9 3. A description of measures that could be taken to meet the standards, the measures
10 the applicant plans or proposes to undertake, and whether those measures will meet
11 the standards.
- 12 4. For any sites that would not meet NESC clearance standards after taking the
13 proposed measures, provide a detailed explanation of the reasons the standards are
14 not appropriate to the situation or why the applicant will not make modifications to
15 meet the standards.

16 4.14 Housing Impacts

17 Table B-1 concludes that

18 Housing impacts are expected to be of small significance at plants located in
19 a medium or high population area and not in an area where growth control
20 measures that limit housing development are in effect. Moderate or large
21 housing impacts of the workforce associated with refurbishment may be
22 associated with plants located in sparsely populated areas or in areas with
23 growth control measures that limit housing development.

24 Specifically, 10 CFR 51.53(c)(ii)(I) requires in part that

25
26 An assessment of the impact of the proposed action on housing availability
27 . . . within the vicinity of the plant must be provided.

28 This issue is discussed in Section 3.7.2 (Refurbishment) and Section 4.7.1 (License Renewal
29 Term) of NUREG-1437.

30 Impacts to housing availability result when the demand for housing, caused by the project-
31 related population increase, approaches or exceeds the number of available housing units in
32 the vicinity of the plant. Cumulative housing impacts result when the project-associated
33 demand for housing combined with other anticipated increases in demand together approach
34 or exceed the number of available housing units.

35 Information and Analysis Content

36 A large incremental workforce at plants located in remote rural areas may have significant
37 adverse impacts on housing in the vicinity of the plant. If the applicant can demonstrate that

1 the site is in a medium or high population area¹⁷ and that it is not in an area where growth
2 control measures limit housing development, the applicant should provide documentation in
3 the ER. If the region surrounding the plant meets these conditions, the impact on housing is
4 expected to be minor and no further analysis of project-specific impacts to housing is required.
5 If this cannot be demonstrated, the applicant should provide the following information.
6

7 4.14.1 Refurbishment

- 8 1. From Section 3.4 of this guide, the schedule of refurbishment and refueling activities
9 to ascertain whether temporary work forces will be onsite simultaneously.
- 10 2. From Section 3.4, the size and duration of the peak incremental labor force, including
11 workers directly involved in refurbishment, those involved in refueling and
12 maintenance activities, and indirect employment.
- 13 3. From Section 3.4, the forecast of the number of in-migrating incremental workers and
14 their dependents, and residential location.
- 15 4. The number, type, and location of housing units in the area. Various housing types
16 (e.g., rental units, hotels or motels, trailer parks) should be addressed. The applicant
17 should report housing characteristics (e.g., vacancy rates, rental costs and housing
18 values, and quality of vacant units). Information from local sources (e.g., government
19 officials and realtors) about housing characteristics should supplement the current
20 decade U.S. Census data to ensure that the census data reflect the current situation.
- 21 5. Information from local sources (e.g., government officials, planning and economic
22 development agencies, realtors) about ongoing and anticipated population change or
23 economic development that could affect housing characteristics in the area or could
24 cause cumulative impacts.
- 25 6. Based on the information above, an assessment of the potential for impacts to
26 housing availability, comparing the projected incremental demand for housing
27 associated with the refurbishment and refueling related population increase to the
28 stock of available housing in the area. The assessment should consider the magnitude
29 of potential impacts in terms of housing availability, inflation, changes in housing
30 stock, and accessibility to the resident population.¹⁸
- 31 7. A description of potential mitigation measures to avoid or minimize potential adverse
32 impacts. The range of mitigation measures considered and the type of mitigation
33 proposed should be commensurate with the potential magnitude and duration of the
34 impacts. Mitigation might include, at a minimum, hiring workers from the local area to

¹⁷ The site is in an area having medium population or larger if any of the following criteria are met:

- Within 20 miles (32 km) of the plant, the population is $\geq 75,000$ [population density of $60/\text{mile}^2$ ($21/\text{km}^2$)];
- Within 50 miles (80 km) of the plant, there is an urban area of $\geq 100,000$;
- Within 20 miles (32 km) of the plant, the population is $\geq 50,000$; and within 50 miles (80 km), the population is $\geq 400,000$.

Current decade U.S. Census data (or more recent data maintained by the U.S. Census Bureau or a State or local government agency) should be used.

¹⁸ The following general thresholds for impact significance are provided as guidance. Site-specific factors may require some flexibility in their application. Additional guidance is provided in Section 3.7.2 of NUREG-1437. Generally, small impacts result when projected demand for housing would lower the vacancy rate for rental or for-sale dwellings by < 1 percentage point (e.g., a change from a 5% vacancy rate to a 4% vacancy rate), with rental and for-sale vacancy rates remaining above 2%. Moderate impacts result when projected demand for housing reduces rental and for-sale vacancy rates ≥ 1 but < 5 percentage points, with overall vacancy remaining $> 1\%$. Large impacts result when projected demand would cause rental or for-sale vacancy rates to drop by ≥ 5 percentage points or to drop to $\leq 1\%$.

1 the greatest extent possible. Mitigation of large impacts could include developing
2 trailer pads or supplying temporary housing (e.g., mobile housing) on the site. The
3 development and selection of appropriate mitigation measures should involve
4 discussion with local government officials. The applicant should assess the
5 effectiveness of the mitigation measures at reducing the potential impacts and should
6 briefly explain the reasons for not implementing any measures that were considered
7 but rejected.

8 **4.14.2 License Renewal Term**

- 9 1. From Section 3.4 of this guide, for the license renewal term, the estimates of
10 changes in the number of the operating workforce and refueling or maintenance
11 workforce, including an estimate of the duration of refueling or maintenance activities.
- 12 2. From Section 3.4, the forecast, for the license renewal term, of the number of in-
13 migrating incremental workers and their dependents and their predicted residential
14 locations.
- 15 3. The number, type, and location of housing units in the area. Various housing types
16 (e.g., rental units, hotels/motels, trailer parks) should be addressed. The applicant
17 should report housing characteristics (e.g., vacancy rates, rental costs and housing
18 values, and quality of vacant units). Information from local sources (e.g., government
19 officials and realtors) about housing characteristics should supplement the current-
20 decade U.S. Census data to ensure that the census data reflect the current situation.
- 21 4. Information from local sources (e.g., government officials, planning and economic
22 development agencies, realtors) about ongoing and anticipated population change or
23 economic development that could affect housing characteristics in the area or could
24 cause cumulative impacts.
- 25 5. Based on the information above, an assessment of the potential for impacts to
26 housing availability, comparing the projected incremental demand for housing
27 associated with the refurbishment and refueling related population increase to the
28 stock of available housing in the area. The assessment should consider the magnitude
29 of potential impacts in terms of housing availability, inflation, changes in housing
30 stock, and accessibility to the resident population.¹⁸
- 31 6. A description of mitigation measures to avoid or minimize potential adverse impacts.
32 The range of mitigation measures considered and the type of mitigation proposed
33 should be commensurate with the potential magnitude and duration of the impacts.
34 Mitigation might include, at a minimum, hiring workers from the local area to the
35 greatest extent possible. Mitigation of large impacts could include developing trailer
36 pads or supplying temporary housing (e.g., mobile housing) on the site. The
37 development and selection of appropriate mitigation measures should involve
38 discussion with local government officials. The applicant should assess the
39 effectiveness of the mitigation measures for reducing the potential impacts and
40 should briefly explain the reasons for not implementing any measures that were
41 considered but rejected.

42 **4.15 Public Utilities: Public Water Supply Availability**

43 Table B-1 concludes that

44 An increased problem with water shortages at some sites may lead to
45 impacts of moderate significance on public water supply availability.

1 Specifically, 10 CFR 51.53(c)(ii)(I) requires in part that

2 . . . [T]he applicant shall provide an assessment of the impact of population
3 increases attributable to the proposed project on the public water supply.

4 This issue is discussed in Section 3.7.4.5 (for refurbishment) and in Section 4.7.3.5 (for
5 operation) of NUREG-1437.

6 Information and Analysis Content

7 The ER should include the following information.

- 8 1. The information developed for Section 4.14 on the work force, in-migrating
9 population, and residential location.
- 10 2. If water used at the plant is provided by a water utility, identify anticipated increases
11 in the amount of water used during the renewal term.
- 12 3. For each water utility service area that may be affected, provide information on the
13 capacity and utilization rate of the public water system projected to exist at the time
14 of peak refurbishment workforce, as well as capacity and cumulative utilization rate
15 caused by general population increase during the renewal period. Document
16 discussions with the potentially affected water utilities as to whether the projected
17 population increase will stress the water supply or require an increase in capacity.
- 18 4. If the water supply will be stressed as a result of refurbishment or operation during
19 the renewal period, identify, in coordination with the water utility, what mitigating
20 measures would be appropriate. Describe these measures and state which, if any, will
21 be taken.

22 4.16 Education Impacts from Refurbishment

23 Table B-1 states that

24 Most sites would experience impacts of small significance but
25 larger impacts are possible depending on site- and project-
26 specific factors.

27
28 Specifically, 10 CFR 51.53(c)(ii)(I) requires in part that

29
30 An assessment of the impact of the proposed action on . . .
31 public schools (impacts from refurbishment activities only)
32 within the vicinity of the plant must be provided.

33 This issue is discussed with regard to plant refurbishment in Section 3.7.4.1 of NUREG-1437.
34 Section 4.7.3.1 of NUREG-1437 found this issue to be Category 1 for the license renewal
35 period.

36 Impacts to education are a product of (1) the additional demand on the public education
37 system resulting from the refurbishment-related population growth and (2) the capacity of the
38 education system to absorb additional students. The capacity of the system to absorb
39 additional students is related to the size of the school system (i.e., larger school systems
40 typically can absorb more students than smaller systems) and whether the system already is

1 experiencing growth pressures. Section 3.7.4.1 of NUREG-1437 includes definitions of small,
2 moderate, and large impacts to education.¹⁹ Cumulative impacts can result if the project-
3 related demand for education, coupled with demand associated with other ongoing economic
4 development or with changes in the level of service (e.g., resulting from changes in fiscal
5 policy), affects the school system's ability to provide educational services.

6 Information and Analysis Content

7 The analysis of potential effects on education in the ER is to include the following information.
8

- 9 1. The information developed for Section 4.14 on the incremental work force, in-
10 migrating population, the number of school-age children, and their residential
11 locations during the refurbishment period.
- 12 2. For each school system that may be affected, information on the classroom capacity
13 and student-teacher ratio projected to exist at the time of peak refurbishment
14 workforce. Document discussions with the potentially affected school systems as to
15 whether the projected increase in students will stress the capacity of the school
16 system.
- 17 3. If educational resources will be stressed by the additional students during the renewal
18 period, identify, in coordination with the school officials, what mitigating measures
19 would be appropriate. Describe these measures and state which, if any, will be
20 taken.

21 4.17 Offsite Land Use

22 4.17.1 Refurbishment

23 Table B-1 concludes that

24 Impacts may be of moderate significance at plants in low
25 population areas.

26 Specifically, 10 CFR 51.53(c)(ii)(I) requires in part that

27 An assessment of the impact of the proposed action on . . .
28 land-use . . . within the vicinity of the plant must be provided.

¹⁹ Section 3.7.4.1 states: "In general, small impacts are associated with project-related enrollment increases of 3 percent or less. Impacts are considered small if there is no change in the school systems' abilities to provide educational services and if no additional teaching staff or classroom space is needed. Moderate impacts generally are associated with 4 to 8 percent increases in enrollment. Impacts are considered moderate if a school system must increase its teaching staff or classroom space even slightly to preserve its pre-project level of service. . . . Large impacts are associated with project-related enrollment increases above 8 percent."

1 This issue is discussed in Section 3.7.5 of NUREG-1437, in which general standards are
2 provided for determining the magnitude of land-use impacts.²⁰ The term "vicinity of the plant"
3 used in the regulation and the term "study area" used in this footnote are synonymous. This
4 area is generally defined as the host county and municipality, as well as other counties or
5 municipalities in which a substantial segment of the immigrating population would be expected
6 to reside.

7 Impacts to off-site land use result when the development pressures resulting from the project-
8 related population increases result in changes to local land-use and development patterns.
9 Development pressures are closely tied to population increase impacts on housing covered in
10 Section 4.14. These changes can have either positive or negative impacts, depending upon
11 the value attributed to land-use changes by different individuals and groups. Cumulative land-
12 use impacts result when the project-associated population growth, combined with other
13 population growth and land-use pressures, induces changes to local land-use and development
14 patterns.

15 Information and Analysis Content

16 The information and analyses developed in this section should build from the information and
17 analyses developed in Section 4.14 relevant to the period of refurbishment. If the population
18 and growth control criteria given in Section 4.14 resulted in a determination that "... the
19 impact on housing is expected to be minor and no further analysis of project-specific impacts
20 to housing is required," it is likely that offsite land-use impacts will also be minor. In any
21 case, further screening for land-use impacts is appropriate. If the applicant can demonstrate
22 the validity of the following three conditions, it may be concluded that the effects of
23 refurbishment-related population growth on land-use and development patterns will be small,
24 and no further analysis is needed.

- 25 (1) Project-related population growth (including direct and indirect workers and
26 their families), when added to other anticipated or reasonably foreseeable
27 population growth, would not increase existing area population by more than 5
28 percent.
- 29 (2) The project area has established development patterns. Established
30 development patterns are indicated if the community has established land use
31 controls or infrastructure in place to support reasonably foreseeable
32 development.
- 33 (3) The project area is not extremely isolated or sparsely populated. Extreme
34 isolation is indicated if the area is more than 50 miles (80 km) from the nearest
35 urban area with a population of 100,000 or more; sparsely populated is

²⁰ In Section 3.7.5 of NUREG-1437 it is stated that:

Generally, if plant related population growth is less than 5 percent of the study area's total population, off-site land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 persons per square mile (2.6 km²), and at least one urban area with a population of 100,000 or more within 80 km (50 miles).

If refurbishment-related growth is between 5 and 20 percent of the study area's total population, moderate new land-use changes can be expected. Such impacts would most likely occur when the study area has established patterns of residential and commercial development, a population density of 30 to 60 persons per square mile (2.6 km²), and one urban area within 80 km (50 miles).

... Large impacts were not induced at any site by population growth.

1 indicated if the population density is less than 60/mile² (21/km²) within a 20-
2 mile (32-km) radius from the plant.

3 If any of these cannot be demonstrated, an assessment of the impact of the proposed action
4 on off-site land use should be provided in the ER.

5 The assessment should consider the size of the peak incremental labor force (onsite and
6 indirect) associated with the project, the number of workers expected to commute daily, the
7 number expected to migrate to the area and require temporary or permanent housing, the
8 potential demand for new temporary or permanent housing as determined in the analysis of
9 potential housing effects, land-use controls in the area, and the physical infrastructure in place
10 in the area. If refurbishment and refueling workers are to be on-site simultaneously, the
11 analysis should consider the combined work forces. Similarly, the analysis of impacts from
12 post-relicensing refueling and maintenance activities should consider potential effects of the
13 total number of temporary refueling/maintenance workers. Section 3.7.5 of NUREG-1437
14 provides definitions of small, moderate, and large impacts.

15 Information in the ER for the analysis of potential effects on land use is to include the
16 following.

- 17 1. The information and analysis developed in Section 4.14.1 should be referenced.
- 18 2. A description of land-use controls, zoning, or restrictions in the area, including
19 reasonably foreseeable future changes.
- 20 3. A description of land-use patterns in the area, including the scale and type of
21 commercial development and the housing stock (see Section 4.14.1).
- 22 4. A description of existing and planned infrastructure (including gas, water, sewer, and
23 power lines and roads).
- 24 5. An analysis of the potential for population changes arising from refurbishment to
25 cause changes in patterns of land use. If potential changes in land use are identified,
26 assess their significance. Document discussions with local planning authorities as to
27 their assessment of the significance of any changes in patterns of land use.
- 28 6. If the local planning authorities believe the potential changes in land use are
29 significant, identify, in coordination with the authorities, mitigating measures that
30 would be appropriate. Describe these measures and state which, if any, will be
31 taken.

32 4.17.2 License Renewal Term

33 Table B-1 states

34 Significant changes in land use may be associated with
35 population and tax revenue changes resulting from license
36 renewal.

37 Specifically, 10 CFR 51.53(c)(3)(ii)(I) requires, in part, that

38 An assessment of the impact of the proposed action on . . .
39 land-use . . . within the vicinity of the plant must be provided.

1 This issue is addressed in Section 4.7.4 of NUREG-1437. The specifics of the magnitude of
2 land-use change and impact predictor criteria, and the definition of the term "vicinity of the
3 plant," are as given in Section 4.17.1 of this guide. Table B-1 of 10 CFR Part 51 partially
4 misstates the conclusion reached in Section 4.7.4 of NUREG-1437. Section 4.7.4 concludes
5 that "population-driven land-use changes during the license renewal term at all nuclear plants
6 will be small." Until Table B-1 is changed, applicants need only cite NUREG-1437 to address
7 population-induced land-use change during the license renewal term.

8 During the license renewal term, new land-use impacts could result from plant-related
9 population growth or from the use of tax payments from the plant by local government to
10 provide public services that encourage development. The resulting changes can have either
11 positive or negative impacts, depending upon the value attributed to land-use changes by
12 different individuals and groups. Cumulative land-use impacts result when tax revenues
13 generated by the plant combine with land-use pressures (e.g., rapid, unexpected population
14 growth) to induce changes to local land-use and development patterns.

15 **Information and Analysis Content**

16 The assessment should consider the size of the plant-generated revenues relative to the total
17 revenues of the taxing jurisdictions, land-use controls in the area, and the physical
18 infrastructure in place in the area.

19
20 Information for the analysis of potential effects on land use includes the following.

- 21 1. The information and analyses developed in Section 4.14.2 should be referenced.
- 22 2. A description of land-use controls, zoning, or restrictions in the area, including
23 reasonably foreseeable future changes.
- 24 3. A description of land-use patterns in the area, including the scale and type of
25 commercial development and the housing stock (see Section 4.14.1).
- 26 4. A description of existing and planned infrastructure (gas, water, sewer, and power
27 lines, roads).
- 28 5. An estimate of the tax or other revenue to be paid to local governmental jurisdictions
29 during the license renewal term (considering all tax payments by the plant—not just
30 the increment arising from refurbishment-related improvements—whether paid directly
31 to local jurisdictions or indirectly through State tax revenue-sharing programs).
32 Relevant jurisdictions include the State, city, county, school district, or other special
33 purpose districts in which the plant is located.
- 34 6. The total revenue for the current year of the taxing jurisdictions and an estimate of
35 total revenue during the plant's license renewal term.
- 36 7. If potential changes in land use are identified, assess their significance. Discuss with
37 local planning authorities whether tax revenue changes during the license renewal
38 term will cause land-use changes in their jurisdiction. Document discussions with
39 local planning authorities as to their assessment of the significance of any anticipated
40 changes in patterns of land use.
- 41 8. If the local planning authorities believe the potential changes in land use are
42 significant, identify, in coordination with the authorities, mitigating measures that
43 would be appropriate. Describe these measures and state which, if any, will be
44 taken.

1 **4.18 Transportation**

2 This section provides guidance on assessing impacts on transportation during both the
3 refurbishment period and the license renewal term. As promulgated in December 1997,
4 10 CFR 51.53(c)(ii)(J) requires only that impacts on transportation during refurbishment be
5 addressed. This is an error that is being corrected by a rule amendment. It was concluded in
6 Section 4.7.3.2 of NUREG-1437 that transportation impacts during the license renewal term is
7 a Category 2 issue and should be addressed in individual plant reviews. Until a rule change is
8 promulgated, an applicant for license renewal is not obligated to address transportation
9 impacts during the license renewal term. However, the NRC will conduct this analysis as part
10 of its NEPA review.

11 Table B-1 states that

12
13 Transportation impacts are generally expected to be of small significance.
14 However, the increase in traffic associated with the additional workers and
15 the local road and traffic control conditions may lead to impacts of moderate
16 or large significance at some sites.

17 Specifically, 10 CFR 51.53(c)(ii)(J) requires that

18 All applicants shall assess the impact of the proposed project on local
19 transportation during periods of license renewal refurbishment activities.

20 These impacts are addressed in Sections 3.7.4.2 and 4.7.3.2 of NUREG-1437. Transportation
21 impacts are related to the total size of the work force and to the prevailing road and traffic
22 conditions at the time of the project. Transportation effects result when project-related traffic
23 induces a change in the level of service (LOS)²¹ such that LOS of C or higher occurs on
24 highway segments or intersections in the vicinity of the plant. Section 3.7.4.2 states that,
25 "LOS A and B are associated with small impacts because operation of individual users is not
26 substantially affected by the presence of other users. At this level, no delays occur and no
27 improvements are needed. LOS C and D are associated with moderate impacts because the
28 operation of individual users begins to be severely restricted by other users, and at level D small
29 increases in traffic cause operational problems. Consequently, upgrading of roads or additional
30 control systems may be required. LOS E and F are associated with large impacts because the
31 use of the roadway is at or above capacity level, causing breakdowns in flow that result in
32 long traffic delays and potentially increased accident rates. Major renovations of existing
33 roads or additional roads may be needed to accommodate the traffic flow.

34 NUREG-1437 defines small, moderate, and large impacts to transportation in Section 3.7.4.2.
35 Cumulative transportation impacts are the result of project-related traffic increases coupled
36 with traffic increases resulting from other activities (e.g., other large construction projects or
37 new economic development) in the area. Although plant-related traffic will use highway
38 segments not in the vicinity of the plant, such traffic likely will be dispersed over a number of
39 roads. Highway segments and intersections that are a considerable distance from the plant
40 may need to be assessed if the majority of project-related traffic will flow through them.

²¹ Level of service is defined in Section 3.7.4.2 of NUREG-1437. See also Transportation Research Board, *Highway Capacity Manual*, Special Rpt 209, National Research Council, Washington, DC, 1985.

1 **Information and Analysis Content**

2 The information to analyze potential impacts to transportation includes the following.²²

- 3 1. From the refurbishment and license renewal term employment information provided in
4 Section 3.4, "Employment," estimate the daily traffic associated with refurbishment
5 activities and with the license renewal term. The estimate should include commuting
6 workers (including refueling workers if the refueling and refurbishment activities will
7 occur simultaneously) and shipments of materials. The effect of carpooling and the
8 availability and use of public transportation should be considered in the estimate.
9 Peak traffic times should be determined or estimated.
- 10 2. A forecast, for both periods, of the highway segments and interchanges likely to be
11 affected by the increased traffic, inferred from current traffic patterns associated with
12 operations and refueling workers.
- 13 3. Information on recent LOS, capacity, and usage for highway segments and
14 intersections forecast to be impact areas. State or county departments of
15 transportation typically maintain these data.
- 16 4. Information from local sources (e.g., government officials, planning and economic
17 development agencies) about ongoing and anticipated economic development (e.g.,
18 new construction or industry in the area of the plant) and changes in road conditions
19 that could affect LOS and be a contributor to cumulative impacts.
- 20 5. Based on this information, the applicant, for both periods, should project the volume
21 of project-related traffic likely to occur at each segment, calculate the increase in
22 traffic on affected highway segments and intersections, and project the LOS that
23 would result during peak periods on each segment. Consultation with local and State
24 departments of transportation, who often have guidelines about how LOS is affected
25 by an increase in traffic volume given specific road conditions, should facilitate the
26 LOS determination. The analysis and the resulting LOS for each segment or
27 intersection considered should be documented in the ER.
- 28 6. A discussion of potential mitigation measures, commensurate with the projected level
29 of impact, should be included in the ER. Mitigation measures could include, for
30 example, adjusting shift change time to nonpeak traffic times, busing, or road and
31 traffic control improvements. The applicant should estimate the potential effect of
32 the mitigation measures, include this assessment in the ER, and briefly explain the
33 reasons for not implementing the measures that were considered but rejected.

34 **4.19 Historic and Archaeological Resources**

35 Table B-1 states that

36 Generally, plant refurbishment and continued operation are
37 expected to have no more than small adverse impacts on
38 historic and archaeological resources. However, the National
39 Historic Preservation Act requires the Federal agency to consult
40 with the State Historic Preservation Officer to determine
41 whether there are properties present that require protection.

²² The information required for assessment of the transportation issue is much the same as some of the information required for the assessment of the air quality issue, in Section 4.11 of this guide.

1
2 Specifically, 10 CFR 51.53(c)(ii)(K) requires that

3 All applicants shall assess whether any historic or archaeological
4 properties will be affected by the proposed project.

5 This issue is discussed in Section 3.7.7 and Section 4.7.7 of NUREG-1437. The National
6 Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470w-6, in Section 106,
7 requires that Federal agencies take into account the effects of the agency's undertaking
8 (including issuance of a license) on properties included in or eligible for the National Register of
9 Historic Places and, prior to approval of an undertaking, to afford the Advisory Council on
10 Historic Preservation a reasonable opportunity to comment on the undertaking. The procedure
11 for meeting Section 106 requirements is defined in regulations of the Advisory Council,
12 "Protection of Historic Properties" (36 CFR Part 800). The guidance that follows instructs the
13 applicant as to the information and analysis that is required for the NRC to comply with
14 Section 106 requirements in a manner that minimizes the potential for the consultation
15 process with the Advisory Council to delay review of the application. The applicant should
16 also consider the effects on properties that are not eligible for the National Register of Historic
17 Places but nevertheless are thought by the State Historic Preservation Officer or local
18 historians to have local historic value and to contribute substantially to an area's sense of
19 historic character.²³

20 Information and Analysis Content

21 The ER should include the following information.

- 22 1. From Chapter 3 of this guide, identify those refurbishment and license renewal term
23 activities that could affect onsite or offsite historic properties.²⁴ Such activities
24 would include ground disturbing activity, increases in traffic, and audio and visual
25 intrusions.
- 26 2. On a copy of the site map or, if appropriate, the site vicinity map included in Chapter
27 2, identify the areas of potential effects if historic properties were to be found.
- 28 3. On the map, identify historic properties that may be affected. All on-site historic
29 properties and any off-site historic properties located in or near areas of potential
30 effects should be identified. These properties should be described in the text.
31 Properties can be identified by referring to the "National Register of Historic Places,"
32 36 CFR Part 60; consultation with the State Historic Preservation Officer (SHPO),
33 local preservation officials, and nearby Native American Tribal officials; and field
34 surveys.
- 35 4. If historic properties are found in or near areas of potential effects, assess those
36 effects. Criteria of effect and adverse effect are given in 36 CFR 800.9. Applicants

²³ This criterion is a NEPA consideration, not related to NHPA requirements.

²⁴ Historic property is defined in 36 CFR 800.2(e): "Historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register. This term includes, for the purposes of these regulations, artifacts, records, and remains that are related to and located within such properties. The term 'eligible for inclusion in the National Register' includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria." National Register criteria for listing are found in 36 CFR Part 60.

1 are encouraged to involve the SHPO and local historic preservation officials in the
2 assessment. The assessment should lead to one of three conclusions.

- 3 1. No effect: the undertaking will not affect historic properties;
- 4 2. No adverse effect: the undertaking will affect one or more historic properties,
5 but the effect will not be harmful;
- 6 3. Adverse effect: the undertaking will harm one or more historic properties.

- 7 5. If an adverse effect will occur, the applicant, in consultation with the SHPO and other
8 interested parties should identify ways to make the refurbishment or license renewal
9 term activities less harmful.

10 4.20 Severe Accident Mitigation Alternatives

11 Table B-1 states that

12 The probability weighted consequences of atmospheric releases, fallout onto
13 open bodies of water, releases to ground water, and societal and economic
14 impacts from severe accidents are small for all plants. However, alternatives
15 to mitigate severe accidents must be considered for all plants that have not
16 considered such alternatives.

17 Specifically, 10 CFR 51.53(c)(3)(ii)(L) requires that

18 If the staff has not previously considered severe accident mitigation
19 alternatives for the applicant's plant in an environmental impact statement or
20 related supplement or in an environmental assessment, a consideration of
21 alternatives to mitigate severe accidents must be provided.

22 Severe accident mitigation alternatives are discussed in Section 5.4 of NUREG-1437.

23 The analyses performed for Chapter 5, "Environmental Impacts of Postulated Accidents," of
24 NUREG-1437 represent adequate, plant-specific estimates of the environmental impacts of
25 severe accidents. However, the Commission determined that a site-specific consideration of
26 severe accident mitigation alternatives (SAMA) will be required at the time of license renewal
27 unless a previous consideration of such alternatives regarding plant operation has been
28 included in a final environmental impact statement, or final environmental assessment, or a
29 related supplement. The applicant should provide the relevant citation. If no such citations
30 exist, the applicant should provide the following information.

31 Information and Analysis Content

32 The identification of possible SAMAs and evaluation of their merits should use the information
33 and analyses developed for the plant-specific individual plant examination (IPE) for severe
34 accident vulnerabilities and, when available, the plant-specific individual plant examination of
35 external events (IPEEE) for severe accident vulnerabilities (e.g., earthquakes, fires, winds). If
36 an IPEEE has not been completed, the applicant may use the results of IPEEEs performed for
37 other plants, adjusted for plant-specific variables. In preparing the SAMA analyses, applicants
38 may be guided by analyses performed by the NRC for Watts Bar Unit 1 Nuclear Power Plant,
39 NUREG-0498, Supplement 1, "Final Environmental Statement Related to the Operation of

1 Watts Bar Nuclear Plant, Units 1 and 2," April 1995.² In structuring the analysis, the applicant
2 should consider the methodology presented in NUREG/BR-0184, "Regulatory Analysis
3 Technical Evaluation Handbook," January 1997.²

4 The results of the following analytical steps should be presented in the ER, and the
5 methodology or analytical process should be described..

- 6 1. From the IPE, list the leading contributors to dose consequence risk. For these leading
7 contributors, provide estimates of core damage frequency, large release from
8 containment frequency, and the dose consequence risk.
- 9 2. From the IPEEE or other external event analyses, provide estimates of the incremental
10 contribution to dose consequence risk identified from the IPE.
- 11 3. Identify physical plant modifications and plant procedural and administrative changes
12 that can reduce severe accident dose consequence risk. For each modification or
13 change, estimate the contribution to reduction in risk.
- 14 4. Estimate the value of the reduction in risk. Value is usually calculated for public
15 health, occupational health, offsite property, and onsite property. A detailed
16 discussion of calculating values is found in Chapter 5 of NUREG/BR-0184.
- 17 5. Estimate the cost of each modification and procedural and administrative change
18 found to reduce the dose consequence risk of severe accidents.
- 19 6. Perform a value-impact analysis to identify any plant modifications and procedural
20 changes that may be cost effective (see Chapter 5 of NUREG/BR-0184).
- 21 7. List plant modifications and procedural changes (if any) that have or will be
22 implemented to reduce the severe accident dose consequence risk.

23 4.21 Transportation of Radiological Waste

24 Table B-1 states that

25 Table S-4 of this Part [51] contains an assessment of impact parameters to
26 be used in evaluating transportation effects in each case.

27 Specifically, 10 CFR 51.53(c)(3)(ii)(M) requires that

28 The environmental effects of transportation of fuel and waste shall be
29 reviewed in accordance with § 51.52.

30 This issue is discussed in Section 5.4 and Section 5.5.2.5 of NUREG-1437.

31 This issue is the subject of a rulemaking to amend 10 CFR 51.53(c)(3)(ii). The rulemaking will
32 be supported by an EIS supplement to NUREG-1437. The staff anticipates that the rulemaking
33 will be completed well before a decision on the first license renewal application.²⁵ If the
34 rulemaking is not completed prior to issuance of the draft supplemental environmental impact
35 statement on the first license renewal application, the staff will incorporate the report in the

²⁵ A document reporting on the technical analysis that will be incorporated in the supplement to NUREG-1437 is available in the Commission's Public Document Room, at 2120 L Street, NW, Washington, DC 20003-1527. This document is entitled "Supplemental Analysis: Cumulative Environmental Impacts of Spent Nuclear Fuel Transport in the Vicinity of the Proposed Yucca Mountain High-Level Waste Repository Attributable to License Renewal, and Implications of Higher-Burn-Up Fuel for the Conclusions in Table S-4."

1 statement. Until this rulemaking is completed, an applicant need only reference the technical
2 report in its ER.

3 **4.22 Environmental Justice**

4 Table B-1 states that

5 The need for and the content of an analysis of environmental justice will be
6 addressed in plant-specific reviews.

7 Environmental justice was not reviewed in NUREG-1437. Executive Order 12898, "Federal
8 Actions To Address Environmental Justice in Minority Populations and Low-Income
9 Populations," issued on February 11, 1994, is designed to focus the attention of Federal
10 agencies on the human health and environmental conditions in minority communities and low-
11 income communities.²⁶ The NRC Office of Nuclear Reactor Regulation (NRR) is guided in its
12 consideration of environmental justice by Attachment 4, "Interim NRR Procedures for
13 Environmental Justice Reviews," to NRR Office Letter No. 906, Revision 1, "Procedural
14 Guidance for Preparing Environmental Assessments and Considering Environmental Issues,"
15 September 27, 1996. The environmental justice review involves identifying off-site
16 environmental impacts, their geographic locations, minority and low-income populations that
17 may be affected, the significance of such effects and whether they are disproportionately high
18 and adverse compared to the population at large within the geographic area, and if so, what
19 mitigative measures are available, and which will be implemented. Until the Commission
20 develops agency-wide guidelines for NRC environmental justice reviews that can be
21 incorporated in this regulatory guide, the staff will perform the review. Applicants for license
22 renewal should include the following information in the ER to assist the staff in its
23 environmental justice review.

24 **Information and Analysis Content**

25 The ER should include the following information.

26 The composition by census tract of minority and low-income persons within 80 km (50 miles)
27 of the plant. Migrant workers as well as full time residents should be included. The most
28 recent Bureau of the Census demographic information should be supplemented with
29 demographic information from State and local planning agencies.

30 **CHAPTER 5. ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION**

31 The regulatory requirement to report new and significant information and the definition of new
32 and significant information is discussed in the "General Guidance" section at the beginning of
33 this regulatory guide. The following information should be presented in this section of the ER.

- 34 1. Describe the information gathering and review process used in developing this ER.
35 Explain how the process would result in the identification of new and significant
36 information concerning Category 1 issues and issues not listed in Appendix B to

²⁶ Minority categories are defined as Black/African American; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; other non-white; and Hispanic origin. Low-income is defined as being below the poverty level as defined by the Bureau of the Census.

1 Subpart A of 10 CFR Part 51. The process might include a systematic consideration
2 of the Category 1 issues in view of ongoing monitoring programs, special studies and
3 surveys, compliance with Federal, State, and local environmental and natural resource
4 regulations and programs, and consultations with Federal, State, and local
5 environmental, natural resource, and land use agencies.

- 6 2. Describe any new and significant information identified and the associated
7 environmental impacts.
- 8 3. For each impact, describe mitigation measures that were considered and, in addition,
9 the measures that will be implemented.
- 10 4. If no new and significant information was identified after completing the process
11 described in item 1, this should be stated in the ER.

12 CHAPTER 6. SUMMARY OF LICENSE RENEWAL IMPACTS 13 AND MITIGATING ACTIONS 14

15 6.1 License Renewal Impacts

16 This section should provide a summary, preferably in tabular form, of the environmental
17 impacts related to license renewal at the applicant's plant. The summaries should be
18 descriptive and informative rather than evaluative or comparative. The presentation of material
19 should be organized by environmental resource area, such as the subject areas used in
20 Table B-1.

21 6.2 Mitigation

22 This section should provide a summary, preferably in tabular form, of each mitigative action
23 committed to in this ER.

24 6.3 Unavoidable Adverse Impacts

25 This section should summarize "Any adverse environmental effects which cannot be avoided
26 should the proposal be implemented," as required by 10 CFR 51.45(b)(2). Unavoidable
27 adverse effects should be identified in Chapters 4 and 5, in detail commensurate with the
28 significance of the effects.

29 6.4 Irreversible or Irretrievable Resource Commitments

30 This section should summarize "any irreversible or irretrievable commitments of resources
31 which would be involved in the proposed action should it be implemented," as required by 10
32 CFR 51.45(b)(5). Irreversible or irretrievable commitments of resources include energy and
33 materials consumed, resources and materials committed over the license renewal term, and
34 additional waste materials that will be generated by extended operations. In addition to
35 summarizing irreversible and irretrievable resource commitments discussed in Chapters 4 and
36 5, this section should briefly describe the magnitude and significance of irreversible or
37 irretrievable commitments of resources that are not addressed in those sections. Discussions
38 should be proportionate to the significance of the resource commitments.

- 1 (c) Include reasonable alternatives not within the jurisdiction of the lead
- 2 agency.
- 3 (d) Include the alternative of no action.
- 4 (e) Identify the agency's preferred alternative or alternatives, if one or more exists,
- 5 in the draft statement and identify such alternative in the final statement unless
- 6 another law prohibits the expression of such a preference.
- 7 (f) Include appropriate mitigation measures not already included in the
- 8 proposed action or alternatives.

9 In deciding whether or not to approve license renewal, the NRC will consider the
10 environmental impacts of alternatives as well as those of the proposed action. The NRC's
11 considers environmental effects of license renewal according to 10 CFR 51.103(a)(5).

12 In making a final decision on a license renewal action pursuant to Part 54 of
13 this chapter, the Commission shall determine whether or not the adverse
14 environmental impacts of license renewal are so great that preserving the
15 option of license renewal for energy planning decisionmakers would be
16 unreasonable.

17 **7.1 No-action Alternative**

18 For license renewal, the no-action alternative is defined as the alternative of not renewing the
19 license. At license expiration, plant operations would terminate and decommissioning
20 activities would commence. The environmental impacts of terminating nuclear power plant
21 operations and decommissioning are discussed in Section 8.4 of NUREG-1437. The ER should
22 contain an analysis of the no-action alternative, including impacts on land use, water quality,
23 air quality, ecological resources, human health, social and economic structure, waste
24 management, aesthetics, and cultural resources. Direct, indirect, and cumulative impacts
25 should be considered. The level of effort expended on impact analyses of alternatives should
26 be commensurate with the significance of the impacts. Material from NUREG-1437 may be
27 summarized and incorporated by reference to the extent it is applicable.

28 **7.2 Alternatives that Meet System Generating Needs**

29 **7.2.1 Alternatives Considered**

30 The range of alternatives to be considered should be focused by the stated purpose and need
31 for the proposed action. The statement of purpose and need adopted by the NRC and stated
32 in NUREG-1437 and in Chapter 1 of this regulatory guide focuses on meeting future power
33 system generating needs. Alternatives that meet the stated purpose and need are (1) build
34 new generating capacity, (2) purchase the power from outside the system, and (3) reduce
35 power requirements through demand reduction. The ER should demonstrate that the applicant
36 has considered these or similar alternatives. The applicant should identify the criteria used in
37 evaluating the reasonableness of the alternatives and explain which alternatives will not be
38 considered further and why. The ER should identify the alternatives that will be carried
39 forward for comparison with license renewal. The ER should discuss the extent to which
40 these alternatives have been considered by State authorities (e.g., public service commissions
41 and environmental, natural resource, or energy agencies) and how such considerations relate
42 to the applicant's evaluation.

1 **7.2.2 Environmental Impacts of Alternatives**

2 This section should describe the impacts of the alternatives identified for further consideration.
3 The impacts should be described in sufficient detail so that reviewers may compare the
4 adverse and beneficial impacts of the alternatives with those of renewing the operating
5 license. Impact analyses should consider land use, water quality, air quality, ecological
6 resources, human health, social and economic systems, waste management, aesthetics, and
7 cultural resources. The impacts analyses should include direct, indirect, and cumulative
8 impacts. For each alternative, the analysis should identify and, to the extent possible,
9 quantify, unavoidable adverse impacts, irreversible and irretrievable resource commitments,
10 and tradeoffs between short-term use and long-term productivity of the environment. To the
11 extent possible, each alternative should be analyzed on a site- or region-specific basis. Each
12 impact should be analyzed in proportion to its significance. Chapter 8 of NUREG-1437
13 includes the results of an analysis of the generic environmental impacts of several electricity
14 generating technologies. These results may be utilized to the extent that they are applicable.

15 **Chapter 8. COMPARISON OF ENVIRONMENTAL IMPACT OF**
16 **LICENSE RENEWAL WITH THE ALTERNATIVES**

17 This section should present the impacts of the proposed action, the no action alternative, and
18 other reasonable alternatives in comparative form in order to sharply define the issues and
19 provide a clear basis for the NRC to "determine whether or not the adverse environmental
20 impacts of license renewal are so great that preserving the option of license renewal for
21 energy planning decisionmakers would be unreasonable." This comparison may be presented in
22 any of several formats. Often the comparison is presented in a tabular format such as Tables
23 8.1 and 8.2 of NUREG-1437. The comparison should emphasize the more significant impacts
24 of each alternative.

25 **Chapter 9. STATUS OF COMPLIANCE**

26 According to 10 CFR 51.45(d), an applicant should discuss the status of compliance in the ER.

27 The environmental report shall list all Federal permits, licenses, approvals and
28 other entitlements which must be obtained in connection with the proposed
29 action and shall describe the status of compliance with these requirements.
30 The environmental report shall also include a discussion of the status of
31 compliance with applicable environmental quality standards and requirements
32 including, but not limited to, applicable zoning and land-use regulations, and
33 thermal and other water pollution limitations or requirements which have
34 been imposed by Federal, State, regional, and local agencies having
35 responsibility for environmental protection.

36 Appendix H of Volume 2 of NUREG-1437² summarizes the major Federal statutes that may
37 relate to license renewal applications.

REGULATORY ANALYSIS

1
2 A separate regulatory analysis was not prepared for this draft regulatory guide. NUREG-1440,
3 "Regulatory Analysis of Amendments to Regulations for the Environmental Review for Renewal
4 of Nuclear Power Plant Operating Licenses" (May 1996)² provides the regulatory basis for this
5 draft guide. NUREG-1440 was prepared for the amendment to 10 CFR Part 51 with respect
6 to requirements for the environmental review for renewal of nuclear power plant operating
7 licenses, which was promulgated on December 18, 1996, 61 FR 66537. A copy of NUREG-
8 1440 is available for inspection and copying for a fee at the NRC Public Document Room,
9 2120 L Street NW., Washington, DC 20555-0001; phone (202)634-3273; fax (202)634-3343.
10 In addition, copies may be purchased from the Superintendent of Documents, U.S.
11 Government Printing Office, PO Box 37082, Washington, DC 20013-7082. Copies are also
12 available for purchase from the National Technical Information Service, 5285 Port Royal Road,
13 Springfield, VA 22161.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

FIRST CLASS MAIL
POSTAGE AND FEES PAID
USNRC
PERMIT NO. G-67

119406110459 1 1SA1SB1S411S1
US NRC-REG I
REGIONAL STATE LIAISON OFFICER
475 ALLENDALE RD
KING OF PRUSSIA PA 19406