



U.S. NUCLEAR REGULATORY COMMISSION

ENVIRONMENTAL STANDARD REVIEW PLAN

9.4.3 TRANSMISSION SYSTEMS

RESPONSIBILITIES

Primary— Organization responsible for the review of transmission system information

Secondary—None

I. AREAS OF REVIEW

This environmental standard review plan (ESRP) directs the staff's analysis of alternatives to the applicant's proposed transmission system^(a). This includes evaluation of alternatives, in comparison with the proposed system routing, to identify those system routings that are environmentally preferable to the proposed system. Environmentally preferable alternatives should be compared with the proposed system on a benefit-cost basis to determine if any such system should be considered as a preferred alternative to the proposed system.^(b)

The scope of the review directed by this plan should focus on alternative corridor routes. The review should be limited to route alternatives that (1) are applicable to and compatible with the proposed plant, the service area, and the regional transmission network, (2) are not prohibited by local, State, or Federal regulations, and (3) can be judged as practical from a technical standpoint with respect to the proposed dates of plant operation. This review should also take account of the investigation of alternatives proposed by other reviewers to mitigate impacts associated with construction and operation of the proposed transmission system.

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- (a) "System", as used in this ESRP, refers to the proposed transmission line(s) and route(s) and the grid to which it can be connected. It includes routes and corridors, substations and the voltages at which the lines operate.
- (b) The review of environmentally preferable transmission systems should consider both the environment and economics; two or more reviewers may be needed to conduct this portion of the review.

USNRC ENVIRONMENTAL STANDARD REVIEW PLAN

This Environmental Standard Review Plan has been prepared to establish guidance for the U.S. Nuclear Regulatory Commission staff responsible for environmental reviews for nuclear power plants. The Environmental Standard Review Plan is not a substitute for the NRC's regulations, and compliance with it is not required.

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This plan is the basis for staff conclusions with respect to the environmental preference of alternative transmission system routes and conclusions regarding any such systems having an equivalent or better benefit-cost balance than the proposed system.

Review Interfaces

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

- ESRP 3.7. Obtain background information on the proposed transmission system owner, operator, siting and design.
- ESRPs 4.1.2, 5.1.2, and 5.6.3. Obtain input from these reviewers to obtain information regarding the environmental impacts and impacts to man from construction and operation of the proposed transmission system and corridors.
- ESRP 4.1.3. If the proposed construction of the transmission system and corridors is likely to result in adverse impacts to historic properties, obtain information regarding alternative locations for the system that may be taken into consideration.
- ESRPs 4.6 and 5.10. Provide, as appropriate, a list of those measures and controls to limit adverse transmission-system impacts that were developed as a result of this environmental review.
- ESRPs 5.6.1 and 5.6.2. Obtain a list of adverse impacts to the aquatic or terrestrial ecology from the transmission system that could be avoided or mitigated through alternative design or maintenance procedures.
- ESRPs 4.4.3 and 5.8.3. If disproportionate adverse impacts on minority or low-income populations from transmission systems are identified, consider alternate designs, locations, or activities to avoid the impacts.
- ESRPs 10.1 and 10.4. Provide data and information to permit the inclusion of any suggested alternative to the proposed transmission system in the final evaluation of the proposed action.
- Interface with the Environmental Project Manager (EPM). Obtain input from the EPM when an alternative route or design appears to be environmentally preferable and meets regulatory requirements.

Data and Information Needs

In some cases transmission lines may be constructed and operated by an entity other than the applicant. In such cases, alternative route and impact information may be limited and the reviewer should proceed with the assessment using the information that can be obtained.

The kinds of data and information needed will be affected by site- and region-specific factors, and the degree of detail should be modified according to the magnitude of the impacts predicted for the proposed transmission system and to the practicability of adopting the alternative under consideration. Data or information should be obtained for the following alternatives:

(1) Alternative Corridor Routes

- maps or aerial photographs showing alternative transmission corridors from the station site to interconnecting points on the existing high voltage system and identifying corridor characteristics (e.g., new lines/towers on existing corridors, widening of existing corridors, new corridors). A map detailing this information should be included in the environmental report (ER).
- maps or aerial photographs showing existing and known future generating stations and transmission networks for the service area or affected region. For existing transmission corridors not proposed as alternatives to the proposed system, reasons why they were not considered (e.g., system reliability) should be provided (from the ER and through consultation with agencies such as regional power pools).
- approximate location and description of known populations of threatened or endangered species of plants and animals occurring along alternative corridors (through consultation with Federal, State, regional, local, and affected Native American tribal agencies) and locations of major wetlands and critical habitat (from the ER).
- lengths and widths of rights-of-way for each alternative segment or corridor (from the ER).
- number and approximate location of known historic/archaeological sites within 2 km of the alternative corridors (from the ER and through consultation with Federal, State, regional, local, and affected Native American tribal agencies)
- State and local laws or regulations that affect right-of-way acquisition, transmission line construction and operation, or corridor siting (from the ER and consultation with appropriate Federal, State, regional, local, and affected Native American tribal agencies).

Note: The following items should not be needed when the alternative route is an existing corridor containing towers and lines that will not be widened or require new towers for use as an alternative:

- maps or aerial photographs showing the approximate locations of national, State, or private wildlife refuges or other areas dedicated to ecological preservation, management, or study that are within 1 km of alternative corridors (from the ER and through consultation with Federal, State, regional, local, and affected Native American tribal agencies)

- location and extent of agricultural areas that are on or within 2 km of alternative corridors that are routinely serviced by aircraft (e.g., crop dusting) (through consultation with local representatives of the State and Federal departments of agriculture)
- corridor proximity to airports, roads, railroads, or other transportation facilities (from the ER)
- general land-use characteristics along the alternative corridors, expressed as percentages of total corridor length and in terms of the intensity of use (e.g., residential density) for the following classifications (from the ER and through consultation with State and Federal agencies):
 - agricultural
 - forest, woodland
 - rangeland
 - recreational or ecologically sensitive areas such as parks, wildlife preserves/refuges or management areas, wetlands, wild and scenic rivers
 - urban or residential areas
 - commercial or industrial areas
 - other potentially significant classifications (e.g., Federally owned lands, Native American tribal lands, ethnic enclaves, or areas of high minority population)
 - potential geologic hazards (e.g., active faults) that could affect transmission system reliability.

(2) Selection Process and Cost Data

- discussion of the selection process used to evaluate transmission line routes and the rationale and criteria used to select the proposed route (from the ER)
- acquisition cost data for the proposed and alternative route rights-of-way (from the ER)
- construction and maintenance costs for the proposed system and for principal system alternatives (from the ER)
- estimated transmission line losses for the proposed system and for principal alternatives (from the ER).

II. ACCEPTANCE CRITERIA

Acceptance criteria for the review of alternative transmission systems are based on the relevant requirements of the following:

- 10 CFR 51.71(a) referring to 10 CFR 51.45(a)(3) with respect to the need to discuss alternatives in the environmental analysis
- 10 CFR 51, Appendix A, with respect to discussion of alternatives to the proposed action
- 18 CFR Part 50 with respect to regulations for filing applications for permits to site interstate electric transmission facilities
- Regulatory requirements specific for particular land types (see Table 4.1.2-1)

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 evaluation of alternative systems designs
- Regulatory Guide 4.7, Rev. 2, *General Site Suitability for Nuclear Power Stations* (NRC 1998), with respect to site suitability guidelines
- U.S. Nuclear Regulatory Commission, "Alternative Electrical Transmission Systems and Their Environmental Impact," NUREG-0316, August 1977 (NRC 1977), with respect to environmental impacts.

Technical Rationale

The technical rationale for evaluating alternatives to the applicant's proposed transmission systems is discussed in the following paragraph:

The consideration of alternatives is the essence of the NEPA process. The review conducted under this ESRP section contributes to the consideration of alternatives by addressing alternative means of power transmission to determine if there is an obviously superior transmission corridor in terms of environmental impacts and economic costs when compared to the proposed system.

III. REVIEW PROCEDURES

The principal objectives of this analysis procedure are (1) to provide assistance to those ESRP Chapter 4.0 and 5.0 reviewers concerned with identifying and verifying means to mitigate adverse impacts associated with the proposed transmission system, and (2) to identify and analyze reasonable

alternatives to the applicant's proposed system to the extent needed to rank them, from an environmental standpoint, as preferable or not preferable to the applicant's proposed system. The analysis should consider only those alternatives applicable to and compatible with the proposed plant, the applicant's service area, and the regional transmission network. **In this analysis, the reviewer should consider alternatives to transmission corridor routes.** The reviewer should also ensure that due consideration has been given to the use of existing transmission line corridors as an alternative to the development of new corridors.

The depth of the analysis should be governed by the nature and magnitude of proposed transmission-system impacts predicted by the ESRP Chapter 4.0 and 5.0 reviewers. When adverse impacts are predicted, the reviewer should coordinate with these reviewers in identifying and analyzing means to mitigate these impacts. The proposed system with any verified mitigation schemes (i.e., measures and controls to limit adverse impacts) should be the baseline system against which alternative transmission systems will be compared. The nature and adversity of the remaining unmitigated impacts for this baseline system should establish the level of analysis required in the review of alternative systems to permit staff evaluation and conclusions with respect to the environmental preference or equivalence of these alternatives. When no adverse impacts have been predicted for the proposed system, the review should be limited to an analysis of alternative transmission systems in the depth necessary to judge their environmental preferability to the applicant's proposed system.

The reviewer should conduct an initial environmental screening of each alternative transmission system to eliminate those systems that are obviously unsuitable for application to the proposed project. Economic factors should not be considered in this initial screening. Working through the EPM, the reviewer may consult with appropriate Federal, State, regional, local, and affected Native American tribal agencies when needed to conduct this screening. When the reviewer rejects an alternative, that alternative needs no further consideration other than the preparation of the reasons and justification for the rejection.

When environmentally preferable alternatives are identified, the review should be expanded to consider the economic costs of any such alternative. This analysis should be done in consultation with appropriate reviewers for ESRPs 10.4.1, 10.4.2, and 10.4.3. Assistance from these reviewers should be sought to establish the economic-cost data used to develop a benefit-cost comparison with the baseline (proposed) transmission system.

The following procedure for developing the analysis of alternative transmission systems considers both environmental and economic-cost factors. In following this procedure, the reviewer should initially consider only the environmental factors, and should repeat the procedure for economic factors only for those alternatives shown to be environmentally preferable by the evaluation procedures of this ESRP. The analysis of those alternative transmission systems not eliminated by the initial screening process should be based on the environmental and economic factors shown in Table 9.4.3-1. The reviewer should prepare a similar table for each transmission system element under consideration, comparing each of the environmental and economic cost and benefit factors with those of the proposed transmission system element. Information for this table may be prepared either in terms of absolute environmental and

economic costs and benefits, or as incremental costs and benefits referenced to the proposed system. Additional factors may be included when needed on a site- or system-specific basis as follows:

- (a) The reviewer's analysis of alternative corridor routes should be based on a comparison of those routes with the proposed routes described in ESRP 3.7. The comparison may be made for complete routes or for route segments, as appropriate, and should consider those factors listed under the heading "Data and Information Needs" in this ESRP.
- (b) The reviewer should consider both environmental and economic factors, using a tabular format similar to that shown in Table 9.4.3-1. The reviewer should consult with the reviewer for ESRP 3.7 and the appropriate ESRP Chapter 4.0 and 5.0 reviewers to establish construction and operation impacts for the proposed corridor routes. The reviewer's comparison of these data with those for the alternative corridors should involve the following:
 - **Impacts**—The reviewer should estimate the impacts that can be expected from development of alternative transmission corridors. The appropriate ESRP Chapter 4.0 and 5.0 reviewers should be consulted in making these estimates and in comparing these impacts with those predicted for the proposed corridor routes.
 - **Economic Factors**—The reviewer should estimate acquisition or right-of-way costs, clearing and construction costs, maintenance costs, and the costs to mitigate predicted environmental impacts for the proposed and alternative routes. Where there are appreciable differences in transmission line lengths, the reviewer should estimate the loss in delivered electrical capacity due to transmission line losses.
- (c) The reviewer should consider alternative locations of auxiliary transmission system facilities only when the reviewers for ESRPs 4.1.2 or 5.1.2 advise relocating of such facilities.

Using the guidance below, the reviewer should evaluate the applicant's process for identifying and selecting alternative transmission system routes to ensure that reasonable alternatives to the proposed routes have been considered. The reviewer should ensure that each transmission system alternative has been described in sufficient detail to enable the reviewer to make an effective analysis and comparison of environmental impacts leading to a staff conclusion that the alternative system is environmentally preferable, equivalent, or inferior to the proposed system.

For those alternatives determined to be environmentally preferable, the reviewer should ensure that economic-cost data are available in sufficient detail to enable the reviewer to conduct benefit-cost balance and comparisons with the proposed system, leading to a final staff recommendation for

Table 9.4.3-1. Comparison of Alternative Corridor Routes

Factor	Proposed Route or Segment	Alternative A Route/Segment	Alternative B Route/Segment
<p><u>Descriptions</u></p> <p>New Corridors</p> <p>Total Length Right-of-Way Width Total Area Corridor Characteristics</p> <ul style="list-style-type: none"> • As Appropriate from “Data Information Needs” in this ESRP • Others as Appropriate <p>Existing (Cleared Corridors)</p> <p>Total Length Right-of-Way Width Total Area</p>			
<p><u>Impacts</u></p> <p>Land Use (e.g., agriculture, recreational areas)</p> <p>Terrestrial Ecology (e.g., habitat loss, endangered species)</p> <p>Aquatic Ecology (e.g., siltation, stream crossings)</p> <p>Socioeconomics (e.g., aesthetics, historic sites)</p>			
<p><u>Economic Factors</u></p> <p>Estimated Acquisition Cost Estimated Construction Costs Estimated Maintenance Costs Estimated Transmission Losses</p>			

transmission system consideration. The reviewer should also ensure that all comparisons are made on the basis of the proposed system, as supplemented with those measures and controls to limit adverse impacts proposed by the applicant and concurred with by the staff. For those alternatives eliminated from consideration on the basis of land use, water use, or legislative restrictions, the reviewer should ensure that adequate documented justification for this action has been prepared.

(1) General Considerations

- (a) If a mitigation measure or alternative transmission system is being considered, the reviewer should determine first that the measure or system being evaluated has a lesser overall environmental impact than the proposed system (i.e., is environmentally preferable). When this is true, the economic costs of mitigation or of the alternative could result in an equivalent or improved project benefit-cost balance. When these criteria are met, the reviewer should verify that those mitigation measures proposed by the reviewers for ESRP Chapters 4.0 and 5.0 will meet the criteria as a feasible alternative transmission system.
- (b) The reviewer should keep in mind that an environmental review of alternative transmission systems, if conducted in the depth applied to the review of the proposed system, would be expected to find additional impacts and/or increased severity of the impacts already predicted for the alternative. The reviewer should allow for this when evaluating the comparative environmental impacts of each proposed alternative with those of the proposed system.
- (c) The reviewer should ensure that the level of detail provided for each economic, environmental, and social cost estimate is commensurate with the level of importance of the related environmental impact.

(2) Measures and Controls to Limit Adverse Impacts

- (a) When considering measures identified by the reviewers for ESRP Chapters 4.0 and 5.0 to mitigate adverse environmental impacts predicted for the proposed transmission system, the reviewer's verification of the desirability of the measure should reach the following conclusions:
 - The measure provides the desired mitigation and does not introduce other adverse environmental impacts not predicted for the proposed system.
 - The measure will result in an overall benefit-cost balance equivalent to, or better than, that of the proposed project.
 - The measure is not precluded by Federal, State, regional, local, or affected Native American tribal regulations or ordinances.

(3) Alternative Transmission Systems

(a) The initial step in the evaluation of those alternative transmission systems identified by the analysis procedure of this ESRP should be to categorize these systems as environmentally preferable or inferior to the proposed transmission system as modified by measures and controls to limit adverse impacts. The following criteria should be applied to this evaluation:

- When the reviewer determines that the proposed system (with mitigation measures, if necessary) will have no unavoidable adverse impacts and will comply with applicable Federal, State, regional, local, and affected Native American tribal regulations or requirements, the reviewer should conclude that there is no environmentally preferable transmission system alternative.
- When the reviewer determines that the proposed transmission system will meet regulatory requirements, but is predicted to have unavoidable adverse environmental impacts, the reviewer should evaluate the identified alternative systems for potential environmental preference to the proposed system. The scope and extent of this evaluation should depend on the nature and magnitude of the proposed system's environmental impacts. An environmental review of the alternatives may be required following the analysis and evaluation procedures of the appropriate ESRP Chapters 4.0 and 5.0. The following criteria apply to this evaluation:
 - *Environmental preference will be established* when an alternative can be shown to (1) have no unavoidable adverse impacts and (2) meet regulatory requirements.
 - *Environmental preference may be established* when an alternative that meets regulatory requirements can be shown to have unavoidable adverse impacts that are less severe in both nature and magnitude than those of the proposed system. Determination of environmental preference under these conditions should lead to consultation with the EPM and the appropriate ESRP Chapter 4.0 and 5.0 reviewers. This consultation should result in a joint determination of the status of any such alternative.

When the reviewer determines that there are environmentally preferable alternatives to the proposed transmission system, the reviewer should conduct those portions of the analysis instructions of this ESRP that deal with the economic costs of the alternative systems.

(b) When environmentally preferable alternative transmission systems have been identified, the reviewer should ensure that economic cost data have been developed for the alternatives and that these data are adequate for a benefit-cost balance and comparison with the proposed system. This portion of the evaluation procedure should be conducted with the assistance of reviewers for ESRPs 10.4.1, 10.4.2, and 10.4.3. The reviewer should complete the economic factors portions of Table 9.4.3-1. On the basis of the completed table, the reviewer should balance and compare benefits and costs of the environmentally preferable alternative(s) with those of the proposed system. When an environmentally preferable alternative can be shown to have the same benefits as

the proposed system with comparable reliability and at the same or lesser economic costs, the reviewer may conclude that the alternative should be considered as a replacement for the proposed system. For those cases in which benefits of the alternative are less than those of the proposed system (e.g., increased transmission losses or decreased system reliability) or where economic costs exceed those of the proposed system, a conclusion to further consider the alternative should lead to consultation with the Environmental Project Manager and with the appropriate ESRP Chapter 4.0 and 5.0 reviewers. If this conclusion establishes that the benefit-cost balances of such alternatives are no more than equivalent to the proposed system, the alternatives should not be considered further. When alternatives have significantly decreased benefits or increased economic costs, they should be rejected for any further consideration as replacements for the proposed system.

IV. EVALUATION FINDINGS

Data for the EIS should meet the following objectives: (1) description of the alternative transmission systems that were considered and results of the staff's analysis of these alternatives, (2) presentation of the basis for the staff's analysis, and (3) presentation of the staff's conclusions.

The reviewer should prepare separate descriptions with respect to the review and analysis of each alternative system. Each item should normally describe (1) those alternatives considered by the staff, (2) those alternatives rejected by the staff as being inappropriate for the proposed project, (3) the staff's analysis and comparison of potentially appropriate alternatives seeking environmentally preferable alternatives to the proposed system or component, and (4) the staff's conclusions. For alternative routes, the reviewers should also briefly describe the applicant's process for identifying and evaluating alternative routes and the staff's conclusion with respect to the merits of the procedure.

The reviewer should discuss briefly those alternatives rejected because of specific deficiencies and state why the alternatives were rejected. The reviewer should also identify those alternatives judged inferior to the proposed system. The use of a table similar to Table 9.4.3-1 to present the staff's comparison of these potentially acceptable alternative transmission systems is recommended.

When the reviewer has concluded that an alternative is environmentally preferable and should be considered as the preferred route (or route segment) sufficient additional narrative detail should be included in the material to justify the alternative on an environmental and economic-cost basis.

V. IMPLEMENTATION

The method described in this ESRP should be used by the staff in evaluating conformance with NRC requirements, except in those cases in which the applicant proposes an acceptable alternative for complying with specified portions of the requirements.

VI. REFERENCES

10 CFR Part 51, Appendix A, "Format for Presentation of Material in Environmental Impact Statements."

10 CFR 51.45, "Environmental report."

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

18 CFR Part 50, "Regulations for Filing Applications for Permits to Site Interstate Electric Transmission Facilities."

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

U.S. Nuclear Regulatory Commission (NRC). 1977. *Alternative Electrical Transmission Systems and their Environmental Impact*. NUREG-0316, Washington, D.C.

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

PAPERWORK REDUCTION ACT STATEMENT

The information collections contained in the Environmental Standard Review Plan are covered by the requirements of 10 CFR Part 51, and were approved by the Office of Management and Budget, approval number 3150-0021.

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