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U.S. NUCLEAR REGULATORY COMMISSION
**ENVIRONMENTAL
STANDARD
REVIEW PLAN**
OFFICE OF NUCLEAR REACTOR REGULATION

**STANDARD REVIEW PLANS FOR
ENVIRONMENTAL REVIEWS FOR
NUCLEAR POWER PLANTS**

October 1999

OFFICE OF NUCLEAR REACTOR REGULATION
U.S. NUCLEAR REGULATORY COMMISSION

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NUREG-1555

USNRC ENVIRONMENTAL STANDARD REVIEW PLAN

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Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.



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 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.2.2 WATER-USE IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's description, analysis, and assessment of proposed project construction activity impacts on water use.

The scope of the review directed by this plan should include (1) identification of the proposed construction activities or hydrologic alterations resulting from proposed construction activities that could have impacts on water use, (2) identification of changes in water quality resulting from hydrologic alterations or from construction activity effluents, (3) analysis and evaluation of impacts resulting from these alterations and activities, (4) analysis and evaluation of proposed practices to minimize adverse construction impacts on water use, and (5) evaluation of compliance with Federal, State, regional, local, and affected Native American tribal regulations applicable to water use and water quality. The review should include analysis and evaluation of impacts to water quality, water availability, and water use.

Review Interfaces

The reviewer for this ESRP should obtain input from and provide input to the reviewers for the following ESRPs, as indicated:

- ESRP 2.1. Obtain a description of the location of the proposed construction site and the surrounding region.

October 1999

4.2.2-1

NUREG-1555

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- ESRPs 2.2.1 through 2.2.3. Obtain descriptions of the regional land uses for the area surrounding the proposed plant site.
- ESRP 2.3.1. Obtain descriptions of the hydrology of the region surrounding the proposed plant site.
- ESRP 2.3.2. Obtain descriptions of the regional water uses (and users) for the area surrounding the proposed plant site.
- ESRP 2.3.3. Obtain input regarding the baseline water quality of the water sources/bodies for the area surrounding the proposed plant site.
- ESRP 2.8. Obtain input regarding any related Federal project activities that would affect or be affected by the proposed plant construction.
- ESRP 3.1. Obtain descriptions of the external appearance of the proposed plant and the plant layout.
- ESRPs 3.3.1 and 3.3.2. Obtain input regarding expected water use by the proposed plant.
- ESRP 3.6.2. Obtain input regarding water use for sanitary system during construction.
- ESRP 3.7. Obtain input regarding power transmission systems for the proposed plant.
- ESRPs 4.1.1 through 4.1.3. Provide a list of construction activities (e.g., groundwater depletion) that may have land-use impacts and, when applicable, a description of altered flood patterns resulting from construction or construction activities in the floodplain.
- ESRPs 4.2.1 and 5.2.2. Obtain input regarding hydrological alterations that are expected to result from the construction water-use changes from operation of the proposed plant.
- ESRPs 4.3.1 and 4.3.2. Provide a list of construction activities (e.g., surface runoff and water-quality degradation) that may have adverse terrestrial and aquatic ecology impacts.
- ESRPs 4.4.1 through 4.4.3. Provide a list of construction activities that may have socioeconomic impacts.
- ESRP 4.6. Provide a list of applicant commitments and staff evaluations of practices to limit adverse water-use impacts.
- ESRP 6.3 and 6.6. Provide a list of possible impacts potentially requiring monitoring.
- ESRPs 9.4.1 and 9.4.2. Provide a list of adverse environmental impacts affecting water use that could be mitigated or avoided through alternative project designs or construction practices, and assist in determining appropriate alternatives.

- ESRP 10.1. Provide a list of the unavoidable water-use impacts that are predicted to occur during or as a result of project construction.
- ESRP 10.2. Provide a brief summary of the irreversible and irretrievable commitments of water resources that are predicted to occur during or as a result of project construction.
- Interface with Environmental Project Manager (EPM). Obtain input from the EPM to verify that proposed modifications to water use plans are practical and should lead to an improvement in the benefit-cost balance.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of the potential impacts. The following data and information should be obtained:

- descriptions of the site and vicinity water bodies and aquifers (including sole-source aquifers)
- descriptions of hydrologic alterations and their related construction activities
- the physical effects of hydrologic alterations
- comparisons of water quantity available to other water users with existing and known future water rights and allocations
- identification of water bodies receiving construction effluents (e.g., sanitary wastes, cleaning wastes, dust control, fuels and lubricants, chemical, herbicides, pesticides) and the expected average and maximum flow rates and composition of these effluents
- baseline water-quality data for surface-water and groundwater sources used during construction and impacted by construction activities
- potential changes to surface-water and groundwater quality (e.g., heavy metal contamination) resulting from substrate exposure during construction
- identification and locations of groundwater and surface-water users and areas that could be impacted by project related construction activities affecting water use (from ESRP 2.3.2, the site visit, and the environmental report [ER])
- predicted impacts on the water users identified in the previous item (from the ER)
- descriptions of any proposed practices and measures to control construction related water-use impacts. Factors to be considered include flooding, drainage, groundwater elevation, erosion,

sedimentation, water quality, protection of natural drainage channels and water bodies, protection of shorelines and beaches, restrictions on access to and use of surface water, protection against saltwater intrusion, and handling of fuels, lubricants, oily wastes, chemical wastes, sanitary wastes, herbicides, and pesticides (from the ER).

- consultations with Federal, State, regional, local, and affected Native American tribal regulators (from consultation with the above agencies)
- descriptions of proposed means to ensure construction activity compliance with water-quality and water-use standards and regulations
- water-quality requirements for key elements of aquatic ecosystem and domestic users.

II. ACCEPTANCE CRITERIA

Acceptance criteria for the review of the water-use impact at the proposed plant sites are based on the relevant requirements of the following:

- 33 CFR 322 with respect to definition of activities requiring permits
- 33 CFR 330, Appendix A, with respect to conditions, limitations, and restrictions on construction activities
- 40 CFR 6, Appendix A, with respect to procedures on floodplain and wetlands protection
- 40 CFR 122 with respect to the National Pollutant Discharge Elimination System (NPDES) permit conditions for discharges, including storm water discharges
- 40 CFR 149 with respect to possible supplemental restrictions on waste disposal and water use in or above a sole-source aquifer
- Federal, State, regional, local, and Native American tribal water laws and water rights.

Regulatory positions and specific criteria necessary to meet the regulations as identified above are as follows:

Compliance with environmental quality standards and requirements of the Federal Water Pollution Control Act (FWPCA), commonly referred to as the Clean Water Act, is not a substitute for and does not negate the requirement for NRC to weigh the environmental impacts of the proposed action, including any degradation of water quality, and to consider alternatives to the proposed action that are available for reducing the adverse impacts. If an environmental assessment of aquatic impacts is available from the permitting authority, the NRC will consider the assessment in its determination of

the magnitude of the environmental impacts of striking an overall benefit-cost balance. When no such assessment of aquatic impacts is available from the permitting authority, the NRC (possibly in conjunction with the permitting authority and other agencies having relevant expertise) will establish its own impact determination.

Because water quality and water supply are interdependent, changes in water quality must be considered simultaneously with changes in water supply. In *Jefferson County PUD #1 vs. Department of Ecology* (U.S. Supreme Court Case), the U.S. Supreme Court granted the States additional authority to limit hydrological alterations beyond the States' role in regulating water rights.

Regulatory Guide 4.2, Rev. 2, *Preparation of Environmental Reports for Nuclear Power Stations* (NRC 1976), contains guidance on the format and content of ERs, including hydrology, water-use, and water-quality issues.

Technical Rationale

The technical rationale for evaluating the applicant's potential water-use impacts is discussed in the following paragraphs:

A detailed and thorough description of the water use during construction activities is essential for the evaluation of potential impacts to the environment that may result from plant construction or operation. Water quality and water supply are linked. The authority to regulate water quality can be extended to regulate water supply if the domestic or environmental water needs are impacted by reduced water quality.

Where an assessment of the environmental impacts resulting from construction activities is available from a separate permitting authority (such as Corps, State, EPA, or NPDES permitting agency), NRC will consider the assessment in its determination of the magnitude of environmental impacts for striking an overall benefit-cost balance. Documentation of adequate consultation with the appropriate permitting authorities is required.

III. REVIEW PROCEDURES

The reviewer should take the following steps:

- (1) Evaluate water quantity and availability by identifying water users potentially impacted by alterations in water quantity and availability:
 - (a) Describe any impacts of reduced water quantity and availability.

- (b) Describe the possibility for inequalities between proposed construction water use and existing and known future water rights and allocations and the probable nature and extent of these inequalities.
- (2) Evaluate the construction activities and the hydrologic alterations identified in ESRP 4.2.1 with respect to their potential impacts to water users or water-use areas:
- (a) Compare the effects of these alterations (e.g., increased temperature, salinity, erosion, sedimentation) with pre-construction conditions to assess the magnitude of the impact.
 - (b) Evaluate the impacts for individual water users and for water-use areas.
 - (c) Identify and describe proposed construction or construction activities located on a floodplain or wetland as follows:
 - Consult with appropriate Federal, State, regional, local, and Native American tribal agencies to determine the extent to which any such activities will conform with applicable floodplain and wetland standards.
 - Ensure that the analysis has considered short-term effects (e.g., floodplain alterations resulting from temporary construction structures or activities) as well as the long-term alteration caused by the completed plant.
 - Consult with the reviewer for ESRP 4.2.1 and the reviewers for ESRP 9.4.1 to analyze alternatives to any proposed activity located in the floodplain.

The intent of this instruction is to ensure that alternatives to avoid adverse effects and incompatible development in a floodplain or wetland have been considered.

- (d) Identify construction and construction activities that will alter or restrict shoreline access (e.g., beach closure) and surface oriented water uses (e.g., commercial and recreational fishing, navigation) including the following:
 - Describe the effects of construction to water users.
 - If potential adverse impacts are predicted, identify alternative design, construction practices, or procedures that could mitigate or avoid the impacts.
- (3) Analyze water quality:
- (a) Identify hydrologic alterations and construction activities affecting water quality and describe their effects on water users or water-use areas.

- (b) Describe the time duration or time periods when the impact will be experienced, and the number of water users or extent of water-use areas affected. (When necessary, consult with Federal, State, regional, local, and affected Native American tribal agencies for assistance in evaluating the identified impacts.)
- (c) Review consultation with appropriate agencies regarding compliance with Federal, State, regional, local, and affected Native American tribal water-quality standards.

The reviewer's analysis of construction impacts on water use should be coordinated with the hydrologic alteration descriptions provided by the environmental review for ESRP 4.2.1. This coordination should ensure that the environmental factors most likely to be impacted by hydrologic alterations are described in sufficient detail to permit assessment of the predicted impacts. The reviewer should independently identify and analyze those construction activities expected to affect the quality of receiving water bodies. The reviewer should consult with the reviewers for ESRPs 2.3.2, 4.1, 4.3, and 4.4 to establish the location and nature of those water users potentially impacted by hydrologic alterations and water-quality changes.

The reviewer should take the following steps:

(1) Analyze reduced water availability:

- (a) Initiate this analysis if the reviewer for ESRP 4.2.1 determines that construction activities will result in decreased water availability.
- (b) When this is predicted to occur, identify the location of those water users likely to be affected and consult with the reviewer for ESRP 4.2.1 to determine the hydrologic effects at these locations.
- (c) Consider these effects (e.g., lowered groundwater table, reduced well yields, lowered surface-water levels at intake structures) and determine their impacts on individual water users or water-use areas.
- (d) Consider seasonal requirements for water and temporal variations in water availability.
- (e) Consider the potential for impacts when the reviewer for ESRP 4.2.1 predicts an incompatibility between water availability as affected by project construction activity and existing and known future water rights and allocations. For these cases, analyze the potential for future inequalities in water availability to determine their probable nature and extent.

(2) Analyze the construction activity and hydrologic alterations identified by the reviewer for ESRP 4.2.1 and compare them with present and predicted future water uses that could be affected:

- (a) Analyze in further detail any alterations that can be shown to represent a potential for water-use impacts.
 - (b) Consider both short-term impacts (e.g., from temporary channel diversions) that will occur only during the construction period, and long-term impacts (e.g., channel restriction by a breakwater) that will occur for the period of plant operation.
 - (c) Identify individual water users or water-use areas and predict impacts to these users or areas.
 - (d) Identify the proposed construction activities that will restrict non-consumptive water use or water access and identify the water users so affected, categorizing the impacts as either short- or long-term.
 - (e) Give special consideration to hydrologic alterations that affect floodplains. When such alterations are predicted, consult with the reviewer for ESRP 4.1.1 or 4.1.2 to complete the analysis of any resulting impacts.
- (3) Analyze water quality by considering the construction activities and hydrologic alterations expected to result in altered water quality and the water users or water-use areas that could be impacted by the water-quality alterations:
- (a) Consult with the reviewer for ESRP 4.2.1 to identify the affected receiving water bodies and the hydrologic alterations (e.g., erosion, sedimentation) that could affect water quality.
 - (b) Consult with the reviewer for ESRP 2.3.3 to determine the baseline water quality of the receiving water bodies and with the reviewer for ESRP 2.3.2 to identify potentially affected water users.
 - (c) Identify the water bodies receiving construction effluents, the flow rates and chemical composition of these effluents, and the potential for and nature of any contaminants that could be released to surface or groundwater as a result of substrate exposure during construction.
 - (d) Consider potential impacts to water users in terms of the intended usage (e.g., heavy metals as a contaminant affecting a municipal water supply, suspended solids affecting industrial use).
 - (e) Consult with nearby Federal, State, regional, local, and affected Native American tribal agencies in analyzing potential water-quality impacts.
 - (f) Finally, consult with the reviewer for ESRP 4.3.2 to coordinate the analysis of impacts to water quality and to avoid any duplication of effort in this analysis.

IV. EVALUATION FINDINGS

Input from this ESRP to the environmental impact statement (EIS) should accomplish the following objectives: (1) public disclosure of major direct water-use consequences of proposed project construction, (2) presentation of the basis for the staff analysis, and (3) presentation of staff conclusions and conditions regarding water use. The reviewer should coordinate this input with the reviewer for ESRP 4.2.1 to avoid duplication.

The following information should be included in the EIS:

- a description of plant design and construction activities that may cause adverse water-use impacts and a quantitative description of these impacts for each affected water body. For plant facilities and construction activities located on the floodplain, the description should include (1) staff conclusions as to the necessity of such location (e.g., intake structures) and a discussion of applicant commitments or staff recommendations for actions to minimize environmental harm to the floodplain, (2) reference to appropriate ESRP 9.4 discussion of alternatives to facility or activity location in the floodplain, and (3) discussion of the extent of conformance with applicable State or local floodplain protection standards.
- comparison of predicted effluent and receiving water quality with applicable effluent limitations and water-quality standards, and conclusions with respect to project compliance with these standards
- the physical impacts of consumptive water uses during construction (e.g., groundwater depletion) on other water users
- the compatibility of proposed construction water use with existing and known water rights and allocations
- adverse impacts on surface oriented water users (e.g., fishing, navigation) resulting from plant construction and construction activity
- construction practices and procedures to mitigate potential adverse water-use impacts or consider alternative project designs to avoid these impacts.

Evaluation of each identified impact should result in one of the following determinations:

- *The impact is minor, and mitigation is not required.*
- *The impact is adverse, but can be mitigated by specific design or procedure modifications that the reviewer has identified and determined to be practical.* For these cases, the reviewer should consult with the EPM and the appropriate ESRP 9.4 reviewer for verification that the reviewer's identified modifications are practical and will lead to an improvement in the benefit-cost balance. The reviewer should prepare a list of verified modifications and identified measures and controls to limit

the corresponding impact. These lists should be provided the reviewer for ESRP 4.6.

- *The impact is adverse, cannot be successfully mitigated, and is of such magnitude that it should be avoided.* When impacts of this nature are identified, the reviewer should inform the appropriate ESRP 9.4.1 reviewers that an analysis and evaluation of alternative designs or procedures is required. The reviewer should participate in any such analysis and evaluation of alternatives that would avoid the impact and that could be considered practical. If no such alternatives can be identified, the reviewer should be responsible for providing this information to the reviewer for ESRP 10.1.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

33 CFR 322, "Permits for Structures and Work in or Affecting Navigable Waters of the United States."

33 CFR 330, Appendix A, "Nationwide Permit and Conditions."

40 CFR 6, Appendix A, "Statement of Procedures on Floodplain Management and Wetlands Protection."

40 CFR 122, "EPA Administered Permit Programs: The NPDES Pollution Elimination System."

40 CFR 149, "Sole Source Aquifers."

Federal Water Pollution Control Act (FWPCA), as amended, 33 USC 1251 et seq. (also known as Clean Water Act).

Jefferson County PUD#1 vs. Department of Ecology, 92-1911, Supreme Court of the United States, 510 U.S. 1037; 114 S. Ct. 677; 1994 U.S. LEXIS 795; 126 L. Ed. 2d 645; 62 U.S.L.W. 3450 (January 10, 1994).

U.S. Nuclear Regulatory Commission (NRC). 1976. *Preparation of Environmental Reports for Nuclear Power Stations*. Regulatory Guide 4.2, Rev. 2, Washington, D.C.



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 STANDARD
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4.3 ECOLOGICAL IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's preparation of an introductory paragraph for the portion of the environmental impact statement (EIS) that describes the ecological impacts of construction. The scope of the paragraph covered by this plan introduces the material from the reviews conducted under ESRPs 4.3.1 and 4.3.2.

Review Interfaces

None.

Data and Information Needs

The reviewer for this ESRP should obtain the proposed organizational structure of the EIS from the Environmental Project Manager.

II. ACCEPTANCE CRITERIA

The reviewer should ensure that the introductory paragraph prepared under this ESRP is consistent with the intent of the following regulation:

- 10 CFR 51.70(b) with respect to preparation of an EIS that is concise, clear, analytic, and written in

October 1999

4.3-1

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plain language.

Regulatory positions and specific criteria necessary to meet the regulations identified above are as follows:

- There are no regulatory positions specific to this ESRP.

Technical Rationale

The technical rationale for evaluating the applicant's potential ecological impacts is discussed in the following paragraph:

Introductory paragraphs that orient the reader with respect to the relevance of the material to the overall organization and goals of the EIS add clarity to the presentation.

III. REVIEW PROCEDURES

The material to be prepared is informational in nature, and no specific analysis of data is required.

IV. EVALUATION FINDINGS

The reviewer of information covered by this ESRP should prepare at least one introductory paragraph for the EIS. The paragraph(s) should introduce the nature of the material to be presented by the reviewers of information covered by ESRPs 4.3.1 and 4.3.2. The paragraph(s) should list the types of information to be presented and describe their relationships to information presented earlier and to be presented later in the EIS.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCE

10 CFR 51.70, "Draft environmental impact statement—general."



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 STANDARD
 REVIEW PLAN**
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4.3.1 TERRESTRIAL ECOSYSTEMS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's description, quantification, and assessment of the impacts of construction on the terrestrial ecosystem. The scope of the review directed by this plan includes an assessment of both onsite and offsite construction, including transmission line and access corridor construction. The assessment should be in sufficient detail to (1) predict and evaluate the significance of potential impacts to "important" species and their habitats and (2) evaluate how these impacts should be considered in the licensing decision. If necessary, the reviewer should suggest consideration of alternative designs or construction practices, or licensee commitments to mitigate the intensity of environmental impacts.

Review Interfaces

The reviewer for this ESRP should obtain input from or provide input to reviewers for the following ESRPs, as indicated:

- ESRP 2.4.1. Obtain descriptive material on the terrestrial ecology of the site and vicinity needed to support the analyses made in ESRP 4.3.1. The reviewer for ESRP 4.3.1 should also provide input on significant impacts of construction to the terrestrial environment.
- ESRP 3.1. Obtain information about the power plant's external appearance and layout in enough detail to support the analyses made in ESRP 4.3.1.

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4.3.1-1

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- ESRP 3.4.2. Obtain information on cooling system in enough detail to support analysis of bird impacts with cooling towers.
- ESRP 3.7. Obtain information about the power transmission system in enough detail to support the analyses made in ESRP 4.3.1.
- ESRP 4.1.1. Obtain information regarding impacts of construction on land use onsite and in the vicinity of the plant to complete the description of construction impacts on the terrestrial ecosystem.
- ESRP 4.1.2. Obtain information regarding impacts to land use in transmission corridors and offsite areas to complete the description of construction impacts on the terrestrial ecosystem.
- ESRP 4.2.2. Obtain information regarding impacts on water use to complete the description of construction impacts on the terrestrial ecosystem.
- ESRP 4.4.2. Provide information regarding impacts to the terrestrial ecosystem from construction so that an evaluation of social and economic impacts from construction can be completed.
- ESRP 4.6. Provide a list of applicant commitments and staff evaluations of practices to limit adverse environmental impacts of construction.
- ESRP 6.5.1. Provide appropriate information on impacts to the terrestrial environment from construction activities in sufficient detail to allow for the evaluation of the applicant's proposed monitoring program.
- ESRP 9.4. If the reviewer determines that a proposed construction activity will result in an adverse environmental impact that cannot be mitigated by alternative construction practices and procedures, then provide the reviewer of ESRP 9.4 with a notification that alternative locations and plant or component designs should be considered.
- ESRP 10.1. Provide a brief summary of the unavoidable impacts predicted to occur during construction. For example, this should be limited to the more significant impacts, such as modification of habitat for "important" species.
- ESRP 10.2. Provide a brief summary of irreversible and irretrievable commitments of terrestrial resources predicted to occur during construction. For example, this would include permanent loss of terrestrial habitat or loss of wetlands.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of potential impacts. The following site and vicinity data or information (in addition to that listed in ESRP Section 2.4.1) should be obtained:

- a site map showing proposed buildings, the land to be cleared, waste disposal areas, the construction zone, and the site boundary (from the environmental report [ER] and ESRP 3.1)
- the proposed schedule of construction activities
- clearing methods; temporary and permanent erosion, runoff, and siltation control methods; dust suppression methods; and other construction practices for control or suppression specific to the site (from the ER)
- the total area of land to be disturbed (from the ER)
- the maximum area of soil to be exposed at any one time (from the ER)
- the area (hectares) of each plant community and habitat type to be cleared or disturbed (e.g., marshes, agricultural fields, and deciduous forests) and how much is being destroyed relative to the total amount present in the region (from the ER)
- the area to be covered by permanent station facilities, including new ponds and lakes (from the ER)
- the area to be used on a short term basis during construction, and plans for restoration of this land (from the ER)
- any proposed construction activity expected to impact “important” habitat (from the ER)
- documentation that the applicant has consulted with the appropriate Federal, State, regional, local, and affected Native American tribal agencies (e.g., as required by the U.S. Fish and Wildlife Coordination Act) (from the ER)
- identification of other Federal and State projects within the region that affect or could potentially affect the same threatened and endangered species (or their habitats) that occur on or near the site (from the ER)
- an estimate of the potential for bird collisions with cooling towers or other elevated construction equipment or plant structures (from the ER and consultation with Federal, State, regional, local, and affected Native American tribal agencies)

Additional background information about the terrestrial ecology of the site and vicinity, necessary for this review of impacts on terrestrial resources from construction, is requested in ESRP Section 2.4.1 and can be found in the ER, general literature, and from consultation with Federal, State, regional, local, and affected Native American tribal agencies.

The following data and information about transmission corridors and offsite areas should be obtained:

- clearing methods, erosion, runoff and siltation control methods (both temporary and permanent), dust suppression methods, and other construction practices for impact control or minimization specific to the proposed transmission system (from the ER).
- potential for bird collisions with transmission towers or lines (from the ER and consultation with Federal, State, regional, local, and affected Native American tribal agencies).

Additional background information about the terrestrial ecology of transmission corridors and offsite areas, necessary for this review of impacts to terrestrial resources from construction, is requested in ESRP 2.4.1 and can be found in the ER, general literature, and from consultation with Federal, State, regional, local, and affected Native American tribal agencies.

II. ACCEPTANCE CRITERIA

Acceptance criteria for the review of construction impacts on terrestrial ecology in the vicinity of the site and transmission corridors are based on the relevant requirements of the following:

- 10 CFR 51.71(d) with respect to including in the EIS information on impacts to the terrestrial environment due to construction
- Bald and Golden Eagle Protection Act with respect to the prohibition of taking, possessing, selling, transporting, importing, or exporting the bald or golden eagle, dead or alive, without a permit
- Coastal Zone Management Act with respect to natural resources, and land or water use of the coastal zone
- Endangered Species Act with respect to identifying impacts to threatened or endangered species and critical habitats by means of informal and/or formal consultations with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service
- Fish and Wildlife Coordination Act with respect to consideration of fish and wildlife resources and the planning of development projects that affect water resources
- Migratory Bird Treaty Act with respect to declaring that it is unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. Feathers or other parts of nests or eggs,

and products made from migratory birds are also covered by the Act. "Take" is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, or collecting.

Regulatory positions and specific criteria necessary to meet the regulations and other statutory requirements identified above are as follows:

- Second Memorandum of Understanding and Policy Statement Regarding Implementation of Certain NRC and EPA Responsibilities, serves as the legal basis for NRC decisionmaking concerning licensing matters covered by NEPA and Section 511 of the Federal Water Pollution Control Act (FWPCA), commonly referred to as the Clean Water Act (CWA).
- Memorandum of Understanding between the Corps of Engineers, U.S. Army, and the NRC for the Regulation of Nuclear Power Plants, 40 FR 60115, provides guidance with respect to the NRC exercising the primary responsibility in conducting environmental reviews and in preparing EISs for nuclear power stations. However, the Corps of Engineers will participate with the NRC in the preparation of EISs by helping to draft material for sections covering (1) coastal erosion and other shoreline modifications, (2) siltation and sedimentation processes, (3) dredging activities and disposal of dredged materials, and (4) location of structures affecting navigable waters.
- Regulatory Guide 4.7, Rev. 2, *General Site Suitability for Nuclear Power Stations* (1998), contains guidance that the ecological systems and biota at potential sites and their environs should be sufficiently well known to allow reasonably certain predictions of impacts that there would be no unacceptable or unnecessary deleterious impacts on populations of important species or on ecological systems from the construction of a nuclear power station.
- Regulatory Guide 4.11, Rev. 1, *Terrestrial Environmental Studies for Nuclear Power Stations* (1977), contains technical information for the design and execution of terrestrial environmental studies, the results of which may be appropriate for inclusion in the applicant's ER. The reviewer should ensure that the appropriate results are included in the ER.

Technical Rationale

The technical rationale for evaluating the applicant's potential construction or refurbishment impacts on terrestrial ecosystems is discussed in the following paragraph:

Construction of a nuclear power facility will directly impact the terrestrial environment. This section of the ESRP reviews and evaluates the impacts that are anticipated from the construction process. This information can then be used in other ESRPs to balance the environmental effects of construction of the proposed facility and the alternatives available for reducing or avoiding adverse environmental effects, as well as the environmental benefits of the proposed action. The acceptance criteria listed above should be used to ensure that the environmental impacts of the proposed action are considered with respect to matters covered by such standards and requirements.

III. REVIEW PROCEDURES

When reviewing the impacts of station construction on the terrestrial ecology, the reviewer should take the following steps:

- (1) Review the general data and information necessary to determine the impacts on the terrestrial ecology from station construction:
 - (a) Identify the construction activities that impact “important” species and habitats of the site and vicinity, transmission corridors, and offsite areas (definition of “important” resources can be found in Table 2.4.1-1).
 - (b) Determine the areal extent and location of such potential impacts:
 - Prepare a map superimposing impact areas over resource areas.
 - During the site visit, inspect areas where construction activities will occur and inspect all other potentially impacted areas.
 - When necessary, supplement the data and information specified in the “Review Procedures” through consultations with Federal, State, regional, local, and affected Native American tribal agencies (e.g., the U.S. Fish and Wildlife Service and State wildlife agencies).
- (2) Review impacts of station construction on terrestrial ecology:
 - (a) Review and discuss the following impacts:
 - the number of hectares of plant community types preempted and the number of hectares modified by construction activities. Describe how construction activities will disturb the existing terrain and wildlife habitats.
 - Estimate the magnitude of the impact for important species that have commercial or recreational value. This may be expressed in terms of dollars, lost opportunity for recreational pursuits, percent reduction in harvest, percent loss of habitat, or other appropriate quantifiers.
 - Consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service under Section 7 of the Endangered Species Act, if threatened or endangered species or critical habitat are known to occur in the project area and the proposed project is predicted to add to their further endangerment.

- the impact of habitat modification (e.g., tree removal) on associated animal populations
- an evaluation of the impacts of construction on “important” species relative to effects on the local population and the total population of the species
- the effects of noise on “important” species
- construction activities that create obstacles to the movements of vertebrates or result in increased dispersal of invertebrate species known to be important as disease vectors or pests
- the potential for bird collisions with cooling towers, other elevated plant structures and construction equipment, transmission towers, and transmission lines
- changes in terrestrial habitat resulting from establishment of cooling ponds or lakes including the following:
 - construction activities that will dewater any wetlands, ponds, or seepages or alter surface drainage patterns supporting terrestrial biota
 - the adequacy of proposed plans for preventing soil erosion runoff to surface waters and revegetating disturbed soil
 - disposal of construction wastes that will need landfill or special disposal
- impacts to floodplains and wetlands on the power line right-of-way.

(b) Become familiar with the provisions of standards, guides, and agreements that are pertinent to the construction of nuclear power stations:

- Refer to the “Acceptance Criteria” section of this ESRP for a list of those that are applicable to this environmental review.
- Consult with appropriate agencies, when necessary (e.g., the U.S. Fish and Wildlife Service and the State wildlife agency) to ensure compliance with the applicable regulations.
- Analyze construction activities in light of recognized “good practice.” The term “good practice” as used here will refer to those construction activities that tend to mitigate adverse environmental impacts.

IV. EVALUATION FINDINGS

Input to the EIS should include (1) a list of adverse impacts of construction to terrestrial ecosystems, (2) a list of the impacts for which there are measures or controls to limit adverse impacts and the

associated measures and controls, (3) the applicant's commitments to limit these impacts, and (4) the staff's evaluation of the adequacy of the applicant's measures and controls to limit adverse impacts. This information should be summarized and provided to the reviewer of ESRP Section 4.6.

Any construction activity that should receive mitigative action should be described by the staff. Where mitigation is an option, the reviewer should evaluate appropriate measures, which could include alternative placement of structures, alternative schedules, or alternative construction practices. The reviewer should also evaluate alternatives for any proposed construction activity that is predicted to result in an adverse impact that cannot be mitigated. Practices proposed by the applicant for the protection of the environment should be described if the reviewer determines that they are necessary.

The depth and extent of the input to the EIS should be governed by the attributes of the terrestrial ecological resources that could be affected by plant construction and operation, and by the nature and magnitude of the expected impacts to those resources. However, the following should be evaluated for inclusion by the reviewer in the EIS:

- loss of habitat for endangered or threatened species in the context of guidelines under the Endangered Species Act of 1973. Where loss of habitat for commercially or recreationally important species occurs, the reviewer should consider the effects on the harvestable crop. It should generally be concluded that loss of up to 5 percent of such habitat in the site vicinity will have negligible impact on the crop and need no further analysis. Where losses exceed 5 percent, the reviewer should consider the loss in relation to regional abundance of these species.
- construction practices to minimize soil erosion and the number of hectares disturbed
- the clearing of vegetation from stream banks, making certain that it is limited to that necessary for placement of structures
- the CWA amendments of 1972, the Coastal Zone Management Act of 1972, and the Marine Protection, Research, and Sanctuaries Act of 1972. Guidelines under the Acts should be followed in evaluating the significance of dewatering wetlands. Because of the importance of wetlands, any unavoidable impact to this habitat must be considered in the overall benefit-cost balancing.
- the intrusion on or destruction of terrestrial plant communities that are regarded as representative of natural, undisturbed, or remnant communities or that show unusual ecological or geographical distributions, and the loss of fragile or sensitive habitat
- the proposed procedures for compliance with EPA guidelines for drainage from dredge spoil. Filling of biologically productive wetlands is generally to be avoided. Plans for dumping of dredge spoils must be approved by the EPA and the District Office of the Corps of Engineers.

- where cooling reservoirs are to be constructed, the potential beneficial impacts (e.g., provision of water for irrigation, livestock watering, or the creation of riparian habitat) and adverse impacts (e.g., the shortstopping of migratory waterfowl) should be considered and balanced against the ecological losses associated with inundation of the land area by the reservoir.
- the applicant's commitment to the use of good construction practices
- secondary impacts on wildlife, such as altered behavior resulting from construction noise, in addition to direct impacts on animals, such as loss of habitat and road kills
- the reviewer should screen each predicted impact using criteria appropriate to the impacted segment of the ecosystem. For example, loss of more than a few percent of the habitat available in the region for an "important" species could be considered of sufficient importance to consider mitigating action.

If the reviewer verifies that sufficient information has been provided in accordance with the requirements of this ESRP section, then the evaluation supports the following type of concluding statement to be included in the EIS:

The staff reviewed the available information relative to impacts to the terrestrial environment on or in the vicinity of the site. The staff concludes that the list and description of impacts is adequate to comply with 10 CFR 51.45.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 51.45, "Environmental report."

10 CFR 51.71, "Draft environmental impact statement—contents."

Bald and Golden Eagle Protection Act of 1940, as amended, 16 USC 668 et. seq.

Coastal Zone Management Act, as amended, 16 USC 1451 et seq.

Endangered Species Act, as amended, 16 USC 1531 et seq.

Federal Water Pollution Control Act (FWPCA), as amended, 33 USC 1251 et seq. (also known as Clean Water Act).

Fish and Wildlife Coordination Act Amendment, 16 USC 661 et seq.

Marine Protection, Research, and Sanctuaries Act, as amended, 33 USC 1401 et seq.

“Memorandum of Understanding between the Corps of Engineers, U.S. Army, and the U.S. Nuclear Regulatory Commission for the Regulation of Nuclear Power Plants.” 40 *Federal Register* 60115, August 25, 1975.

Migratory Bird Treaty Act, as amended, 16 USC 703 et seq.

“Second Memorandum of Understanding and Policy Statement Regarding Implementation of Certain NRC and EPA Responsibilities,” 40 *Federal Register* 60115, December 31, 1975.

U.S. Nuclear Regulatory Commission (NRC). 1998. *General Site Suitability for Nuclear Power Stations*. Regulatory Guide 4.7, Rev. 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1977. *Terrestrial Environmental Studies for Nuclear Power Stations*. Regulatory Guide 4.11, Rev. 1, Washington, D.C.



U.S. NUCLEAR REGULATORY COMMISSION
**ENVIRONMENTAL
 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.3.2 AQUATIC ECOSYSTEMS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's description, quantification, and assessment of the impacts of construction of the proposed facilities on the aquatic ecosystem. The scope of the review directed by this plan will include an assessment of both onsite and offsite construction activities, including transmission line and access corridor construction. The assessment should be in sufficient detail to (1) predict and evaluate the significance of potential impacts to "important" species and their habitats and (2) evaluate how these impacts should be considered in the licensing decision. If necessary, the reviewer should consider alternative designs or construction practices to mitigate the intensity of environmental impacts.

Review Interfaces

The reviewer for this ESRP should obtain input from or provide input to reviewers for the following ESRPs, as indicated:

- ESRP 2.3.1. Obtain information regarding the hydrology of the site.
- ESRP 2.3.2. Obtain a description of surface-water and groundwater uses so that the description of impacts to the aquatic ecosystem from construction or refurbishment can be completed.

October 1999

4.3.2-1

NUREG-1555

USNRC ENVIRONMENTAL STANDARD REVIEW PLAN

Environmental standard review plans are prepared for the guidance of the Office of Nuclear Reactor Regulation staff responsible for environmental reviews for nuclear power plants. These documents are made available to the public as part of the Commission's policy to inform the nuclear industry and the general public of regulatory procedures and policies. Environmental standard review plans are not substitutes for regulatory guides or the Commission's regulations and compliance with them is not required. The environmental standard review plans are keyed to Preparation of Environmental Reports for Nuclear Power Stations.

Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

- ESRP 2.3.3. Obtain information about the water-quality conditions at the site in enough detail to determine impacts to the aquatic environment from construction.
- ESRP 2.4.2. Obtain descriptions of the aquatic ecology of the site and vicinity. Provide input on the significant impacts of construction on the aquatic environment to guide the reviewer of ESRP 2.4.2 in preparing a more detailed description of the part(s) of the environment that will be significantly affected.
- ESRP 3.1. Obtain information about the power plant's external appearance and layout in enough detail to support the analyses made in ESRP 4.3.2.
- ESRP 3.4.2. Obtain a description of the intake, discharge, and heat dissipation system design and performance characteristics so that a description of impacts on the aquatic ecosystem from construction can be completed.
- ESRP 3.6.2. Obtain a description of sanitary system effluents and their treatment so that a description of impacts on the aquatic ecosystem from construction can be completed.
- ESRP 3.7. Obtain information about the power transmission system in enough detail to support the analyses made in ESRP 4.3.2.
- ESRP 4.1.1. Obtain an evaluation of impacts of construction on land use of the site and vicinity so that a description of impacts on the aquatic ecosystem from construction can be completed.
- ESRP 4.1.2. Obtain an evaluation of impacts of construction on land use within the transmission line and access corridors and other offsite areas so that a description of impacts on the aquatic ecosystem from construction can be completed.
- ESRP 4.2.1. Obtain information about hydrological alterations and potential water-use impacts on the aquatic environment during construction.
- ESRP 4.2.2. Obtain an evaluation of the impacts on water use so that a description of impacts on the aquatic ecosystem from construction can be completed.
- ESRP 4.4.2. Provide information regarding impacts on the aquatic ecosystem from construction so that an evaluation of social and economic impacts from construction can be completed.
- ESRP 4.6. Provide a list of applicant commitments and staff evaluations of practices to limit adverse environmental impacts of construction.
- ESRP 6.3. Provide information on impacts on the aquatic ecosystem from construction so that an evaluation of the hydrological monitoring programs can be completed.

- ESRP 6.5.2. Provide information on impacts on the aquatic environment from construction in sufficient detail to permit evaluation of the applicant's proposed monitoring program.
- ESRP 6.6. Provide information on impacts on the aquatic ecosystem from construction so that a description and evaluation of the water-quality monitoring programs can be completed.
- ESRPs 9.3 and 9.4. Provide a notification to the reviewers of ESRPs 9.3 and 9.4 that alternative locations and plant or component designs should be considered if the reviewer determines that a proposed construction activity will result in an adverse environmental impact that cannot be mitigated by alternative construction practices and procedures.
- ESRP 10.1. Provide a brief summary of the unavoidable impacts that are expected to occur during construction. This should be limited to the more significant impacts (e.g., temporary loss of habitat for "important" species).
- ESRP 10.2. Provide a brief summary of irreversible and irretrievable commitments of aquatic resources that are expected to occur during construction. For example, this would include any permanent loss of aquatic habitat or loss of wetlands.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of the potential impacts. The following site and vicinity data or information should be obtained:

- a map of the site and vicinity delineating areas of construction, particularly those where habitat of "important" species (see definition in Table 2.4.2-1) is expected to be altered, such as areas to be cleared along stream banks and areas proposed for the disposal of dredged material (from the environmental report [ER] and ESRP Section 3.1)
- the proposed schedule of construction activities
- the clearing methods, temporary and permanent erosion, runoff, and siltation control methods, dust suppression methods, and other construction practices for control or suppression specific to the site (from the ER)
- the area of disturbance for each habitat type listed in the top two items above and the total aquatic area to be disturbed, and an estimate of the amount of these habitats that will be destroyed relative to the total amount present in the region (from the ER)
- the aquatic areas to be covered by permanent station facilities (from the ER)

- any proposed construction or refurbishment activity expected to impact “important” species and habitats (from the ER)
- tolerances and/or susceptibilities of “important” biota to physical and chemical pollutants of construction origin (from the ER and the general literature).

Additional background information about the aquatic ecology, hydrology, water quality, and the impacts of hydrological alterations and water use, that is necessary for this review of impacts on aquatic resources from construction, should be obtained from the reviewers of ESRPs 2.3.1, 2.3.2, 2.3.3, 2.4.2, and 4.2, the ER, and from consultation with Federal, State, regional, local, and affected Native American tribal agencies.

The following data and information about transmission corridors and offsite areas should also be obtained:

- the clearing methods, erosion, runoff and siltation control methods (both temporary and permanent), dust-suppression methods, and other construction practices for impact control or minimization that are specific to the proposed transmission system (from the ER).
- the water bodies and wetlands crossed or spanned that are expected to have tower foundations located within them (from the ER)
- the location and areal limits of construction activities having impacts on aquatic environs (from the ER and ESRP 4.2)
- a description of the magnitude and schedule of construction activities that are expected to impact “important” aquatic species and their habitats (from the ER and ESRP 4.2).

Additional background information about the aquatic ecology along the transmission corridors and offsite areas, necessary for this review of impacts on aquatic resources from construction, should be obtained from the reviewer of ESRP 2.4.2 and can be found in the ER, general literature, and from consultation with Federal, State, regional, local, and affected Native American tribal agencies.

II. ACCEPTANCE CRITERIA

Acceptance criteria for the review of construction impacts on aquatic ecology in the vicinity of the site and transmission corridors are based on the relevant requirements of the following:

- Coastal Zone Management Act of 1972 with respect to natural resources and land or water use in the coastal zone

- Endangered Species Act of 1973 with respect to identifying impacts on threatened or endangered species and critical habitats by means of informal and/or formal consultations with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service
- Federal Water Pollution Control Act (FWPCA), commonly referred to as the Clean Water Act (CWA), of 1948 with respect to activities associated with the discharge of dredge or fill materials into waters of the United States
- FWPCA Amendments of 1972 with respect to restoration and maintenance of the chemical, physical, and biological integrity of water resources
- Fish and Wildlife Coordination Act of 1958 with respect to consideration of fish and wildlife resources in planning development projects that affect water resources
- Marine Mammal Protection Act of 1972 with respect to the protection of marine mammals
- Marine Protection, Research, and Sanctuaries Act of 1972 with respect to the dumping of dredged material into the ocean
- Rivers and Harbors Appropriations Act of 1899 with respect to construction of any bridge, causeway, dam, or dike over or in any port, roadstead, haven, harbor, canal, navigable river, or any other navigable water of the United States.

Regulatory positions and specific criteria necessary to meet the regulations and other statutory requirements identified above are as follows:

- Regulatory Guide 4.7, Rev. 2, *General Site Suitability for Nuclear Power Stations* (NRC 1998), contains guidance that the ecological systems and biota at potential sites and their environs should be sufficiently well known to allow reasonably certain predictions of impacts and that there would be no unacceptable or unnecessary deleterious impacts on populations of important species or on ecological systems from the construction of a nuclear power station.
- Memorandum of Understanding between the Corps of Engineers, U.S. Army, and the NRC for the Regulation of Nuclear Power Plants, 1975, provides guidance with respect to the NRC exercising the primary responsibility in conducting environmental reviews and in preparing environmental impact statements (EISs) for nuclear power stations. However, the Corps of Engineers will participate with the NRC in the preparation of EISs by helping to draft material for sections covering (1) coastal erosion and other shoreline modifications, (2) siltation and sedimentation processes, (3) dredging activities and disposal of dredged materials, and (4) location of structures affecting navigable waters.

- Second Memorandum of Understanding and Policy Statement Regarding Implementation of Certain NRC and EPA Responsibilities, serves as the legal basis for NRC decisionmaking concerning licensing matters covered by NEPA and Section 511 of the Federal Water Pollution Control Act (FWPCA), commonly referred to as the CWA.

Technical Rationale

The technical rationale for evaluating the applicant's construction impacts on aquatic ecosystems is discussed in the following paragraph:

The EIS needs to include an analysis that considers the environmental and other effects of construction on the aquatic environment and the alternatives available for reducing or avoiding adverse environmental and other effects, as well as the environmental benefits of the proposed action. Following the acceptance criteria listed above will help ensure that the environmental impact of the proposed action is considered with respect to matters covered by such standards and requirements.

III. REVIEW PROCEDURES

When reviewing the impacts of station construction on aquatic ecology, the reviewer should take the following steps:

- (1) Review the general data and information necessary to determine the impacts of station construction on aquatic ecology:
 - (a) Identify the construction activities that impact "important" aquatic species and habitats of the site and vicinity, transmission corridors, and offsite areas.
 - (b) Determine the areal extent and location of such potential impacts.
 - Prepare a map superimposing impact areas over resource areas.
 - During the site visit, inspect areas where construction activities will occur, and inspect all other potentially impacted areas.
 - When necessary, supplement the data and information specified in this part through consultations with Federal, State, regional, local, and affected Native American tribal agencies (e.g., the U.S. Fish and Wildlife Service and State fish and wildlife agencies).
- (2) Review impacts of construction on aquatic ecology:

Review and discuss the following impacts:

- (a) Determine how construction activities will impact “important” species and their habitats (e.g., those resulting from scouring and siltation, dredging and soil disposal, and interference with shoreline processes), and estimate the magnitude and duration of such impacts.
- (b) Determine the impacts of construction on threatened or endangered species, evaluating these impacts relative to the local population and the total estimated population over the entire range of the species as noted in the literature.
- (c) Identify water bodies receiving construction effluents and the expected average and maximum flow rates, composition, and physical characteristics of these effluents (from ESRP 4.2).
- (d) Describe proposed construction management practices for the amelioration of impacts (from the ER). For example,
- avoid narrow reaches of water bodies and important habitats as sites for locating intake or discharge structures
 - provide a zone of passage that permits normal movement of “important” species populations and maintenance of the harvestable crop of economically important populations.
- (e) For important species having commercial or recreational value, estimate the magnitude of the impact. This may be expressed in terms of dollars, lost opportunity for recreational pursuits, percent reduction in harvest, percent loss of habitat, or other appropriate quantifiers. In absence of more sophisticated population models, these determinations can usually be based on percent of habitat type lost.
- (f) If threatened or endangered species are known to occur in the project area, and the proposed project is predicted to add to their further endangerment, consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service under Section 7 of the Endangered Species Act.
- (g) Identify potential disturbances of benthic areas by
- placement of intake and discharge structures
 - channel modifications for navigation or flow control
 - placement and removal of cofferdams
 - construction of bulkheads, piers, jetties, basins, and storm sewers
 - direct dredging, including the area that may be affected by resulting siltation and turbidity.
- (h) Analyze the importance of these disturbed benthic areas to “important” species, taking into account the relationship between the area disturbed and the remaining comparable undisturbed area in the region available for the continued maintenance of impacted biota.

- (i) Relate the critical life history and habitat needs of “important” fish and shellfish (e.g., seasonal requirements, migration routes, spawning areas, nursery grounds, and feeding and wintering areas) to the plant construction schedule and consider whether impacts are likely to be of short duration or otherwise reversible.
- (j) In analyzing such impacts, consider
- percent of the water body cross section that might be obstructed by construction activity at any time
 - time and duration of such obstruction
 - potential changes to water quality caused by exposure of substrate to contaminants during construction (e.g., dredging for intake channels, cofferdam construction)
 - coordinating this review with the District Office of the Corps of Engineers.
- (k) Identify sediments, petroleum products, pesticides, fertilizers, heavy metals, and other potential pollutants entering affected water bodies.
- Consider both the points of entry of site drainage into surface-water bodies and the areal extent of impact by suspended materials and siltation.
 - Determine the potential for reversibility of impacts following completion of construction.
 - Assess plans for maintenance of siltation ponds or catchment basins.
- (l) Identify potential clearing along reaches of streams, rivers, and other water bodies.
- Identify water bodies where such habitat alterations will occur and indicate the extent of such changes.
 - Compare this with the extent of remaining similar habitats in the region.
- (m) Identify potential dewatering effects on groundwater supply, wetlands (protected under Executive Order 11990 as amended by Executive Order 12608), and other aquatic habitats.
- Consider the location and areal extent of any wetlands that will be drained.
 - Determine the relative extent of comparable wetlands in the region and, as in item (g) above, address the relative importance to the ecosystem of the impacted wetlands in comparison with the regional wetlands.

- Examine the potential for reversibility of impacts and environmental improvement following construction.
- (n) Identify disposal plans for dredged material and placement of fill material.
- Identify the areal extent of any water bodies or wetlands that would receive dredge spoils during construction.
 - Consider the relative extent of similar water bodies and wetlands in the region, and in this context, analyze the importance of the impacted wetlands and water bodies to the ecosystem.
 - Coordinate this review with the District Office of the Corps of Engineers.
- (o) Ensure that aquatic species expected to become established in cooling ponds are identified.
- Ensure that the applicant has described in the ER the aquatic species that are expected to become established in cooling ponds.
 - Consider how these colonizations may impact aquatic species in adjacent water bodies and wetlands in the site and vicinity.
- (p) In addition to the above analyses (items a-p), consider any other site-specific construction impacts to aquatic ecosystems that can be predicted on the basis of construction and the local aquatic ecosystem, consulting with the reviewers for ESRPs 2.3, 2.4.2, 3.6, and 4.2 to identify such additional impacts.
- (q) Ensure that initial evaluation of environmental impacts has been submitted by the applicant if the applicant wishes to accelerate the start of construction.
- Ensure that an applicant wishing to accelerate the start of construction by early submittal of the ER has submitted in the ER an initial evaluation of environmental impacts based on an analysis of at least 6 months of field data related to the proposed facility and suitable projections of the remaining seasonal periods if information has already been provided on the critical life stages and biologically significant activities (e.g., spawning, migration) that increase the vulnerability of the potentially affected biota at the proposed site.
 - If this has been done, the reviewer should ensure that the applicant makes a commitment to furnish, within 6 months of the time of filing, a final evaluation based on a full year of field data.
- (r) Become familiar with the provisions of standards, guides, and agreements pertinent to the construction of nuclear power stations:

- Refer to the “Acceptance Criteria” section of this ESRP for a list of the standards that are applicable to this environmental review.
- Where required by these provisions, consult with the reviewers of ESRP 2.3 and with appropriate agencies (e.g., the U.S. Fish and Wildlife Service and the State wildlife agency) to ensure compliance with the applicable regulations.
- Analyze construction activities in light of recognized best management practices.

IV. EVALUATION FINDINGS

Input to the EIS should include (1) a list of adverse impacts of construction to aquatic ecosystems, (2) a list of the impacts for which there are measures or controls to limit adverse impacts and the associated measures and controls, (3) the applicant’s commitments to limit these impacts, and (4) the staff’s evaluation of the adequacy of the applicant’s measures and controls to limit adverse impacts. This information should be summarized by the reviewer of ESRP Section 4.6.

For all construction activities, the commitment of aquatic resources should be indicated. The reviewer should also evaluate the proposed construction activities to ensure that the applicant is planning to use generally acceptable practices that should result in minimizing impacts associated with such practices (see 40 CFR 423.40). Practices and commitments proposed by the applicant for the protection of the environment should be described.

Any construction activity that should receive mitigative action should be described by the staff. Where mitigation of a predicted impact is an option, the reviewer should evaluate appropriate measures, which could include alternative placement of structures, alternative schedules, or alternative construction practices. The reviewer should evaluate alternatives for any proposed construction activity that is predicted to result in an adverse impact that cannot be mitigated.

The depth and extent of the input to the EIS will be governed by the attributes of the aquatic ecological resources that could be affected by plant construction and operation, and by the nature and magnitude of the expected impacts to these resources. The reviewer should screen each predicted impact using criteria appropriate to the impacted segment of the ecosystem. The following should be evaluated by the reviewer for inclusion in the EIS:

- loss of habitat for endangered or threatened species in the context of guidelines under the Endangered Species Act of 1973. If loss of habitat for commercially or recreationally important species occurs, the reviewer should consider the effects on the harvestable crop. It should generally be concluded that loss of up to 5% of such habitat in the site vicinity will have negligible impact on the crop and need no further analysis. Where losses exceed 5%, the reviewers should consider the loss in relation to regional abundance of these species.
- construction practices to minimize soil erosion and the number of hectares disturbed

- the clearing of vegetation from stream banks, making certain that it is limited to that necessary for placement of structures
- the applicant's commitment to the use of best management practices
- alternatives to mitigate such impacts, such as using a fish hatchery and habitat restoration to increase natural fish production, if the applicant's ER reveals a potential significant impact on fish populations
- lost "important" aquatic species and habitats from the viewpoints of their uniqueness within the region under consideration, relative impacts, and long term net effects
 - The assessments of relative impacts should include statements expressed in percentage terms in which the amount of expected resource loss is related to the total resource in the immediate region and in which the total resource in the immediate region is related to that in the surrounding regions.
 - The assessments of long term net effects should include statements about whether impacts represent long-term net losses, long-term net gains, or something in between. For example, short term impacts to individuals in the local impact area may be severe while long-term impacts to the local population may represent no net losses.
- disturbance of benthic areas. All dredged areas or areas affected by dredging may be considered as temporarily lost habitat; therefore dredging should be limited, if possible.
- surface runoff. Good construction practices will generally control surface runoff. Where drainage courses represent an especially important resource, attention should be given to measures for their protection during construction or refurbishment. The reviewer should (1) determine if construction activities affecting water quality (e.g., runoff, turbidity) will comply with Federal, State, regional, and local water-quality standards, and (2) reach a conclusion as to whether controls proposed by the applicant will ensure satisfactory protection of surface waters.
- dewatering on wetlands. Guidelines under the CWA Amendments of 1972, the Coastal Zone Management Act of 1972, and the Marine Sanctuaries Act of 1972 should be followed in evaluating the significance of dewatering on wetlands. Generally, dewatering of biologically productive wetlands may be considered an adverse impact that should be avoided. The percentage loss of such wetlands in the region should be considered to place the loss in perspective for the licensing decision. Because of the importance of wetlands, alternatives to avoid any loss of this habitat should always be considered.
- dredge spoils and placement of fill. Drainage from dredge spoil areas should comply with existing EPA guidelines. The reviewer should reach a conclusion about whether adequate practices have

been provided for management of this stage of construction. Filling of biologically productive wetlands should generally be avoided. Dumping of dredge spoils should be performed under the cognizance of the EPA and the District Office of the Corps of Engineers.

If the reviewer verifies that sufficient information has been provided in accordance with the requirements of this ESRP section, then the evaluation supports the following types of concluding statements to be included in the EIS:

The staff reviewed the available information relative to impacts to the aquatic environment on or in the vicinity of the site. The staff concludes that the list and description of impacts is adequate to comply with 10 CFR 51.45.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 51.45, "Environmental report."

40 CFR 423, "Steam Electric Power Generating Point Source Category."

Executive Order 11990, "Protection of Wetlands."

Executive Order 12608, *52 Federal Register* 34617, September 9, 1987.

Coastal Zone Management Act, as amended, 16 USC 1451 et seq.

Endangered Species Act, as amended, 16 USC 1531 et seq.

Federal Water Pollution Control Act (FWPCA), as amended, 33 USC 1251 et seq. (also known as Clean Water Act).

Fish and Wildlife Coordination Act Amendment, 16 USC 661 et seq.

Marine Mammal Protection Act of 1972, as amended, 16 USC 1361 et seq.

Marine Protection, Research, and Sanctuaries Act, as amended, 33 USC 1401 et seq.

“Memorandum of Understanding between the Corps of Engineers, U.S. Army, and the U.S. Nuclear Regulatory Commission for the Regulation of Nuclear Power Plants.” 40 *Federal Register* 37110, August 25, 1975.

Rivers and Harbors Appropriations Act of 1899, 33 USC, 403 et seq.

“Second Memorandum of Understanding and Policy Statement Regarding Implementation of Certain NRC and EPA Responsibilities,” 40 *Federal Register* 60115, December 31, 1975.

U.S. Nuclear Regulatory Commission (NRC). 1998. *General Site Suitability for Nuclear Power Stations*. Regulatory Guide 4.7, Rev. 2, Washington, D.C.



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**ENVIRONMENTAL
 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.4 SOCIOECONOMIC IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's preparation of an introductory paragraph for the portion of the environmental impact statement (EIS) that describes the socioeconomic impacts of construction. The scope of the paragraph covered by this plan introduces the material from the reviews conducted under ESRPs 4.4.1 through 4.4.3.

Review Interfaces

None.

Data and Information Needs

The reviewer for this ESRP should obtain the proposed organizational structure of the EIS from the Environmental Project Manager.

II. ACCEPTANCE CRITERIA

The reviewer should ensure that the introductory paragraph prepared under this ESRP is consistent with the intent of the following regulation:

- 10 CFR 51.70(b) with respect to preparation of an EIS that is concise, clear, and analytic, and written

October 1999

4.4-1

NUREG-1555

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Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

in plain language.

Regulatory positions and specific criteria necessary to meet the regulations identified above are as follows:

- There are no regulatory positions specific to this ESRP.

Technical Rationale

Technical rationale for evaluating the applicant's potential socioeconomic impacts is discussed in the following paragraph:

Introductory paragraphs that orient the reader with respect to the relevance of the material to the overall organization and goals of the EIS add clarity to the presentation.

III. REVIEW PROCEDURES

The material to be prepared is informational in nature, and no specific analysis of data is required.

IV. EVALUATION FINDINGS

The reviewer of information covered by this ESRP should prepare at least one introductory paragraph for the EIS. The paragraph(s) should introduce the nature of the material to be presented by the reviewers of information covered by ESRPs 4.4.1 through 4.4.3. The paragraph(s) should list the types of information to be presented and describe their relationships to information presented earlier and to be presented later in the EIS.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCE

10 CFR 51.70, "Draft environmental impact statement—general."



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**ENVIRONMENTAL
 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.4.1 PHYSICAL IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's identification and assessment of the direct physical impacts of construction-related activities^(a) to the community. Among these are the construction disturbances of noise, odors, vehicle exhaust, dust, vibration, and shock from blasting.

The scope of the review directed by this plan should include consideration of impacts resulting from plant construction, transmission corridors and access roads, other offsite facilities, and project-related transportation of goods and materials. The review should be of sufficient detail to predict and assess potential impacts and to show how these impacts should be treated in the licensing process. Where necessary, the reviewer should identify alternative locations, designs, practices, and procedures that would mitigate predicted adverse impacts.

Review Interfaces

The reviewer for this ESRP should obtain input from or provide input to the reviewers for the following ESRPs, as indicated:

- ESRPs 2.1 and 2.2. Obtain a detailed description of the plant location and of the surrounding region affected by the plant construction.

(a) Construction-related activities are those that occur solely as a result of plant construction.

October 1999

4.4.1-1

NUREG-1555

USNRC ENVIRONMENTAL STANDARD REVIEW PLAN

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Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

- ESRP 2.3.2. Obtain descriptions of bodies of water likely to be affected by noise, odor, transportation, or construction or whose aesthetics would be affected.
- ESRPs 2.5.1 and 2.5.2. Obtain the socioeconomic features such as population and community characteristics of the site environs that potentially may be subject to physical impacts from construction.
- ESRP 2.7. Obtain estimates of the impacts of non-radiological emissions related to plant construction on air quality.
- ESRP 3.1. Obtain any aspects of the plant's appearance that may cause physical impacts in the region, including visual aesthetics.
- ESRP 3.7. Provide a detailed description of any power transmission system construction associated with the plant that may physically impact the region, including visual aesthetics.
- ESRPs 4.1.1 through 4.1.2. Obtain data on land uses likely to be affected physically or aesthetically by construction noise, odors, dust, etc. at the plant and along transmission and access corridors. Of special concern are nearby recreation areas.
- ESRP 4.2.2. Obtain data on construction activities that may have adverse impacts on noise, odors, dust, shock, vibration, or aesthetics in the vicinity of the plant and transmission and access corridors.
- ESRP 4.6. Provide a list of the applicant's commitments and the practices that the staff identified to limit adverse environmental impacts of construction.
- ESRP 5.8.1. Provide the features of plant construction expected to result in operational impacts.
- ESRPs 9.3 and 9.4. Provide a request to the reviewers for ESRPs 9.3 and 9.4 to consider alternative plant designs, locations, or construction practices that would avoid the impacts if the reviewer determines that there are physical impacts of construction that are adverse and should be avoided.
- ESRP 10.1. Provide a list of the unavoidable physical impacts that are predicted to occur as a result of the proposed construction activity.
- Interface with Environmental Project Manager (EPM). Consult with the EPM on practicality and cost effectiveness of any proposed modifications to mitigate physical socioeconomic impacts of construction.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of the potential impacts. The following information should be obtained:

- the distribution of people, buildings, roads, and recreational facilities vulnerable to impact from construction-related activities (from the environmental report [ER] and consultation with Federal, State, regional, local, and affected Native American tribal agencies).
- applicable standards for levels of noise, dust, and gaseous pollutants (from consultation with Federal, State, regional, local, and affected Native American tribal agencies)
- predicted noise levels at sensitive areas identified in the first item listed above (from the ER)
- predicted air pollutant levels at sensitive areas identified in the first item listed above (from the ER).

II. ACCEPTANCE CRITERIA

Acceptance criteria are based on meeting the relevant requirements for noise, dust, air pollution, and visual aesthetics of the following regulations:

- Clean Air Act of 1970, as amended, with respect to air quality during construction activities.
- 40 CFR 50-90 as related to National Primary and Secondary Air Quality Standards.
- Noise Control Act of 1972, as amended, with respect to noise from construction.
- 10 CFR 51.71 and 10 CFR 51.45 with respect to describing the significance or potential significance of physical impacts of plant-construction activities on nearby communities.

Regulatory positions and specific criteria necessary to meet the regulations identified above are as follows:

- Regulatory Guide 4.2, Rev. 2, *Preparation of Environmental Reports for Nuclear Power Stations* (NRC 1976), with respect to economic and social impact of siting and construction activities.

Technical Rationale

The technical rationale for evaluating the applicant's potential physical impacts is discussed in the following paragraphs:

In accordance with 10 CFR 51.45(d), the applicant is required to submit in the ER information needed for evaluating socioeconomic impacts of construction. Similar information is required to be present in the EIS pursuant to 10 CFR 51.71.

Reasonably detailed information about the potential for physical socioeconomic impacts such as noise or dust at the site in question is required to assess any potential social or economic impacts that might occur as a result of plant construction or operation. Data in the ER must be adequate to make these determinations.

III. REVIEW PROCEDURES

The reviewer's analysis of construction impacts on the community should be linked to the environmental reviews directed by ESRPs 2.1, 2.2, 2.5.1, 2.5.2, 3.1 and 3.7 to ensure that the environmental factors most likely to be impacted by the proposed construction are adequately described. The reviewer should ensure that information presented in the applicant's ER is complete and accurate. The reviewer should recognize that physical impacts to a community from construction of a nuclear plant are not markedly different from any other large heavy construction project. With this in mind, the reviewer should take the following steps:

- (1) For any particular construction related activity, first consider the distribution of residents and transients who could be affected, including determination of sensitive use patterns (e.g., hospitals, residences, recreational areas) and the allowable limits of impacts.
- (2) Identify the potential impacts on the community and predict their extent and magnitude, including impacts from dust, noise, shock from blasting, and polluting gases and particles.
 - Consider impacts in qualitative terms where the effect on the community is expected to be minor.
 - Where adverse impacts (i.e., impacts that should be mitigated or avoided) can be predicted, conduct a more detailed analysis and where practical, make quantitative estimates of the magnitude of the impacts.
- (3) Identify the applicant's commitments to mitigate the physical impacts. These include
 - wetting down roadways and construction sites
 - scheduling noisy operations during daytime hours
 - suppressing blast and shock effects by using mats.
- (4) Consider the major physical impacts of plant construction. The specific impacts should include the impact of construction on transportation and the aesthetic characteristics of the region.

- (5) Become familiar with the provisions of standards, guides, and agreements pertinent to the construction of nuclear power plants.
- (6) Refer to the "Acceptance Criteria" section of this ESRP for a list of those generally pertinent to this environmental review.
- (7) Consult with appropriate Federal, State, regional, local, and affected Native American tribal agencies to verify that current, applicable regulations and guides are available. This should include, for example, consultation with the EPA and State and local agencies for current ambient air quality standards and air pollutant levels and Occupational Safety and Health Administration guidelines and standards applicable to facility construction.
- (8) Verify that the applicant has made commitments to comply with these applicable regulations and guides.
- (9) Become familiar with general references on construction practices and impacts.
- (10) Examine proposed construction activities in light of recognized "good practice." The term "good practice" as used here refers to those activities that tend to mitigate noise levels and adverse construction impacts on the community.

IV. EVALUATION FINDINGS

The review conducted under this plan should be directed toward accomplishing the following objectives: (1) public disclosure of physical impacts resulting from construction related activities, (2) presentation of the basis for the staff analysis, and (3) presentation of staff conclusions regarding physical impacts of construction related activities to the community.

If the site is remote from a community and the applicant is committed to meeting applicable guides and standards and to following good construction practices, these facts should be stated with only a very brief discussion noting that under these conditions, physical socioeconomic impacts should be minor. Where this is not the case, each of the areas identified in the analysis section should be addressed briefly with conclusions regarding the significance of the impact on the community. The reviewer should discuss the applicant's commitments to meet applicable Federal, State, regional, local, and affected Native American tribal standards and should describe mitigating actions that should be taken by the applicant during construction. If there are some unique impacts resulting from unusual methods, materials, or other construction related activities, these impacts should be addressed in detail.

If the reviewer determines that the applicant is committed to complying with all applicable standards and that the applicant's proposed construction related activities represent good construction practices, the reviewer may conclude that the impacts resulting from these activities will be acceptable.

Where predicted impacts are adverse, the reviewer should consider mitigative measures, including alternative placement of structures, alternative schedules, alternative construction practices, or other conditions to be imposed by the construction permit.

Evaluation of each identified impact should result in one of the following determinations:

- *The impact is minor, and mitigation is not required.* When all impacts are of this nature, the reviewer should include a statement in the EIS of the following type:

The staff reviewed the available information on the physical impacts of construction. Based on this review, the staff concludes that there are no significant physical socioeconomic environmental impacts as a result of construction.

- *The impact is adverse, but can be mitigated by specific design or procedure modifications that the reviewer has identified and determined to be practical.* For these cases, the reviewer should consult with the EPM and the reviewers for ESRPs 9.3 and 9.4 for verification that the mitigation measures are practical and will lead to an improvement in the benefit-cost balance. The reviewer should prepare lists of verified modifications for the reviewer for ESRP 4.6.

A statement similar to the following should be included in the EIS:

The staff reviewed the information on physical impacts of construction. Based on this review, the staff concludes that the following impacts require mitigation.

- *The impact is adverse and cannot be successfully mitigated, and is of such magnitude that it should be avoided.* When impacts of this nature are identified, the reviewer should inform the reviewers for ESRPs 9.3 and 9.4 that an analysis and evaluation of alternative designs or procedures is needed. The reviewer should participate in any such analysis and evaluation of alternatives that would avoid the impact and that could be considered practical. If no such alternatives can be identified, the reviewer is responsible for providing this information to the reviewer for ESRP 10.1.

A statement similar to the following should be included in the EIS:

The staff reviewed the information on physical impacts of construction. Based on this review, the staff concludes that the following impact(s) cannot be mitigated and should be avoided. Alternatives should be considered.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 51.45, “Environmental report.”

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

40 CFR 50-90, as related to National Primary and Secondary Air Quality Standards.

Clean Air Act Amendments of 1977, as amended, 41 USC 7401 et seq.

Noise Control Act, as amended, 42 USC 4901 et seq.

U.S. Nuclear Regulatory Commission (NRC). 1976. *Preparation of Environmental Reports for Nuclear Power Stations*. Regulatory Guide 4.2, Rev. 2, Washington, D.C.



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**ENVIRONMENTAL
 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.4.2 SOCIAL AND ECONOMIC IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's analysis and evaluation of the social and economic impacts of construction on the surrounding region^(a) and individual communities that could be affected by the proposed project.

The scope of the review directed by this plan includes the social and economic impacts resulting from construction and from the activities and demands of the construction labor force. Categories of impacts resulting directly from construction of the station include (1) private sector regional materials, products, and services, (2) regional labor, (3) tax revenues to local jurisdictions, (4) public facilities and services, (5) social or economic significance of ecological and land-use impacts, including human displacement, and (6) local planning-political decision processes. Categories of impacts resulting from the activities and demands of the construction labor force include (1) population-settlement pattern, (2) housing, (3) land use, (4) education, (5) other public facilities and service, (6) transportation, (7) private-sector goods and services, (8) employment and regional income, (9) tax revenues to local jurisdictions, (10) local planning-political decision processes, and (11) social structure and community cohesion. The reviewer should identify specific impacts and where they will occur and predict their relative magnitude. Where necessary, the reviewer should access alternative locations, designs, practices, or procedures that would mitigate predicted adverse impacts.

(a) See ESRP 2.5.2 for a definition of "region."

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Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

Review Interfaces

The reviewer for this ESRP should obtain input from or provide input to the reviewers for the following ESRPs, as indicated:

- ESRPs 2.5.1 and 2.5.2. Obtain the socioeconomic features, such as population and community characteristics, of the site environs that may be subject to economic impacts from construction.
- ESRPs 4.1.1, 4.1.2, 4.2, and 4.3. Obtain the potential environmental impacts from plant construction on the plant site, transmission corridors, offsite areas, water resources, and terrestrial resources of the region that may have associated social or economic impacts.
- ESRP 4.6.2. Provide a list of applicant commitments of practices to limit adverse environmental impacts of construction.
- ESRP 5.8.2. Provide the social and economic impacts of construction that are expected to extend throughout the operating lifetime of the plant.
- ESRPs 9.3 and 9.4. Provide a request to the reviewers for ESRPs 9.3 and 9.4 to consider alternate plant designs, locations, or construction activities that would avoid the impacts if the reviewer determines that proposed construction activities will result in adverse social or economic impacts that should be avoided.
- ESRP 10.1. Provide a list of unavoidable adverse social and economic impacts that are predicted to occur as a result of proposed construction activity.
- ESRP 10.2. Provide a brief summary of the irreversible and irretrievable commitments of social and economic resources predicted to occur as a result of proposed construction activity.
- ESRP 10.3. Provide an assessment of the incremental increase in regional productivity and the expected annual tax payments to local and State governments for the construction period. This information should support analysis of the trade-offs between short term uses of the site and long term productivity of the region.
- Interface with the Environmental Project Manager (EPM). Consult with the EPM to verify that proposed modifications based on socioeconomic impacts are practical and cost effective.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of the potential impacts. The following data or information should be obtained:

- economic base data and information, including
 - important regional industry by category, including employment (from ESRP 2.5.2)
 - the size and nature of the heavy construction industry and construction labor force within the region (from ESRP 2.5.2)
 - the total regional labor force (from ESRP 2.5.2)
 - regional unemployment levels and future economic outlook (from ESRP 2.5.2).
- data and information about the political structure, including regional political jurisdictions, tax districts, and local and regional planning and administrative organizations (from ESRP 2.5.2)
- demographic information, including population forecasts (from ESRP 2.5.1)
- social structure information that covers the major community structures (from ESRP 2.5.2)
- housing information, including the sales and rental market in region, number of units, turnover and vacancy rates, and trends in addition to housing stock, adequacy of structures, and location of existing and projected housing (from ESRP 2.5.2)
- data and information about the educational system, including regional primary and secondary schools and higher institutions, including capacity and present percentage of utilization (from ESRP 2.5.2)
- recreational information that covers public and private recreational facilities and opportunities, including the present and projected capacity and percentage of utilization (from ESRP 2.5.2)
- information about taxation, including the regional tax structure and distribution of the present revenues to each jurisdiction and district (from ESRP 2.5.2)
- land-use planning and zoning information about local plans concerning land use and zoning that are relevant to population growth, housing, and changes in land-use patterns (from ESRP 2.5.2)
- information about social services and public facilities, including the
 - present and projected water and sewer facilities, including present capacity and projected percentage of utilization (from ESRP 2.5.2)
 - present and projected police and fire capabilities (from ESRP 2.5.2)
 - location of hospitals, number of medical doctors, and specialized health facilities, including present and projected capacity (from ESRP 2.5.2).

- information about highways and transportation that covers
 - regional and local highway systems, including carrying capacity and condition of roads and highways (from ESRP 2.5.2)
 - modifications that might affect traffic flow to and from the station site (from ESRP 2.5.2).
- construction induced factors, including the following:
 - annual expenditures within the region for materials and services during construction (from the environmental report [ER])
 - plans to supplement public facilities and services to support construction and agencies responsible for facility expansion (from the ER and consultation with Federal, State, regional, local, and affected Native American tribal agencies)
 - taxes by type and jurisdiction to be paid during construction (from the ER and consultation with Federal, State, regional, local, and affected Native American tribal agencies)
 - annual construction labor force requirements (for each quarter year, if possible) over the construction period. Where necessary, requirements by major construction craft may be reported (from the ER).

II. ACCEPTANCE CRITERIA

Acceptance criteria for including socioeconomic impacts during construction are based on meeting the relevant requirements of the following:

- 10 CFR 51.45(c) with respect to the analysis of socioeconomic data
- 10 CFR 51.45(d) and 51.71(d) with respect to the analyses required in the development of the ER and EIS
- 10 CFR 52.18 with respect to reviewing applications for early site permits
- 10 CFR 52.81 with respect to reviewing applications for combined licenses
- 10 CFR 51 and 52 with respect to describing the significance or potential significance of socioeconomic impacts of plant construction activities.

Regulatory positions and specific criteria necessary to meet the regulations identified above are as follows:

- Regulatory Guide 4.2, Rev. 2, *Preparation of Environmental Reports for Nuclear Power Stations* (NRC 1976), addresses benefits and costs to nearby populations from construction activities.

Technical Rationale

The technical rationale for evaluating the applicant's potential social and economic impacts during construction is discussed in the following paragraph:

In accordance with 10 CFR 51.45(d), the applicant is required to submit in the ER information needed for evaluating potential socioeconomic impacts on communities in the vicinity of the plant. Similar information is required to be present in the environmental impact statement (EIS) pursuant to 10 CFR 51.71. Detailed information about the potential for social and economic impacts of plant construction on the surrounding region and individual communities is needed in the ER so that the staff may evaluate the significance of these impacts.

III. REVIEW PROCEDURES

The reviewer's analysis of the social and economic impacts of construction should be linked to the environmental descriptions provided by the reviewer for ESRP 2.5.2 (Community Characteristics). The reviewer should ensure that the environmental factors most likely to be impacted by plant construction are described in sufficient detail to permit assessment of the predicted impacts. Based on these descriptions, the reviewer should identify and analyze components of the regional and community social, political, and economic systems that would be potentially impacted. The reviewer should take the following steps:

- (1) From the full scope of potential impacts, determine the impacts that are minor and those that are likely to be adverse and thus need detailed analysis.
 - Where practical, develop quantitative measures of adverse impacts.
 - Consider all impacts identified during the analysis to the extent practical, in terms of location, duration, and magnitude.
 - Be aware that the duration of some impacts will be longer than the construction period and that the character of such impacts may be altered due to completion of construction and dispersal of the construction labor force.
 - Confer with the reviewers for ESRP 4.1, Land-Use Impacts; 4.2, Water-Use Impacts; and 4.3, Ecological Impacts, to determine if any of the construction impacts identified under these sections are of sufficient social or economic consequence to be examined further under this plan.

- (2) Consider the socioeconomic impacts of construction on regional housing and public services such as safety, social services, tourism and recreation, public utilities, education, transportation, and offsite land use.
- (3) For analytical purposes, it is effective to categorize impacts into those directly resulting from plant construction and those resulting from the activities and demands of the construction labor force. Analyze the social and economic impacts directly associated with construction, as follows:
- Estimate the annual value of the major categories of materials and services to be purchased within the region and compare that value with the estimated value of the materials and services that would have been produced without plant construction.
 - Estimate the annual construction labor force requirements (for each quarter year, if possible) over the construction period and compare them with the number of workers available from within the region. Where necessary, determine these requirements for the major construction crafts, using standard craft categories.
 - Identify the jurisdictions receiving significant tax revenues derived from plant construction purchased services and materials.
 - Estimate the physical demands placed by plant construction on local public facilities and services (e.g., fire, police, sewer, and water) and compare these demands with existing facilities and services.
 - In consultation with appropriate reviewers, determine if any impacts identified under land-use, water-use, and ecological impacts require further analysis regarding social and economic consequences. Such impacts could include economic impacts of changes in visual quality or recreation resources.
 - Determine the families or households to be displaced by plant construction. Analysis should
 - determine any equitable compensation for relocation and include analysis of adequacy of mitigation plans
 - address socioeconomic effects of labor force mobility, and residential choices.
- (4) Analyze the socioeconomic impacts associated with the construction labor force, as follows:
- From the previous estimates of construction labor requirements and the number of workers available within the region, predict the number of workers originating from within the region and the number of in-migrants.

- Estimate the number of construction force in-migrants, and predict their temporal and geographic distribution.
- Estimate the number of induced in-migrants, and predict their temporal and geographic distribution.
- Estimate the overall impact of in-movers and procurements of goods and services on regional income, employment, and population, and identify critical services and goods for the affected region.
- Predict potential changes in regional housing patterns (e.g., introduction of mobile homes).
- Estimate the additional level of public facilities and services required to support in-migrants as a function of their probable location. Types of facilities and services that should be considered include education, water and sewer, safety, health, welfare, transportation, and recreation.
- Identify adverse traffic conditions caused by transportation of workers and materials to and from the site.
- Identify the jurisdictions expected to receive significant tax revenues generated by the project payroll and induced economic activity.
- Compare the total flow of tax revenues from the various sources associated with plant construction to the expenditures required to meet the additional demand for public facilities and services.

IV. EVALUATION FINDINGS

Input from the ESRP 4.4.2 review to the EIS should be directed toward meeting the following objectives: (1) public disclosure of social and economic impacts resulting from construction, (2) presentation of the basis for the staff analysis, and (3) presentation of staff conclusions regarding impacts of the reviewed construction activity to the region's social, political, and economic structure.

The following information should be included in the EIS:

- a statement of the scope of coverage and the objectives of the analysis
- a summary of the steps taken in the analysis and reference to methodologies employed
- a summary of the findings of the analysis for each impact category with the level of detail being related to the importance/severity of the anticipated impact
- identification and assessment of potential mitigation measures.

Evaluation of each identified impact should result in one of the following determinations:

- *The impact is minor, and mitigation is not required.* When all impacts are of this nature, the reviewer should include a statement of the following type:

The staff reviewed the available information on the construction of the proposed facility. Based on this review, the staff concludes that there are no significant socioeconomic impacts on communities in the vicinity of the plant as a result of construction.

- *The impact is adverse, but can be mitigated by design changes or procedure modifications that the reviewer has identified and determined to be practical.* For these cases, the reviewer should consult with the EPM and the reviewers for ESRPs 9.3 and 9.4 for verification that identified mitigation measures are practical and will lead to an improvement in the benefit-cost balance. The reviewer should prepare a list of verified modifications and identified measures and controls to limit the corresponding impact. These lists should be provided to the reviewer for ESRP 4.6.
- *The impact is adverse and cannot be successfully mitigated, and is of such magnitude that it should be avoided.* When impacts of this nature are identified, the reviewer should inform the reviewers for ESRPs 9.3 and 9.4 that an analysis and evaluation of alternative sites, designs, or procedures is required. The reviewer should participate in any such analysis and evaluation of alternatives that would avoid the impact and that could be considered practical. If no such alternatives can be identified, the reviewer should be responsible for providing this information to the reviewers for ESRPs 10.1 and 10.2.

The reviewer should categorize impacts as those over which the applicant has some control and those over which the applicant has little or no control. The impacts over which the applicant has some control usually are a direct result of the construction process. The impacts over which the applicant has little or no control are indirect results of construction and are usually associated with the influx of the construction labor force.

Where the applicant has control over impacts, the criteria outlined above should be applied.

Where the applicant has little or no control over alternatives to mitigate impacts that in the reviewer's judgment are adverse, the reviewer should (1) prepare a description of these impacts for inclusion in the EIS, (2) where appropriate, identify potential solutions to the problem that are beyond the jurisdiction of the NRC, and (3) ensure that these impacts are considered in the staff's final evaluation of the proposed action.

The reviewer should verify that sufficient information has been provided in accordance with the requirements of this ESRP and that the evaluation supports the following type of concluding statement, to be included in the staff's EIS:

The staff reviewed the available information relative to the socioeconomic impacts of construction. The staff concludes that the information is adequate to satisfy the requirements of 10 CFR 51.45. These conclusions are based on the following:

- the applicant has developed the information using the recommended information sources and approaches suggested by prevailing professional practice
- the information sources used are recently updated versions.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.45, "Environmental report."

10 CFR 51.71, "Draft environmental impact statement—contents."

10 CFR 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

10 CFR 52.18, "Standards for review of applications."

10 CFR 52.81, "Standards for review of applications."

U.S. Nuclear Regulatory Commission (NRC). 1976. *Preparation of Environmental Reports for Nuclear Power Stations*. Regulatory Guide 4.2, Rev. 2, Washington, D.C.



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 STANDARD
 REVIEW PLAN**
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4.4.3 ENVIRONMENTAL JUSTICE IMPACTS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's review of environmental impacts on minority and low-income populations by construction to the extent that such information can serve as the basis of an environmental impact statement (EIS) section on environmental justice.

The scope of the review directed by this plan should include consideration of the methods that are used to identify and quantify impacts on minority and low-income populations, the location and significance of any environmental impacts during construction on populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review should be of sufficient detail to permit subsequent staff assessment and evaluation of specific impacts, in particular whether these impacts are likely to be negative and disproportionate.

Review Interfaces

The reviewer for this ESRP should obtain input from or provide input to the reviewers for the following ESRPs, as indicated:

- ESRP 2.5.4. Obtain descriptions of the minority and low-income populations that could be disproportionately impacted by proposed project construction activities and the mechanisms (including socioeconomic) by which disproportionate harm could occur.

October 1999

4.4.3-1

NUREG-1555

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Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

- ESRPs 4.1.1 through 4.6. Obtain descriptions of potential environmental (including socioeconomic [CEQ 1997]) impacts of construction that may have a bearing on environmental justice.
- ESRPs 9.3 and 9.4. If the reviewer concludes that construction will result in disproportionate adverse impacts on minority or low-income populations that should be avoided, then request that the reviewers for ESRPs 9.3 and 9.4 consider alternate plant designs, locations, or construction activities that would avoid the impacts.
- ESRP 10.1. Provide descriptions of unavoidable adverse environmental impacts that disproportionately affect minority and low-income populations during construction.
- ESRP 10.2. Provide descriptions of environmental impacts that disproportionately affect minority and low-income populations during construction through short-term use and effects on long-term productivity.
- ESRP 10.3. Provide descriptions of irreversible and irretrievable environmental impacts that disproportionately affect minority and low-income populations as a result of construction.

Data and Information Needs

The type of data and information needed will be affected by site- and station-specific factors, and the degree of detail should be modified according to the anticipated magnitude of the potential impacts. The data requirements analysis should generally be the same for any type of environmental review that requires the preparation of an environmental report (ER). The following data or information should be obtained:

- pathways where any environmental (including socioeconomic) impact during construction may interact with cultural or economic facts that may result in disproportionate environmental impacts on minority and low-income populations
- any assessment (qualitative or quantitative, as appropriate) of the degree to which each minority or low-income population would disproportionately experience adverse human health or environmental (including socioeconomic) impacts during construction as compared with the entire geographic area. In addition, information should be obtained on any assessment comparing the impacts with the larger overall geographic area encompassing all of the alternative sites.
- any assessment (qualitative or quantitative, as appropriate) of the significance or potential significance of such environmental impacts on each minority and low-income population
- any assessment of the degree to which each minority and low-income population would disproportionately receive any benefits compared with the entire geographic area

- any discussion of any mitigative measures for which credit is being taken to reduce environmental justice concerns
- when alternative sites are being evaluated, the same reviews should be available for each site.

Supplemental data provided by other individuals and organizations may be useful in determining the completeness of the applicant's identification of minority and low-income populations.

II. ACCEPTANCE CRITERIA

The acceptance criteria for environmental justice impacts during construction are based on the following:

- 10 CFR 51.45(c) with respect to analysis of socioeconomic data
- Executive Order 12898 (59 CFR 7629) with respect to minority populations and low-income populations.

Regulatory positions and specific criteria necessary to meet the regulations identified above are as follows:

- the Council on Environmental Quality (CEQ) guidance for addressing environmental justice (CEQ 1997), which should be followed as appropriate
- the guidelines for specific information requirements for environmental justice determinations, which are described in Attachment 4 to Office of Nuclear Reactor Regulation (NRR) Office Letter No. 906, Revision 1 (NRC 1996). NRR Office Letter No. 906 is revised periodically. Obtain the latest revision for current guidance. Information submitted by the applicant is adequate and meets the 10 CFR 51.45 requirements and NRR guidelines if it permits the identification of minority and low-income populations as required in that guidance.
- Regulatory Guide 4.7, Rev. 2., *General Site Suitability Criteria for Nuclear Power Stations* (NRC 1998a), which specifies the avoidance of disproportionately high and adverse impacts on minority and low-income populations during plant siting.

Technical Rationale

The technical rationale for evaluating the applicant's potential environmental justice impacts is discussed in the following paragraphs:

10 CFR 51.45(e) requires applicants to provide the information that the Commission needs in its development of independent analysis of environmental impacts. Executive Order 12898 directs Federal agencies to consider environmental justice as part of the NEPA process. NRC, while an independent agency, has agreed to comply with the Executive Order.

The purpose of the environmental justice assessment is to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects on minority and low-income populations. These populations may be present in scattered small groups or may have unusual customs, practices, or dependencies on specific resources that would be overlooked in a reconnaissance level analysis that focuses on the majority population. As a result, it is necessary to evaluate impacts for each such population and more carefully examine unusual environmental pathways (including socioeconomic pathways) that could result in disproportionately high and adverse impacts on them.^(a)

III. REVIEW PROCEDURES

To determine which impacts are likely to be of concern and, therefore, what environmental impact areas should be discussed, the reviewer should take the following steps:

- (1) Coordinate with the reviewers of ESRPs 4.1 through 4.6 to ensure that the appropriate impact areas are being discussed.
- (2) Examine the record of the public scoping process to determine whether appropriate environmental impact areas are being discussed with respect to environmental justice.
- (3) Contact the cognizant personnel of each affected State for sites located on or near State boundaries, or where transmission line routes, access corridors, or offsite areas pass through more than one State.
- (4) Analyze the potential impacts on minority and low-income populations.
 - (a) Briefly describe pathways by which any environmental impact during construction may interact with cultural or economic facts that may result in disproportionate environmental impacts on minority and low-income populations.
 - (b) Assess (qualitative or quantitative, as appropriate) the degree to which each minority or low-income population is disproportionately receiving adverse human health or environmental (including socioeconomic) impacts during construction as compared with the entire geographic area. In addition, there should be an assessment comparing the impacts with the larger overall geographic area encompassing all of the alternative sites.
 - (c) Assess the degree to which each minority and low-income population is disproportionately receiving any benefits compared with the entire geographic area.

(a) An example of unusual practices or pathways can be found in NRC (1998b), where proposed relocation of a road between two settlements disproportionately or adversely affected minority and low-income individuals, who ordinarily walked between the two settlements.

- (d) Assess (qualitatively or quantitatively, as appropriate) the significance or potential significance of such environmental impacts on each minority and low-income population. Significance is determined by considering the disproportionate exposure, multiple-hazard, and cumulative hazard conditions outlined in the Environmental Justice: Guidance Under the National Environmental Policy Act (CEQ 1997).
- (e) Discuss any mitigative measures for which credit is being taken to reduce environmental justice concerns.
- (f) When alternative sites are being evaluated, the same reviews should be available for each site.

IV. EVALUATION FINDINGS

The depth and extent of the input to the EIS will be governed by the extent and significance of the identified minority and low-income populations and by the nature and magnitude of the expected impacts of construction.

Data provided by the applicant are useful if

- data in the ER describe the degree to which each minority or low-income population is disproportionately prone to adverse human health or environmental impacts during construction as compared with the entire geographic area
- the data are consistent with data obtained from other sources, when available. In addition, a similar assessment is made in the ER for each of the alternative sites in comparison with the larger geographic region that encompasses all of the sites.
- when applicable, data in the ER describe the significance or potential significance of such environmental impacts on each minority and low-income population
- when applicable, data in the ER describe the degree to which each minority or low-income population is disproportionately prone to any benefits during construction in comparison to the entire geographic area
- when applicable, data in the ER describe any mitigative measures for which consideration is made to reduce environmental justice concerns
- the data in the ER consider the unique lifestyle and practices of minority and low-income communities (for example, subsistence activities or dependence on specific water supplies) that could result in disproportionate impacts from plant construction and site operations.

The following information should be included in the EIS:

- a statement (qualitative or quantitative, as appropriate) about the degree to which each minority or low-income population is disproportionately receiving adverse human health or environmental impacts during construction as compared with the entire geographic area, together with the significance of these impacts
- a discussion of the reasoning (e.g., based on locations of minority and low-income populations and the environmental pathways described in ESRP 2.5.4) behind the estimated degree of impact
- a discussion of any mitigative measures for which credit is being taken to reduce environmental justice concerns.

The reviewer should verify that sufficient information is available to meet the relevant requirements and that the evaluation supports statements of the following type to be included in the staff's EIS:

Based on review of the information provided by the applicant, the staff finds that no minority or low-income group will experience disproportionately high and adverse environmental impacts as a result of activities during construction.

If the reviewer determines that there will be a disproportionately high and adverse environmental impact on some minority or low-income population as a result of activities during construction, an input to the EIS should be prepared that describes the impact(s) and the staff evaluation of alternatives that would mitigate or avoid the impact(s).

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 51.45, "Environmental reports."

Council on Environmental Quality (CEQ). 1997. *Environmental Justice: Guidance Under the National Environmental Policy Act*. CEQ Guidance, December 10, 1997, Washington, D.C.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." 59 *Federal Register* 7629-7633 (1994).

U.S. Nuclear Regulatory Commission (NRC). 1998a. *General Site Suitability Criteria for Nuclear Power Stations*. Second Proposal. Regulatory Guide 4.7, Rev. 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1998b. In the Matter of Louisiana Energy Service Claiborne Enrichment Center. Docket 70-3070-ML. CLI-98-3. Washington, D.C. April 3, 1998.

U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation (NRC/NRR). 1996. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." NRR Office Letter No. 906, Revision 1, Attachment 4, Washington, D.C.



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**ENVIRONMENTAL
 STANDARD
 REVIEW PLAN**
 OFFICE OF NUCLEAR REACTOR REGULATION

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

REVIEW RESPONSIBILITIES

Primary—Appendix B

Secondary—Appendix B

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's analysis and assessment of potential radiological impacts on the proposed project construction work force. The scope of the review directed by this plan should be limited to those projects proposed to be located on or adjacent to the site of an operating nuclear fuel cycle facility^(a) and should include an analysis and evaluation of the radiological impact of such a facility on the construction work force and a determination that the regulatory requirements of 10 CFR 20 are met. The review should be in sufficient detail to enable the staff to determine and confirm the quantitative radiological impact of the operating nuclear fuel cycle facility on construction workers at the site of the proposed plant.

Review Interfaces

The reviewer for this ESRP should obtain input from and provide input to reviewers for the following ESRPs, as indicated:

-
- (a) For the purposes of this environmental review, the term “nuclear fuel cycle facility” or “nuclear facility” is interpreted to mean an operating nuclear power reactor or other nuclear installation associated with the nuclear fuel cycle process and located on or adjacent to the proposed plant site. It includes operation of individual reactors of a multi-unit plant while construction of the remaining unit or units continues.

October 1999

4.5-1

NUREG-1555

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Published environmental standard review plans will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience.

Comments and suggestions for improvement will be considered and should be sent to the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, D.C. 20555-0001.

- ESRP 4.6. Provide a list of issues, if any, regarding compliance with 10 CFR 20.
- ESRP 5.4. Provide a construction work force collective annual dose.
- ESRP 10.4.2. Provide the estimated annual collective dose to construction workers for use in the benefit-cost balance.

Data and Information Needs

This review applies to applications for construction and combined licenses. The following data or information should be obtained when construction of the proposed plant will take place on or adjacent to a site where there are operating nuclear fuel cycle facilities:

- the physical layout of the site, including the location and orientation of onsite or adjacent nuclear fuel cycle facilities that are expected to be operating during construction of the proposed plant (from the environmental report [ER] or Preliminary Safety Analysis Report [PSAR])
- the location and characteristics of radiation sources and radioactive effluent emission sources of the adjacent nuclear facility, including detailed descriptions of the radioactive content of unshielded tanks or storage areas, the steam system in boiling-water reactor (BWR) facilities, and the emissions from vents and stacks (from the ER or PSAR)
- measured radiation dose rates and airborne radioactivity concentrations at specific locations throughout the construction site where environmental radiological monitoring data exist for an operating facility (from the ER or PSAR)
- calculated radiation dose rates at specific locations throughout the construction site where environmental radiological monitoring data are not available, including a description of the methodology used to determine dose rates at the construction site (from the ER or PSAR)
- the number and principal locations of construction workers who will be exposed to the radiation sources described above and the total amount of time per year that they will spend at those locations (from the ER or PSAR)
- the calculated annual collective dose to the construction work force, including all models, assumptions, and input data used in arriving at the figures that have not already been provided in the above described required data and information. This may include assumptions about shielding provided by buildings or structures between the construction location and the radiation sources (from the ER or PSAR).

When the applicant's PSAR and ER are submitted at the same time for review, either document may be used for submission of the data and information required for this review. In the PSAR, the assessment of radiation exposure to construction workers is discussed in Chapter 12, Radiation Protection,

Section 12.4, as described in Regulatory Guide 1.70, *Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants - LWR Edition* (NRC 1978a). The information should be used in the staff's safety review to determine whether turbine-building radiation sources in BWRs are adequately shielded and whether outside tanks or storage areas for radioactive materials need to be shielded.

II. ACCEPTANCE CRITERIA

Acceptance criteria for the analysis and evaluation of radiation exposure to construction workers are based on the relevant requirements of the following regulations:

- 10 CFR 20; 20.1301; 20.1302 with respect to public dose limits; or 10 CFR 20; 20.1001; 20.1201; 20.1203; 20.1204; and 20.1205, with respect to occupational dose limits requirements for summation of internal and external doses and the determination of the dose if construction workers need to be classified as radiation workers
- 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low As Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents" with respect to design objectives for dose when construction workers are considered members of the public.

Regulatory positions and specific criteria necessary to meet the regulations as identified above are as follows:

- Regulatory Guide 8.8, Rev. 3, *Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable* (NRC 1978b) with respect to methods of ensuring that the calculated occupational doses are as low as is reasonably achievable.

Technical Rationale

The technical rationale for evaluating the applicant's potential radiation exposure to construction workers is discussed in the following paragraph:

When construction is taking place nearby or adjacent to an operating light-water-cooled power reactor, there is a possibility that the workers may be exposed to radioactive materials that would cause them to receive doses in excess of limits for members of the public. To ensure that radiation levels are low enough to prevent inadvertent exposure or to properly assess the exposure to construction workers, methods have been developed to determine the potential exposure to these workers. If evaluation of the doses indicate that workers may be exposed to levels above the limits to the public, then construction workers must be treated as radiation workers by the licensee (or applicant), and the requirements in 10 CFR 20 must be followed.

III. REVIEW PROCEDURES

In the analysis of the potential radiation exposures to construction workers, the reviewer should first determine whether there is a need to consider radiological impacts to construction workers. The reviewer should consult the site and vicinity maps of ESRP 2.1 and the NRC list of operational nuclear facilities. If there are or will be no adjacent operating nuclear facilities during the proposed project construction period, the review should be terminated. The reviewer should prepare an input for the environmental impact statement (EIS) stating that there will be no expected radiation exposure to construction workers during construction of the proposed project.

If the reviewer determines that there is or will be an adjacent operating nuclear facility during the construction period, the reviewer should take the following steps:

- (1) Identify the sources of radiation that will contribute to the radiation exposure of construction workers.
 - Base this identification on review of the adjacent nuclear facility description provided by the applicant as appropriate.
 - Consult with the reviewers of ESRP 3.1 and Chapter 12 of the applicant's PSAR, if available, and participate in or get information from reviewers who participate in the site visit to complete this portion of the analysis. Sources to be considered in this portion of the analysis have been identified in the "Data and Information Needs" of this ESRP.
- (2) Determine the source strength for each of the sources identified in Item 1, above.
 - Accomplish this determination by either direct reviewer calculation of these values or by analysis to validate and accept the applicant's data.
 - When the latter procedure is used, conduct this portion of the analysis by comparing the applicant's data with available data from similar systems.
- (3) From the information provided in the ER or PSAR (if available), determine the location, number, duration of stay, and possible shielding of construction workers.
 - If shielding is not practical, consider these workers to be occupationally exposed. Consult with the reviewer of ESRP 3.1 or Chapter 12 of the applicant's PSAR, if available, to confirm plant and station layout and establish possible worker shielding factors and plant construction schedules through the site visit and consultation with the applicant.
- (4) Determine the radiation dose rates at the principal onsite locations where construction workers will be present and at locations where particularly high dose rates could be expected on the basis of the source strengths determined in Item 2 above.

- Accomplish this either by direct reviewer calculation of these values or by analysis to validate and accept the applicant's data. Acceptable codes and methods include the following:
 - The SKYSHINE computer code, developed by Radiation Research Associates and available through the Radiation Shielding Information Center at Oak Ridge National Laboratory, is an acceptable code for calculating dose rate at distances from nitrogen-16 sources in BWR steam system components.
 - The GASPAR code, described in Regulatory Guide 1.109, Rev. 1, *Calculation of Annual Doses to Man from Routing Releases of Reactor Effluents for the Purpose of Evaluating Compliance with CFR 50, Appendix I*, (NRC 1976), is an appropriate code for calculating dose due to gaseous-effluent-plume immersion.
- The dose rate may also be determined through comparison with measured results, such as those available in EPRI NP-243 and HASL-305.
- When the applicant has used these codes or methods to predict dose rates, the reviewer's determination may be limited to verification of the techniques of calculation and input.

(5) Based on the doses or dose rates determined in Item 4 above, and the number, location, and duration of stay of construction workers determined in Item 3 above, determine the estimated individual and annual collective dose to construction workers at the proposed site.

The reviewer's evaluation of radiation exposure to construction workers involves (1) a determination that the predicted doses are realistic and accurate and (2) an evaluation of the predictions with respect to the requirements of 10 CFR 20 for doses to individuals in restricted areas.

The reviewer should take the following steps for estimating the doses to determine if predicted doses are realistic and accurate:

- (1) Analyze radiation sources and source strength.
 - Verify that all potential radiation sources associated with the adjacent nuclear facility have been identified and that their source strengths have been accurately predicted.
 - Determine this on the basis of a site visit to the adjacent facility and through comparison of the facility sources and source strengths with similar facilities.

(2) Analyze the impacts on the work force.

- Verify that the size of the projected work force is consistent with work force data from similar projects and that the locations of workers and the duration of their stay at a particular location are consistent with the proposed plant layout, the schedule of construction, and the nature of the construction task.
- Evaluate the realism of any radiation shielding factors proposed by the applicant to take credit for work force shielding provided by the plant structures under construction.

(3) Evaluate dose rates and collective doses by verifying that

- dose rates have been calculated on the basis of accepted computational models or on the basis of actual measurements.
- dose rates or doses have been calculated for those site locations where principal concentrations of construction workers will be located and that appropriate work force/work duration data have been used.
- the individual and collective doses to the construction work force are realistic and accurate.
 - When the evaluation establishes that there are significant differences in the determination of radiation exposure to construction workers and the applicant's determinations of radioactive exposure, consult with the applicant to determine the reasons for these differences.
 - Request that additional data be provided or that calculations be repeated until the reviewer and the applicant are in reasonable agreement about the estimated individual and collective doses.

The reviewer should take the following steps to evaluate the predicted doses with respect to 10 CFR 20 requirements:

- Determine whether public or occupational dose limits apply to construction workers.
- If public dose limits apply, determine whether construction personnel will be monitored in accordance with 10 CFR 20.1302(a).
- If occupational limits apply, determine whether monitoring of construction personnel under the requirements of 10 CFR 20.1205 is required.
- Summarize measures necessary to meet the requirements of 10 CFR 20 and prepare input to appropriate EIS sections, identifying their merit.

- When advised that such measures have been implemented, recalculate the construction-worker doses.

IV. EVALUATION FINDINGS

The evaluation of the radiation exposure to construction workers should accomplish the following objectives: (1) public disclosure of predicted radiological impacts to the construction work force resulting from construction of the proposed project in the vicinity of an operating nuclear facility, (2) presentation of the basis for the staff analysis, and (3) presentation of staff conclusions, regarding radiological impact to construction workers. The following information should be included in the EIS:

- a description of sources of radiation and physical relationship of these sources to the proposed project construction zone
- estimates of maximum individual doses and a brief discussion of how the estimates were calculated, a comparison of these doses with the requirements of 10 CFR 20, and the reviewer's conclusions with respect to compliance with 10 CFR 20, including any measures necessary to achieve compliance
- estimates of the annual collective dose to the construction force by year of construction, a brief discussion of how the estimates were made, and the reviewer's conclusions with respect to the accuracy of the dose commitment estimates.

When the reviewer has determined that the predicted collective dose is realistic and accurate and that the requirements for protecting construction workers from radiation exposure are being met according to 10 CFR 20, the following statement should be used:

The staff reviewed the available information relative to the radiological impacts to construction workers. The staff concludes that the predicted individual doses are realistic, accurate, and within the limits specified in 10 CFR 20.

V. IMPLEMENTATION

The method described herein will be used by the staff in evaluating conformance with the Commission's regulations, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the regulations.

VI. REFERENCES

10 CFR 20, "Standards for Protection Against Radiation."

10 CFR 20.1001, "Purpose."

10 CFR 20.1201, "Occupational dose limits for adults."

10 CFR 20.1203, “Determination of external dose from airborne radioactive material.”

10 CFR 20.1204, “Determination of internal exposure.”

10 CFR 20.1205, “Conditions requiring individual monitoring of external and internal occupational dose.”

10 CFR 20.1301, “Dose limits for individual members of the public.”

10 CFR 20.1302, “Compliance with dose limits for individual members of the public.”

10 CFR 50, Appendix I, “Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion ‘As Low As Is Reasonably Achievable’ for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents.”

Electric Power Research Institute (EPRI). *Analysis of N-16 Radiation Measurements at the Cooper Nuclear Station*, EPRI NP-243, Palo Alto, California.

Health and Safety Laboratory (HASL-305), *Determination of N-16 Gamma Radiation Fields at BWR Power Stations*.

U.S. Nuclear Regulatory Commission (NRC). 1976. *Calculation of Annual Doses to Man from Routing Releases of Reactor Effluents for the Purpose of Evaluating Compliance with CFR 50, Appendix I*. Regulatory Guide 1.109, Rev. 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1978a. *Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants - LWR Edition* (NUREG-75/094). Regulatory Guide 1.70, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1978b. *Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonably Achievable*. Regulatory Guide 8.8, Rev. 3, Washington, D.C.