

Early Site Reviews

NUREG-0180
Draft Revision

U. S. Nuclear
Regulatory Commission

for

Nuclear Power Facilities

Procedures and Possible
Technical Review Options

Office of Standards
Development

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FOREWORD

The Nuclear Regulatory Commission has issued for review and comment this draft revision to NUREG-0180, "Early Site Reviews for Nuclear Power Facilities, Procedures and Possible Technical Review Options." Formal procedures for early site review became effective June 6, 1977, as an amendment to 10 CFR Part 2 and Part 50 (42 FR 22882, May 5, 1977). NUREG-0180, published at the same time, described the NRC staff's procedure for an early site review and contained a preliminary discussion of technical review options for early review of site suitability issues. This draft revision of NUREG-0180 is the first step in revising the document to provide a more detailed discussion of the technical review options, the extent of supporting information that is acceptable, and the corresponding decisions that can be made.

The first three chapters of the draft revision of NUREG-0180 are generic and thus fully developed for review and comment purposes. However, Chapter IV (safety) and Chapter V (environment) do not cover all technical review areas. Rather, a representative example is given in the safety area and another in environmental issues. The NRC is seeking comments on the technical review areas, based on these two examples that are representative of the philosophy and approach that would be followed in developing the entire document.

Comments received on the draft revision of NUREG-0180 will be used not only in revising the example technical areas that are offered for review but also in focusing the drafting of all the remaining technical areas. Therefore, comments should address the practicality and utility of the approach used in the draft revision of NUREG-0180 as well as the technical substance of the material. Additionally, suggestions of specific material that should be included in any of the remaining technical areas will be welcomed. It should be noted that this review opportunity is not in lieu of the subsequent review of the draft document in its entirety but is in addition to that review.

Interested persons may submit comments on the draft revision of NUREG-0180 for the Commission's consideration. Comments are due April 28, 1978. Comments should be addressed to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Services Branch.

PURPOSE

This document provides guidance for utility companies, State and other governmental agencies, and others who may request or may wish to participate in an early review of site suitability issues related to a site proposed for a nuclear power or test reactor. Although the emphasis of this document is on a nuclear electric generating station, the guidance provided can be used for a test reactor or other kinds of reactors. The procedures to be followed by applicants for construction permits and by others are described and the possible significant areas of technical review are delineated.

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CHAPTER I

INTRODUCTION AND BACKGROUND

An Early Site Review (ESR) is a review in which any issue(s) relating to the suitability of a site for a nuclear power facility is reviewed prior to the submittal of the detailed design of the facility. The ESR allows utility companies, State and other governmental agencies, and others to request the NRC to consider an issue or set of issues to (1) determine the site suitability with respect to one or more of the issues, (2) establish a range of site-related, plant design and performance constraints acceptable to NRC, and/or (3) elicit an NRC staff technical position on methods to analyze one or more unique site issues. This review may be conducted either separate from or in conjunction with a proceeding for the issuance of a permit authorizing the construction of a nuclear power facility. A review conducted in connection with a construction permit (CP) proceeding may culminate in the issuance of a partial decision on the site suitability issues reviewed. A review conducted at the request of persons who do not seek a construction permit does not involve a public hearing and will culminate in the issuance of a Staff Site Report (SSR). Where appropriate, applicants for construction permits may reference previously issued staff site reports as part of their construction permit applications.

Formal procedures for Early Site Review became effective June 6, 1977, as an amendment to 10 CFR Part 2 and Part 50 (42 FR 22882, May 5, 1977). The NUREG-0180, "Early Site Reviews for Nuclear Power Facilities, Procedures and Possible Technical Review Options," published at the same time, described the NRC staff's procedure for an ESR and contained a preliminary discussion of technical review options for early review of site suitability issues. This document is the first step in revising NUREG-0180 to provide a more detailed discussion of the technical review options, the extent of supporting information that is acceptable, and the corresponding types of findings.

Existing regulatory guides and other documents that support construction permit review are referenced or listed in this document although they are not appended because of their volume.

CHAPTER II
DISCUSSION OF EARLY SITE REVIEW PROCEDURES AND
THEIR RELATION TO SELECTION OF ISSUES

The Early Site Review procedures allow the selection of technical review areas that extend in scope from a single site issue up to and including all site-related issues normally addressed in a construction permit (CP) application review.

Under the amendments to 10 CFR Part 2, "Rules of Practice," applicants for construction permits may request early review, hearing and partial decision on specific site-related issues as much as 5 years in advance of the submittal of the remaining portions of their construction permit applications. Persons who do not seek a permit to construct a facility may use the procedures in the new Appendix Q to 10 CFR Part 50 to request an NRC staff review of site issues at any time. This review, which does not involve a public hearing, culminates in a Staff Site Report (SSR). In either case, an Early Site Review should be conducted prior to and separate from the detailed review of the design features of the facility.

Under Early Site Review procedures (CP or Appendix Q), the nature of technical review in any specific review area may vary, depending on the site-related issue or issues submitted for review and the proposed findings or conclusions requested. The finding to be made on a particular issue could vary from (1) a finding similar to that arrived at in present-day CP

applications to (2) a more general finding of "reasonable assurance" regarding site suitability. The finding of "reasonable assurance" for a particular site suitability issue means that, with regard to that issue, the NRC staff experience and the available information indicate probable site suitability for a nuclear power plant of current general type and design without requiring unusual facility design, costs, or external protective features. For an issue that borders on or is outside the range of values reviewed and approved by the NRC staff for other sites, the engineering feasibility and cost of dealing with that issue must be evaluated for the NRC staff to give any reasonable assurance of site suitability.

These procedures for Early Site Review allow early resolution of one or more issues relating to site acceptability and can assist in identifying those site characteristics (both safety and environmental) that must be subsequently considered in designing a nuclear facility for that site.

Review Process

Early Site Review submittals will be subjected to the same general acceptance review and docketing procedures presently used for other types of applications submitted for NRC staff review. The acceptability of a tendered ESR application (CP or Appendix Q) will be characterized by the following review options:

Option 1

In technical review areas where findings are proposed that are similar to those made for CP applications

involving no early review, information requirements will be similar to those described in Chapter 2 of Regulatory Guide 1.70¹ and Regulatory Guide 4.2.² However, reliance may have to be placed on envelope assumptions for facility design and performance, instead of on detailed facility design information and operating characteristics.

Option 2

In technical review areas where a more general finding of reasonable assurance is requested, there is not the same requirement for facility design and performance information or envelope assumptions as there is with Option 1. Information requirements are not as well defined, but as experience is gained with the early review process, it may be possible to define information requirements more explicitly. Generally speaking, the information requirements will largely be dependent on the issue addressed and the type of finding sought.

(These options are discussed in greater detail later in this chapter.)

A notice of the docketing of early review submittals will be published in the Federal Register. Documents comprising the application and those generated during the review will be placed in the NRC Public Document Room in Washington, D.C. In addition, a local Public Document Room containing the same information will be established in the vicinity of the proposed site.

For a docketed application that is filed as the initial part of a CP application, the staff review will be performed in accordance with present CP procedures. For the public health and safety issues, the conclusions of the staff review would be documented in a Site Safety Evaluation Report (SSER). The review could be carried through the Advisory Committee on Reactor Safeguards (ACRS) stage with an ACRS letter report issued and SSER supplement prepared as appropriate. For the environmental protection issues, the conclusions of the review will be documented in a Draft Site Environmental Statement distributed for Federal and State agency review, and a Final Site Environmental Statement incorporating the resulting comments. For these applications, a public hearing normally will then be held by an Atomic Safety and Licensing Board (ASLB) culminating with a partial decision which may then be reviewed by an Atomic Safety and Licensing Appeals Board (ASLAB) and the Commission.

Submittals filed under Appendix Q to 10 CFR Part 50 would be reviewed under procedures similar to the above, but would not involve a public hearing nor proceed to a partial decision by a licensing board. There would be referral to the ACRS when early review of the site safety issues is requested. Upon completion of review by the staff and, if appropriate, by National Environmental Policy Act (NEPA) commenting agencies and/or the ACRS, of a submittal under Appendix Q, the staff would prepare Staff Site Reports (SSR). These reports would identify the site, state the site suitability issues reviewed, explain the nature and scope of the review, state the conclusions of the staff regarding the issues reviewed, and

state the reasons for those conclusions. Any Staff Site Report may be incorporated by reference, as appropriate, in an application for a construction permit. The conclusions of the SSR will be reexamined by the staff where 5 years or more have elapsed between its issuance and its reference in a construction permit application, or where significant new information that would affect the previous conclusions (see Chapter III) is found to exist.

Intergovernmental Coordination

The NRC may decline to initiate an ESR in cases where it appears that an early partial decision on any issue(s) of site suitability would not be in the public interest considering the objections, if any, of cognizant State or local government agencies to the conduct of an ESR on those issues (§ 2.605 of the rule).

Even without the above section it should be clear that the effectiveness of the Early Site Review process will be optimized by close coordination with the other appropriate Federal agencies, as well as with the State. It is recognized that the review and approval processes of many States cannot at present accommodate the ESR process and that the applicant and the NRC must work closely with States to ensure that their siting concerns are recognized and that their decision-making processes are not prejudiced.

The Federal Water Pollution Control Act (FWPCA) is one area where close coordination with a Federal agency and the State is particularly desirable. Under the FWPCA the Environmental Protection Agency (EPA) is responsible for

establishing water quality standards and for issuing permits for activities that comply with those standards. Where States have demonstrated the ability to conduct a permit program and to enforce the standards, the EPA has negotiated memoranda of understanding delegating this responsibility to the State. Although there is no legal requirement that an ESR applicant coordinate closely with the EPA and/or the EPA permitting State, this coordination must occur in any early review of site suitability issues related to water quality. Furthermore, it is likely that a determination of reasonable assurance of site suitability with respect to water quality at some sites will require that baseline studies be conducted, especially if a 316(a) exemption is to be requested. Coordination in designing the baseline studies can focus the studies for a more efficient effort, which is an additional incentive.

It is also particularly desirable to coordinate closely with any coastal State that is in the process of developing or has an approved coastal zone management program. Such interaction is necessary to determine whether the site being considered is within the coastal zone and whether power generation at the site would be consistent with the State's coastal zone management program. According to the "Federal Consistency" provision, Section 307 of the Coastal Zone Management Act of 1972, the NRC can issue a license or permit for a facility only when that action is determined to be consistent with a State's approved coastal zone management program.

Content of Reports to Accompany Submittals

Early Site Review submittals must present, as appropriate, the necessary site information and design assumptions in two self-sufficient and separate reports: a "Site Suitability - Environmental Report" and a "Site Suitability - Site Safety Report." Appropriate portions of Regulatory Guide 4.2² and Chapter 2 of Regulatory Guide 1.70¹ may be used as interim guidance for the format and content of these reports. The reports should specify for each technical review area that is submitted, the technical review option and finding that is requested. The choice as to the proposed findings desired from the review process rests initially with the applicant. The reports submitted by the applicant should contain sufficient information to support the requested findings and be in the format of the appropriate regulatory guide. To enable proper determinations to be made regarding the acceptability of submittals, applicants are requested to express proposed findings in an explicit, comprehensive, and cogent manner.

Scheduling

Regulatory processing of submittals for early review of site suitability issues will generally be accomplished under a scheduling arrangement similar to that used for applications for CPs not involving the early review procedures, except that a lower priority or a longer review schedule may be assigned to the Early Site Reviews. As discussed earlier in this chapter, the major processing steps are the same.

Mode of Approval

Applications for Early Site Reviews, which are submitted as the first part of a CP application, will be appropriately carried through staff, ACRS, Federal and State agency review, and an early public hearing before an ASLB that will reach a partial decision encompassing all issues that were reviewed. The partial decision may then be reviewed by the ASLAB and/or the Commission, after which the tenure period will commence.

For submittals under Appendix Q, a Staff Site Report will be issued by the NRC staff. The Staff Site Report will be transmitted to the applicant and will specify the conclusions of the staff with respect to the site issues reviewed. It will reference the original application, including the Environmental Report and the Site Safety Report, and may include specific recommendations for information required at the later facility review.

Tenure of Approval

The partial decision by the Atomic Safety and Licensing Board (ASLB) (after review by the Atomic Safety and Licensing Appeals Board (ASLAB) and, if appropriate, by the Commission) will remain in effect either for 5 years or, where the applicant for a construction permit has provided the remaining site and facility design information on a timely basis, until conclusion of the CP proceeding, unless the Commission, ASLAB, or ASLB find that significant new information (see Chapter III) exists that substantially affects the earlier conclusions. If a complete CP application

is not submitted within 5 years, the applicant, for good cause shown, may apply prior to expiration for an extension of up to 1 year.

The Staff Site Report, issued at the conclusion of an Early Site Review conducted in accordance with Appendix Q procedures may be incorporated by reference in a CP application at any time. However, when more than 5 years have elapsed since the date of issuance, the Staff Site Report will be reviewed by the staff. Unless there is significant new information (see Chapter III) that could alter the earlier staff position, those portions of the Staff Site Report referenced in an application within the effective period will be used by the staff in the preparation of the Safety Evaluation Report and the Environmental Statement.

Public Hearings

An application for an Early Site Review submitted as the initial part of the CP application will normally be processed through the public hearing phase. This process would involve a public hearing conducted by an ASLB, a partial decision by the ASLB, and an opportunity for administrative review of the partial decision by the ASLAB and/or the Commission. (Whenever practicable, the same members will later be appointed to the ASLB for facility review.) Site issues on which partial decisions have been reached need not be subject to additional review and public hearings, unless significant new information arose that could substantially affect the earlier conclusions.

A party admitted to the original proceeding may continue to participate with respect to the remaining unresolved issues, providing that a

notice of intent to continue as a party is filed within the time prescribed in the supplementary notice of hearing. A supporting affidavit will be required to identify the specific aspects of the proceeding where continued participation is desired and to provide the basis for the contentions.

For CP applications, which reference Staff Site Reports issued after earlier Appendix Q applications, the public hearing will involve all areas of review. The issuance of a Staff Site Report is not a commitment to issue a permit or license, nor does it in any way affect the authority of the Commission, ASLAB, ASLB, and other presiding officers in any proceeding.

Relation of Procedures to Selection of Issues

The ESR procedure is structured so that an applicant may request the NRC staff to consider an issue or set of issues for one or more of the following purposes: (1) to determine the suitability of the site parameter(s) or characteristic(s), (2) to establish a range of site-related plant design and performance constraints acceptable to NRC, or (3) to elicit an NRC staff technical position on methods to analyze one or more unique site issues. Where a finding regarding overall site suitability is requested by the applicant, all relevant issues of review must be covered, and each issue must be covered at least to the degree necessary to support such a finding. Where findings are requested for fewer issues, only the information relevant to the proposed finding(s) should be provided.

It is possible that some findings, which may be proposed to resolve particular siting issues, could lead to a substantial commitment of resources at some sites. For this reason a submittal for an Early Site Review should describe the comprehensive and well-documented process by which the subject site was identified. In the absence of such information, staff effort will not be committed to a formal review when it is possible that a subsequent review of specific site alternatives could cause the site to be turned down. This will minimize the inappropriate expenditure of resources by the applicant and the staff. In the case of applications dealing with several environmental protection issues or in which early resolution of the issue(s) might prejudice the later consideration of specific alternative sites, the information should also include reconnaissance-level data* on specific alternate sites.

Review Options

Under the ESR procedures (CP or Appendix Q), the nature of the technical review in any specific review area may vary from case to case depending

*The term reconnaissance-level data, for the purposes of this report and in accordance with Regulatory Guide 4.7, is information that may be obtained from published reports, public records, public and private agencies, site visits, and individuals knowledgeable about the potential site locality. It is generally data that already exists, although in some cases the applicant may conduct limited, on-the-spot investigations. In some technical review areas, the term reconnaissance-level data may be synonymous with CP-level data.

on the site issues submitted for review and the proposed findings or conclusions requested. The finding to be made on any particular issue could vary from Option 1, a finding similar to that arrived at in CP applications not involving the early review procedures, to Option 2, a more general finding of "reasonable assurance" regarding site suitability.

In Option 1 above, the technical finding would generally be based on analyses similar to those performed for CP applications not involving the Early Site Review procedures, except that detailed safety or environmental impact analyses would normally be based on envelope assumptions regarding facility design and operating characteristics. These assumptions would be necessary, since the final facility design would not usually be known. In this case, the detailed evaluation of impacts would be based on the envelope assumptions and judgments made as to the acceptability of the impacts. If the impacts are judged acceptable, the site is judged suitable in consideration of those issues under Option 1 review. If, at the subsequent facility review stage, there is no significant new information affecting the earlier conclusions, all that would be required for those issues would be a determination of whether the facility design and operating characteristics are within the envelope assumptions used at the Early Site Review.

In Option 2, the technical finding would be based on analyses different from that customarily performed for CP applications. For these reviews,

detailed envelope assumptions regarding facility design and operation would not normally be provided. In addition, detailed analysis of impacts would not normally be performed, but would be deferred, as appropriate, to the facility design review stage. An applicant, the public, and the NRC have an opportunity to interact and communicate on a range of important site-related issues before a commitment is made to develop an entire CP application.

The Option 2 finding of "reasonable assurance" means that, for the site issues considered, the NRC staff experience and the available information indicate probable site suitability for a nuclear power plant of the current general type and design, without requiring unusual facility design, costs, or external protective features. Where a particular issue borders on or is outside the range of values reviewed and approved by the staff at other sites, the engineering feasibility and cost of designing a nuclear power plant to mitigate any impacts related to that issue must be evaluated for the NRC staff to give any reasonable assurance of site suitability. Data submitted in support of an Option 2 review of a given issue would normally be less-than-CP-level data (as described in Regulatory Guides 1.70¹ and 4.2²) and would typically be reconnaissance-level data. This less-than-CP-level data would be used in NRC staff reviews, in ACRS reviews where safety issues are involved, in hearings, and in reviews by participating NEPA-commenting agencies review.

It should be pointed out that in some situations it may be possible to use the same set of less-than-CP-level data for either a conservative Option 1 or Option 2 review.* The difference in the two review options would generally be that:

Any proposed conservative Option 1 finding, since it would be based on less-than-detailed information regarding site, design, or performance characteristics, would necessitate that relevant site, design, and/or performance parameters be enveloped in a conservative manner by the applicant. These parameters (once agreed to by the NRC) would then become conservative design and/or performance parameters to be met by the applicant. During the subsequent facility review stage the applicant would then have to demonstrate (1) that any detailed site-specific data** substantiates the

* Note: This will not be possible in every situation. In some technical areas (Aquatic Impacts of Cooling Systems, for example), it would be difficult to support a conservative Option 1 finding without some detailed data. This will depend on the complexity of the site issue at the specific site and on the availability of site information.

** This does not mean that a conservative Option 1 finding on a site issue at the ESR stage will require that detailed site-specific data regarding that site issue be provided at the subsequent facility review stage. However, if detailed site-specific data becomes available (perhaps through the evaluation of some other site issue), it will be examined, where relevant, to determine whether it substantiates the conservative Option 1 finding.

conservative Option 1 finding at the ESR stage and that the facility is designed in accordance with the conservative design and performance parameters assumed at the ESR stage. What would likely result, therefore, is a conservatively designed plant for that particular site-related issue.

However, an Option 2 finding using the same less-than-CP-level data would not necessitate that specific conservative design and performance parameters be established, since the finding would only be a determination of reasonable assurance that the site is suitable, with regard to that site issue, for a nuclear power plant of the current general type and design. During the subsequent facility review stage the applicant would likely propose facility design and performance characteristics that are less conservative than the above (Option 1) example, i.e., parameters that are more finely tuned to the specific site. These less conservative parameters would thus require data and analyses that are more detailed, i.e., normally characterized as CP-level data.

The decision as to which review option to request and how much conservatism to assume remains the prerogative of the applicant. The applicant may find advantages in certain situations in pursuing an Option 1 review (either conservative or nonconservative) because he already has

a fairly specific concept of the ultimate plant design and performance parameters, and he believes that envelopes can be proposed that will not be unnecessarily conservative and will be appropriate for his ultimate design.* On the other hand, the applicant may be more interested in the NRC staff's more general evaluation of the site issue and may be satisfied with a finding of reasonable assurance of suitability with regard to the site issue. This Option 2 approach, for example, might allow the applicant to define certain site characteristics that must subsequently be accommodated by design.

Thus, the amount of detailed data to be developed by an applicant and reviewed by the staff in evaluating a site will be lessened when, for a particular issue, the use of less-than-CP-level data results in a conservative NRC finding that is acceptable to the applicant, ACRS, ASLB, the Commission, and the public. If the applicant subsequently chooses to design his plant conservatively to comply with that finding, there may be no need to collect and analyze detailed, site-specific data that in many

* Note: An applicant may pursue a conservative Option 1 finding for a site issue at the ESR stage and decide at the facility review stage that it is not advantageous to design the facility in accordance with the conservative design and performance parameter(s) assumed at the ESR stage. Although this would require more detailed data and analysis (normally characterized as CP-level data), the parameter(s) may be reevaluated and more finely tuned to the specific site at the facility review stage.

cases is only used to support the rationale for less conservative plant design. For example, the use of Appendices B and C of Regulatory Guide 1.59⁴ for estimates of precipitation or hurricane-induced flood conditions using regional data will produce conservative numbers. If this level of conservatism is acceptable to the above mentioned parties, no further detailed analyses are required.

Whether an applicant requests an Option 1 or Option 2 review, the level of information to be supplied and the depth of the staff review will depend on the relative importance of the site issue to safety or environmental protection, the amount of conservatism involved in arriving at the conclusions, and/or the usefulness and stability of the proposed finding. In all cases, the applicant should only provide (in the format suggested in Regulatory Guides 1.70¹ and 4.2²) that information necessary to evaluate the proposed finding.

A mix of Option 1 reviews for some issues and Option 2 reviews for others is acceptable to the NRC staff, provided that the findings are relevant to site suitability or site design parameters and that the technical issues are useful and conservatively supported. In turn, the staff should be able to support either its findings of acceptability and feasibility or its findings of reasonableness based on (a) the completeness of information provided, (b) the degree of conservatism of the conclusion, and (c) the feasibility of constructing a nuclear power facility to cope with the particular parameter.

In addition to the guidance provided here, applicants are encouraged to consult with the NRC technical staff when designing the work plan to be used in preparing the ESR application and when describing the proposed findings in the application, in order to minimize review difficulties. This will enable the applicant to focus the preparation of the site application on important issues relative to the specific site, and will produce more efficient reviews by the NRC staff, the ACRS, other governmental agencies, and the public.

Findings

An application for Early Site Review would include the applicant's proposed findings in each technical area that is submitted for review. As was discussed earlier, the findings would range from a CP-level determination of acceptability of design basis parameters in a given technical area (Option 1) to a more general finding of "reasonable assurance" of site suitability regarding a given technical area (Option 2).

The findings proposed by the applicant, as well as the corresponding NRC staff findings, would be influenced by several variables:

- a. Data availability--What data are necessary to support the desired finding? Is the existing data base adequate to support the desired finding? What, if any, additional data should be collected?
- b. Site complexity--For a given technical area at a particular site, what other interacting technical areas should be considered? Have other pertinent related technical areas been addressed in sufficient detail to permit the determination of whether they support the finding in the given

technical area? Are there site characteristics that must be evaluated and addressed in other than a routine manner?

c. Finding proposed--How conservatively based is the proposed finding? What mix of data and conservatism is employed to arrive at the proposed finding? How specific and detailed is the proposed finding?

d. Envelope assumptions (very closely related to conservatism in the above discussion)--What assumptions were made regarding facility design and operating characteristics? Are these assumptions well within the state-of-the-art? If not, what range of cost penalties would accrue to unique engineering solutions?

These variables would be considered for each technical review area of an early review, and the findings would be specifically tailored for each technical area at a particular site.

CHAPTER III

IMPLEMENTATION CRITERIA AND INFORMATION REQUIREMENTS

The amendments to 10 CFR Parts 2 and 50 establish the procedures for early reviews of site suitability issues.

Provisions for Implementation

The procedures for early reviews of site suitability issues are designed to contribute effectively to and be meaningfully integrated into the licensing process. They contain several requirements to ensure this. The regulations provide that only one review of site suitability issues shall be conducted prior to the full CP review. The regulations also provide that the Commission may decline to initiate an Early Site Review or render an early partial decision in cases where an early partial decision on any issue or issues of site suitability might prejudice the conclusions of any later review regarding alternative sites. The Commission may also decline to initiate an Early Site Review or to render an early partial decision in cases where it appears that such action would not be in the public interest considering: (1) the degree of likelihood that an early finding on those issues would retain their validity in later reviews, (2) the objections, if any, of cognizant State or local governmental agencies to the conduct of an early review on those issues, and (3) the possible effect on the public interest and the parties of having an early, if not necessarily conclusive, resolution of those issues.

There are some technical review areas that would not be appropriate to consider during an Early Site Review unless certain other areas or topics were also reviewed at that time. For example, it would not be appropriate at an Early Site Review to address the subject of the evaluation of all potential offsite accidents that may affect the nuclear plant unless the subjects of the location and description of all offsite industrial, transportation, and military facilities were also addressed at the early review, since the findings or conclusions from the latter review are necessary for the former.

Information Requirements

The information needs corresponding to proposed findings are specified in existing NRC documents (such as Refs. 1-8) pertaining to the CP licensing review as well as in this document.

In addition to the information specific to the findings proposed, the following general information should be submitted as a basis for any review of site issues:

1. Description of site selection process.
2. Number and types (e.g., LWR, coal-fired) of nuclear and other generating units planned or existing on the site and approximate dates of initial operation for each unit.
3. Approximate range of thermal and electrical capacities of generating units.

4. A map showing the location of the site with respect to nearby political divisions. Estimated latitude and longitude of each generating unit.

5. Estimated Universal Transverse Mercator coordinates of each reactor.

6. General location of safety-related facilities on the site (safety issues only).

Postulated Information

There will be a need later in the facility design review to verify those Early Site Review conclusions that are based on postulated facility information by comparing the detailed facility information, made available only for the later review, to the facility information postulated at the Early Site Review. This comparative review is not considered to be substantial unless conflicts between the postulated and detailed facility information lead to a reopening of issues resolved at the early review. Thus, facility information postulated for the Early Site Review should be carefully determined, with some appropriate degree of conservatism, and limited to only information actually needed at the Early Site Review. Where this information is not available, some assistance may be found in the available technical literature describing nuclear power generating station design and performance characteristics, e.g., WASH-1355.⁵ Where the postulated facility information addresses a number of facility characteristics, it could be viewed as an envelope of plant design and performance characteristics. There should be no conflict among the

envelopes used for the review of various issues in an Early Site Review. Moreover, the review of any particular issue should normally be based on not more than one envelope.

It may be appropriate to base the early review of some site suitability issues on postulated information other than information concerning the facility. For example, the population distribution and population trend information available at the time of a later review may be postulated at the early review. As with postulated facility information, there would be a need in the later review to verify the agreement between actual and postulated information.

New Information

The partial decision of the Atomic Safety and Licensing Board or the conclusions of the Staff Site Report will remain effective for 5 years unless significant new information that substantially affects the earlier conclusions is found to exist. Such new information could arise from several possible sources such as:

1. The detailed facility information may differ significantly from the facility information provided as a basis for the Early Site Review.
2. Site and related characteristics influenced by man may change significantly.
3. New theories and predictive models may be proven that indicate the Early Site Review conclusions are inaccurate.

4. Federal, State, and local regulatory requirements may change and may necessitate backfitting.

There remains the question as to what extent the applicant has the obligation at the facility review to determine whether new information exists that could affect the previous decision. If the applicant has such an obligation, this could easily force the applicant into re-proving his whole case just to show there is no new information of substance. It appears reasonable that it is the obligation of the NRC staff and/or intervenors* to identify the new information and to show that there is a potential for affecting the previous decision, at which point the contention would be admitted into the proceeding. However, this is in no way to be construed to mean that the applicant is not obliged to divulge such new information if he is aware of it.

In the event that the Commission, the Atomic Safety and Licensing Appeals Board, or the Atomic Safety and Licensing Board find that there is significant new information that substantially affects the conclusions of the partial decision on site suitability issues, it would necessitate reopening the hearing record. However, only those conclusions to which the new information is relevant would be reconsidered.

* Note: Notice would be provided to all interested parties to an ESR, when the applicant decided to proceed toward the CP by initiating the facility review.

It is clear that when conservative assumptions regarding site safety parameters, facility design, resource protection, and socioeconomic impacts are made at the ESR stage, it is less likely that new information of sufficient substance to cause reconsideration of the original site suitability decision will be identified at the facility review stage.

CHAPTER IV

SITE SUITABILITY REVIEWS - PUBLIC HEALTH AND SAFETY ISSUES

The construction permit (CP) review can be segmented according to nine categories of site suitability review areas concerned with public health and safety issues under the Atomic Energy Act of 1954 as amended. Two publicly available documents that are used in CP reviews and that provide a rational and orderly basis for this segmentation (including topics and subtopics) are Regulatory Guide 1.70,¹ which indicates the information to be provided to support the review of these areas, and NUREG-75/087,⁶ which provides standard plans to guide the NRC staff in their review of these areas. Regulatory Guide 4.7,³ which provides a general set of safety and environmental criteria that the NRC staff has found to be valuable in assessing candidate-site identification in specific licensing cases, is generally segmented on this same basis.

The outline provided on the next several pages shows the relationship of the numerous technical review areas within the nine categories, and indicates the sections of Regulatory Guide 1.70¹ and NUREG-75/087⁶ that apply. One category, hydrology, and one technical review area, floods, are developed as examples to illustrate (1) the kind of findings that might be possible for an Early Site Review; (2) the prospects for reaching such Early Site Review findings without facility information of the detail normally provided at a CP review; and (3) the likelihood that

such findings will not be substantially affected by new information made available prior to issuance of a CP. For the example given, a summary breakdown of all the associated review topics and subtopics is provided. A more detailed description of the scope and depth of review of each area can be found in the corresponding sections of Regulatory Guide 1.70¹ and NUREG-75/087.⁶ The possible findings may be found in or inferred from the appropriate section(s) of NUREG-75/087.^{6*} Such findings could vary considerably depending on the actual topics and subtopics chosen by the applicant for review and on the degree of conservatism applied by the applicant. Generally, less site-specific data and less detailed analysis are required to determine a conservative (rather than fine-tuned) design basis parameter. It is expected that an applicant will consider costs of structure or system design and cost of data collection and analysis in determining whether to take a conservative or fine-tuned approach to any topic or subtopic.

The major emphasis in the remainder of this chapter is placed on discussion of an Option 2 review because of the difference between it and the CP application type of review that will be used under Option 1.

* Note: Except for "Radiation Doses to the Public from Routine Operation" that is not contained in NUREG-75/087.⁶

Outline of Technical Review Areas

- A. Exclusion Area Authority and Control
 - Section 2.1.2* Exclusion Area Authority and Control
 - ... (Example will be developed)

- B. Population Distribution
 - Section 2.1.3 Population Distribution
 - ... (Example will be developed)

- C. Nearby Industrial, Transportation, and Military Facilities
 - Section 2.2.1 Location and Routes Descriptions
 - Section 2.2.2 Descriptions
 - Section 2.2.3 Evaluation of Potential Accidents
 - ... (One example will be developed)

- D. Meteorological Characteristics
 - Section 2.3.1 Regional Climatology
 - Section 2.3.2 Local Meteorology
 - Section 2.3.3 Onsite Meteorological Measurements Program
 - Section 2.3.4 Short-Term (Accident) Diffusion Estimates
 - Section 2.3.5 Long-Term (Routine) Diffusion Estimates
 - ... (One example will be developed)

* Note: Section of Regulatory Guide 1.70¹ and NUREG-75/087⁶ that, respectively, indicate information to be provided to support the review of each area, and provide standard plans for the NRC staff review of each area.

E. Hydrologic Characteristics - Examples Provided

Hydrologic engineering aspects of nuclear facility sites and plant designs are a critical area in determining site/plant design suitability. Considering site hydrologic parameters alone cannot ensure that plant design provisions will be adequate. However, by ensuring that all hydrologic variables have been conservatively considered, and by comparing similar parameters at other sites in conjunction with the design provisions employed for coping with the parameter, a finding of site suitability may be made.* Furthermore, the staff's experience has indicated that plant design provisions are functions of both good engineering practice and costs. Both aspects will be considered after identification of the severity of the hydrologic conditions.

The site flood potential is important with respect to plant safety. To identify the flood potential it is necessary to consider, where relevant to a specific site, such phenomena as large area and local precipitation, wind storms (both tropical and extratropical varieties), moving squall lines, tsunamis, seiches, and dam failures. Most of this evaluation can be accomplished without knowledge of specific plant facilities or enveloped design assumptions. However, evaluation of those conditions

* Note: The level of detail of the data need not be different for an Option 1 and Option 2 review, but the Option 1 review would require a more conservative analysis and enveloped assumption regarding facility design and operation.

that could be caused by plant facilities (e.g., site ponds or lakes) or that could be enhanced by the facility can only be accomplished if the physical design of the plant facility is known or design envelope assumptions are made. The evaluation of conditions that could be caused by plant facilities may be left for later review, and then only the local potential for aggravating flood conditions would be evaluated for purposes of assessing design criteria.

2.4.1 Hydrologic Description

2.4.2 Floods

Acceptable sources of data and methods of computation for many types of floods are given in Regulatory Guide 1.59.⁴ Regulatory Guide 1.59 describes both detailed flood analysis of the type usually employed in CP applications and explains a methodology for assessing some types of flood potential using less-than-normal-CP-level data. The use of this less-than-normal-CP-level information is acceptable in an Option 2 review for reasonable assurance of site suitability and also is generally acceptable in Option 1 reviews and CP applications, although it produces conservative estimates.* Problems arising from hydrologic analyses of a specific site can generally be accommodated in the design of the facility. The principal value of a review of the information used in arriving at the flood estimates is in identifying potential problem areas that may have been overlooked by the applicant and in ensuring that an acceptable level of

* Note: See section on Review Options, Chapter II, for discussion of differences between Option 1 and Option 2 reviews when the data and analysis are similar.

conservatism has been applied. For example, a potential source of flooding may not have been considered or may not have been considered conservatively enough. Thus, a principal value of the ESR is prevention of costly delay caused by any reanalysis and design changes at the facility review stage as a result of such oversights or lack of conservatism.

For most plants now being licensed, the design basis flood level (DBFL) to which the safety-related structures, systems and components (criteria for which are identified in Regulatory Guide 1.29⁷) are exposed is within approximately 5 feet of proposed plant grade.

Based on this experience, an Option 2 review and determination of reasonable assurance that a site is suitable from the standpoint of flooding for a nuclear power plant of current general type and design (without unusual facility design or external protective features) can be made if it is demonstrated that the DBFL will be approximately 5 feet or less above grade. This demonstration can be based on estimates using available data, information obtained from onsite reconnaissance, and assumptions as to the probable location of safety-related structures on the site. The staff then would base its findings on the review of material for the site under consideration and on its experience at other nuclear power plants that have been designed to cope with similar flood conditions.*

* Note: An Option 1 review could similarly be based on available data and onsite reconnaissance information, although detailed envelope assumptions regarding facility design and operation would be required. (See section on Review Options, Chapter II.) An Option 1 review based on the site-specific data and detailed analysis would not require this conservative approach.

A DBFL greater than 5 feet above plant grade requires two detailed evaluations for a CP: (1) plant safety considerations and (2) an evaluation of potential increases in local flood levels due to the presence of the nuclear station. If neither of these issues is considered important to the Option 2 finding sought by the applicant, their evaluation may be left to the facility design review, when the specific plant design is known. If, however, these issues are relevant to the finding sought by the applicant, they may also be considered in a conservative manner using less-than-CP-level data, provided that the engineering feasibility and cost of coping with the situation have been considered and that similar situations have been encountered by the staff at other sites.

Standard plant designs (both Nuclear Steam Supply System and Balance of Plant) reviewed to date by the staff have established a DBFL at or below plant grade. Should such a standard plant be contemplated for an Option 2 review, a DBFL above a proposed plant grade may be accommodated in two ways: (1) by raising the grade level and (2) by building a protective structure such as a levee around plant facilities. This situation should be acknowledged in an ESR considering flooding.

A conservative envelope value for a DBFL can be estimated using a minimum of data and limited onsite investigations. However, it may be advantageous to evaluate in detail the design basis flood event without knowing the station design. These events must be determined before evaluating the interface with the station or the potential environmental effects. A firm finding of the adequacy of the information and the

method of computation would provide the applicant with values for design basis parameters. This approach may result in an ultimate saving of time since there will be a firmer basis for an Option 2 finding of reasonable assurance that the site is suitable for a nuclear power station of current type and design without unusual facility design or external protective features. It would also be more likely that the design that ultimately is proposed will be found adequate by the staff during the facility review stage.

In summary, under Option 1, the CP review and conclusions may be based on the following (1) a detailed flood analysis using detailed data that would identify the DBFL or (2) a conservative flood analysis using less-than-detailed data that would identify a conservative value for the DBFL. If the latter type analysis provides a DBFL that is less than 5 feet above the assumed grade level, it can be concluded under Option 1 that the site is suitable from the standpoint of flooding. Similarly, under Option 2, using less-than-detailed data and analysis a judgment can be made as follows:

1. If the analysis provides a DBFL of less than 5 feet above the assumed grade level, reasonable assurance of suitability from the standpoint of flooding can be concluded. (The distinction between the Option 1 and Option 2 analysis is the amount of conservatism introduced into the analysis.)
2. If the analysis provides a DBFL greater than 5 feet above the assumed grade level, the appropriate judgments will have to be provided

regarding the technology and costs required to ensure plant safety and to protect against local flooding. In some instances, such judgments may require detailed analysis, including assumptions regarding plant design and grade.

Detailed analysis of all factors affecting the DBFL without knowing or postulating station design could be useful to the designer even if no judgment could be made at the ESR stage regarding site suitability in this area.

The following flood-related topics, numbered and titled consistent with the system employed in Regulatory Guide 1.70¹, are annotated with comments as to the completeness of analysis and review that can be made without a specific facility design or design envelope assumptions:

2.4.2 Floods

2.4.2.1 Flood History

This section can be completed.

2.4.2.2 Flood Design Considerations

The considerations contained in this section are generally not related to site suitability and need not be evaluated in an ESR unless they are important to the findings sought by the applicant. Otherwise, this section may be left until the stage in CP review when the plant design is known. However, if the considerations in this section are relevant to the findings being sought, then they may be evaluated as follows:

- a. When the plant grade (or assumed grade) is above DBFL, a conclusion of no flood protection requirements may be made.

- b. When the plant grade (or assumed grade) is below DBFL, the specific facility design and geometry must be known (or assumed) or a standard plant must be assumed. If a standard plant is assumed, consideration of providing levees or a plant grade greater than or equal to the DBFL should be discussed.

The potential worsening of flood conditions caused by plant facilities cannot generally be evaluated without specific knowledge or assumptions regarding facility design.

There are cases where the specific facility design requires unique flood protection features, such as cooling ponds constructed above grade, that must be considered during the CP review. It is unnecessary to consider such unique features in an ESR since they may be coped with by proper engineering design.

2.4.2.3 Effects of Local Intense Precipitation

The magnitude of the local intense precipitation may be determined. Further analyses as required by the section would require specific plant design information or assumptions. (See Section 2.4.2.2 above.)

2.4.3 Probable Maximum Flood (PMF) on Streams

2.4.3.1 Probable Maximum Precipitation

2.4.3.2 Precipitation Losses

2.4.3.3 Runoff and Stream Course Models

2.4.3.4 Probable Maximum Flood Flow

All of these sections may be completed in final form, reviewed, and accepted.

2.4.3.5 Water Level Determinations

This section can be completed only if it is assumed that plant structures (fill, intakes, discharge structures, access) will not affect the existing capacity of the stream. Otherwise, specific facility design information or assumptions are required. (See Section 2.4.2.2.)

2.4.3.6 Coincident Wind-Wave Activity

See Section 2.4.2.2. Evaluation of considerations contained in this section would require specific facility design information or assumptions since such an evaluation would be affected by, for example, the location, size, and shape of plant structures as well as by the final plant grading.

2.4.4 Potential Dam Failures, Seismically Induced

2.4.4.1 Dam Failure Permutations

2.4.4.2 Unsteady Flow Analysis of Potential Dam Failures

These sections may be completed, except for those dams that may be designed and constructed in conjunction with the nuclear power plant. (See Section 2.4.2.2.)

2.4.4.3 Water Level at Plant Site

See Section 2.4.2.2. Evaluation of considerations contained in this section would require specific facility design information or assumptions if contemplated plant structures could affect the water level at the plant site.

2.4.5 Probable Maximum Surge and Seiche Flooding

2.4.5.1 Probable Maximum Winds and Associated Meteorological Parameters

2.4.5.2 Surge and Seiche Water Levels

Design information is not needed to complete these two sections unless the water body being considered is to be constructed for the plant or unless plant structures might affect the water level.

2.4.5.3 Wave Action

Wave periods and significant and maximum (1%) waves may be determined without design data. Effect of structures, including their effect on runup, is not generally related to site suitability and its evaluation would require specific facility design information or assumptions. (See Section 2.4.2.2.)

2.4.5.4 Resonance

Can generally be evaluated without design data, except for water bodies that will be modified or established in conjunction with the nuclear power plant. Evaluation of water bodies that will be modified or established would require specific facility design information or assumption. (See Section 2.4.2.2.)

2.4.5.5 Protective Structures

See Section 2.4.2.2. Evaluation of considerations contained in this section would require specific facility design information or assumptions.

2.4.6 Probable Maximum Tsunami

2.4.6.1 Probable Maximum Tsunami

2.4.6.2 Historical Tsunami Record

2.4.6.3 Source Tsunami Wave Height

2.4.6.4 Tsunami Height Offshore

Analyses of all of these sections is independent of plant design.

2.4.6.5 Hydrography and Harbor or Breakwater Influences on Tsunami

2.4.6.6 Effects of Safety-Related Facilities

See Section 2.4.2.2. Evaluation of considerations contained in this section would generally require that design data are available or assumed if changes to the hydrosphere or exposed structures are contemplated.

2.4.7 Ice Effects

2.4.8 Cooling Water Canals and Reservoirs

2.4.9 Channel Diversions

2.4.10 Flooding Protection Requirements

These issues must await plant design, unless a "dry" site where a finding of no requirements can be easily made except for the effects of intense local precipitation and runoff (see 2.4.2.3). If a standard plant is employed, a commitment to standard plant criteria for flood protection should be provided. The types of flood protection considered feasible for the site should be generally described and the costs determined where unique.

2.4.11 Low Water Considerations

2.4.12 Dispersion, Dilution, and Travel Times of Accidental Releases of Liquid Effluents in Surface Waters

2.4.13 Groundwater

2.4.14 Technical Specifications and Emergency Operation Requirements

F. Geologic and Seismic Characteristics

Section 2.5.1 Basic Geologic and Seismic Information

Section 2.5.2 Vibratory Ground Motion

Section 2.5.3 Surface Faulting

... (One example will be developed)

G. Foundation Materials

Section 2.5.4 Stability of Subsurface Materials and Foundations

Section 2.5.5 Stability of Slopes

Section 2.5.6 Embankments and Dams

... (One example will be developed)

H. Radiation Doses to the Public from Routine Operation

Radiation Doses to the Public from Routine Operation*

... (Example will be developed)

I. Design Bases Not Otherwise Covered - Not anticipated for ESR.

Section 3.3.1 Wind Loadings

Section 3.3.2 Tornado Loadings

Section 3.4.1 Flood Protection

Section 3.4.2 Analysis Procedures

Section 3.5.1.4 Missiles Generated by Natural Phenomena

Section 3.5.1.5 Missiles Generated by Events Near the Site

Section 3.5.1.6 Aircraft Hazards

Section 3.7.1 Seismic Input

*Note: Not addressed in Regulatory Guide 1.70¹ or NUREG-75/087.⁶

CHAPTER V

SITE SUITABILITY REVIEWS - ENVIRONMENTAL PROTECTION ISSUES

The construction permit review of environmental protection issues can be segmented according to categories of site suitability review areas. The basis for this segmentation and the further subdivision into topics and subtopics is the Environmental Standard Review Plans, NUREG-0158,⁸ which provides guidance to the NRC staff and will be used in their review of these areas. Acceptable types of data, methods of analysis, and general criteria for site suitability and site ecological characteristics are described in Regulatory Guides 4.7,³ and 4.2.² The major emphasis in this chapter, as in Chapter IV, is on discussion of Option 2 because of the difference between it and the CP application review procedures that would be used under Option 1.

The outline provided in the next several pages shows the relationship of the numerous technical review areas within the categories, and indicates the section numbers of NUREG-0158⁸ that apply. One category, Environmental Impacts of Station Operation, and one technical review area, Intake System - Aquatic Impacts, are developed as examples to illustrate (1) the kind of findings that might be possible for an early review, (2) the prospects for reaching such early review findings without facility information of the detail normally provided at a CP review, and (3) the probability that such findings will not be substantially affected by new information made available prior to the issuance of a CP. The findings possible could vary considerably

depending on the actual topics and subtopics submitted by the applicant for review and on the degree of conservatism applied by the applicant (i.e., in most areas of review, conservative findings can usually be made with a lesser amount of site-specific data and with less detailed analysis or, possibly, with fewer facility design assumptions being necessary).

1. INTRODUCTION

1.1 THE PROPOSED PROJECT

1.2 STATUS OF REVIEWS AND APPROVALS

2. ENVIRONMENTAL DESCRIPTIONS

2.1 SITE LOCATION

2.2 LAND USE

2.2.1 The Site and Vicinity

2.2.2 Transmission Corridors and Offsite Areas

2.2.3 The Region

2.3 WATER USE

2.4 ECOLOGY

2.4.1 Terrestrial Ecology

2.4.1.1 The Site and Vicinity

2.4.1.2 Transmission Corridors and Offsite Areas

2.4.2 Aquatic Ecology

2.4.2.1 The Site and Vicinity

2.4.2.2 Transmission Corridors and Offsite Areas

- 2.5 SOCIOECONOMICS
 - 2.5.1 Demography
 - 2.5.2 Community Characteristics
 - 2.5.3 Historic and Archeological Sites and Natural Landmarks
- 2.6 GEOLOGY
- 2.7 HYDROLOGY
 - 2.7.1 Surface Water
 - 2.7.2 Ground Water
- 2.8 METEOROLOGY
- 2.9 RELATED FEDERAL PROJECT AREAS
- 3. PLANT DESCRIPTION
 - 3.1 EXTERNAL APPEARANCE AND PLANT LAYOUT
 - 3.2 REACTOR STEAM-ELECTRIC SYSTEM
 - 3.3 PLANT WATER USE
 - 3.3.1 Water Consumption
 - 3.3.2 Water Supply
 - 3.3.3 Water Treatment
 - 3.4 COOLING SYSTEM
 - 3.4.1 System Description and Operational Modes
 - 3.4.2 Component Descriptions
 - 3.5 RADIOACTIVE-WASTE-MANAGEMENT SYSTEMS

- 3.6 NONRADIOACTIVE WASTE SYSTEMS
 - 3.6.1 Wastes Containing Chemicals or Biocides
 - 3.6.2 Sanitary System Wastes
 - 3.6.3 Other Wastes
- 3.7 POWER-TRANSMISSION SYSTEMS
- 3.8 RADIOACTIVE MATERIAL MOVEMENT
- 4. ENVIRONMENTAL IMPACTS OF CONSTRUCTION
 - 4.1 LAND-USE IMPACTS
 - 4.1.1 The Site and Vicinity
 - 4.1.2 Transmission Corridors and Offsite Areas
 - 4.1.3 Historic/Archeological Sites
 - 4.1.3.1 The Site and Vicinity
 - 4.1.3.2 Transmission Corridors and Offsite Areas
 - 4.2 HYDROLOGICAL AND WATER-USE IMPACTS
 - 4.2.1 Hydrological Impacts
 - 4.2.2 Water Use Impacts
 - 4.3 ECOLOGICAL IMPACTS
 - 4.3.1 Terrestrial Ecosystems
 - 4.3.1.1 The Site and Vicinity
 - 4.3.1.2 Transmission Corridors and Offsite Areas
 - 4.3.2 Aquatic Ecosystems
 - 4.3.2.1 The Site and Vicinity
 - 4.3.2.2 Transmission Corridors and Offsite Areas

- 4.4 SOCIOECONOMIC IMPACTS
 - 4.4.1 Physical
 - 4.4.2 Social and Economic
- 4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS
- 4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION
 - 4.6.1 Applicant's Commitments
 - 4.6.2 Staff Evaluation and Recommendations
- 5. ENVIRONMENTAL IMPACTS OF STATION OPERATION
 - 5.1 LAND-USE IMPACTS
 - 5.1.1 The Site and Vicinity
 - 5.1.2 Transmission Corridors and Offsite Areas
 - 5.1.3 Historic/Archeological Sites
 - 5.2 WATER-USE IMPACTS
 - 5.3 COOLING-SYSTEM IMPACTS

The use of water in cooling systems to dissipate large amounts of waste heat from nuclear power plants is a major cause of nonradiological environmental impacts of plant operation. The potential aquatic impacts that may be encountered include: impingement, entrainment, and entrapment of aquatic organisms; consumptive use of water; thermal and chemical alterations to the water discharged; and physical alteration to the habitat. The terrestrial impacts may include: land use, fogging, drift, and esthetics.

5.3.1 Intake System

5.3.1.1 Hydrodynamic Descriptions and Physical Impacts

5.3.1.2 Aquatic Impacts

An Option 1 Early Site Review of an intake system would generally consist of a detailed evaluation of site-specific ecological data coupled with analysis of specific facility design information or a design envelope. The level of review and impact evaluation performed under Option 1 would be similar to that of a CP-type environmental impact assessment, as described in NUREG-0158⁸ (Environmental Standard Review Plan 5.3.1.2). To support this level of review, detailed site-specific ecological information commensurate with the type and level of findings sought by the applicant would be needed. Under such an Option 1 review, site-specific impact assessments could be made that result in specific site suitability determinations with regard to water withdrawal at the site.

An Option 2 review of intake system aquatic impacts can range from a determination of reasonable assurance of site suitability for accommodating a cooling-water intake system to an approval of the sampling program designed to support a subsequent CP application. An Option 2 review may be based on less-than-CP-level data (discussed earlier in this document) and generally on less detailed facility design information

than necessary for a typical Option 1 review.* However, this will depend on the specificity of the findings sought by the applicant and on whether there are any unique features associated with the site that would necessitate special consideration.

The less-than-CP-level data used in an Option 2 review will be reconnaissance-level information, the source of which could include: (1) review of applicable literature, (2) reports from State, Federal, and local agencies, (3) applicable scientific, engineering, economic, and regional planning studies, (4) aerial photographs and topographic maps of the site(s) and vicinity, (5) onsite inspections by professionals knowledgeable in their respective fields, (6) local experts, interested parties, and cognizant individuals from State and Federal agencies, universities, and museums, and (7) reports from other power plant studies within the region.

The extent of reconnaissance level information relevant to a particular site will vary. Generally, the greater the number of competing uses within a region, the greater will be the availability of information regarding the region's resources. Reconnaissance-level information relevant to the aquatic resources of a particular site could include the following:

* Note: There could be a situation where the same site issue data and its analysis could support a conservative Option 1 review or an Option 2 review. The conservative Option 1 review would necessitate that either the relevant design and performance parameters be enveloped or that the findings be conditioned with design and performance constraints. See Chapter II, the section on Review Options.

- a. Principal organisms present in the general vicinity, based on available information.
- b. Relative abundance of these principal organisms, e.g., common, rare.
- c. Commercial and recreational fishing locations in the vicinity with estimates of their importance and the amounts of fish harvested.
- d. Rare, endangered, or threatened species and their critical habitats known or suspected in the area.
- e. Major habitat types, including specialized habitats, and the approximate areas of each.
- f. Important spawning and nursery areas that might be affected by the proposed facility as determined by an initial field inspection.
- g. The ecological state of the major habitats on the site and under the influence of the proposed facility, e.g., productive, eutrophic, diverse fauna.
- h. Special features associated with the site that would be important to aquatic living resources.
- i. Averages, extremes, and ranges of variabilities of key water-quality parameters as indicated by the literature and by consultation with locally cognizant authorities.

- j. The physical and hydrological characteristics of the cooling water source and receiving water body.*
- k. Anticipated interbasin water transfers.*
- l. Present and anticipated water uses within the area potentially influenced by a power facility. Include identification of the types and location of these uses and indicate their relative magnitudes. Include consideration of waters used for recreation, agriculture, irrigation, industry, cooling, public water supply, and fish and wildlife habitat.*

It is not intended that all of the above categories of reconnaissance-level information regarding aquatic resources would be included in every situation, but rather that the information would be included on the basis of its applicability to the proposed finding.

Based on past licensing experience, it should be possible to give reasonable assurance of site suitability with regard to the cooling water intake using reconnaissance-level data if it can be demonstrated that (1) the general vicinity where the intake system would be located is not significantly used by any sensitive life-cycle stages of any economically or otherwise important species, (2) water use and consumption would be compatible with the water-use plans of cognizant water resource

*Note: It is the aquatic impacts associated with these safety-related parameters that should be considered here. When a finding is sought for the aquatic impacts associated with these parameters, it is not intended that the hydrologic analysis be duplicated here. Rather, the corresponding hydrology sections of the outline for health and safety issues should be completed even if no finding is sought in hydrology.

planning agencies and that other water uses would not be impaired during extreme low flow conditions (determined according to generally accepted engineering practices), and (3) for multipurpose impoundments, water withdrawal could be managed such that the magnitude and frequency of drawdown would not cause unacceptable damage to important habitats (for example, drawdown that could eliminate vegetated wetland habitats should be scheduled to occur when it is least likely to impact susceptible life-cycle stages of species using the habitat).

If the reconnaissance-level data provided by the applicant fails to support any one of the above applicable statements,* and indicate, for example, that the general vicinity where the intake system would be located is used as a nursery area by an important species, a more in-depth assessment of the site and of the potential for entrainment, entrapment, and impingement of these organisms would be necessary. Reasonable assurance of site suitability for the cooling water intake system would then depend on the applicant's ability to demonstrate that (1) the site has characteristics that would allow placement of an intake structure where the relative abundance of the important species is low and where low approach velocities can be attained, (2) sufficient zone of passage will remain to permit

*Note: Generally, in this situation the facility design information should at least (1) describe the general type of cooling system anticipated and the approximate intake and discharge flows, (2) indicate the approximate location, general design, and size of the cooling system components, and (3) be commensurate with the finding proposed by the applicant.

normal movement of the important species, (3) the important habitat will not be unacceptably impacted (see Regulatory Guide 4.7,³ B-1), and (4) intake canals will not be necessary or would not be employed unless the site and the important species' characteristics are such that entry of the species to the canal can be prevented or would not result in significant adverse impacts. The greater the probability that significant impacts on identified resources might occur, the greater will be the requirement for site-specific data, detailed facility design information, and/or conservative assumptions regarding facility design (e.g., a commitment by the applicant to employ cooling towers if he cannot support the use of a once-through cooling system).* The NRC staff will base its findings on the review and evaluation of material for the site under consideration, as well as on its experience at other nuclear power plant sites where the cooling water intake system design has successfully mitigated potential impacts on similar aquatic ecosystem.

5.3.2 Discharge System

5.3.2.1 Thermal Description and Physical Impacts

5.3.2.2 Aquatic Impacts

* It is possible that some findings that may be proposed could lead to a substantial commitment of resources at some sites. For this reason, a submittal for an Early Site Review should describe the comprehensive and well-documented process by which the site was identified. In the absence of such information, staff effort will not be committed to a formal review when it is possible that a subsequent review of specific site alternatives could cause the site to be turned down.

- 5.3.3 Heat Dissipation System
 - 5.3.3.1 Heat Dissipation to the Atmosphere
 - 5.3.3.2 Impacts to Terrestrial Ecosystems
- 5.4 RADIOLOGICAL IMPACTS OF NORMAL OPERATION
 - 5.4.1 Exposure Pathways
 - 5.4.2 Dose Commitments
 - 5.4.3 Impact to Man
 - 5.4.4 Impact to Biota Other than Man
- 5.5 NONRADIOACTIVE-WASTE-SYSTEM IMPACTS
- 5.6 TRANSMISSION-SYSTEM IMPACTS
 - 5.6.1 Terrestrial
 - 5.6.2 Aquatic
 - 5.6.3 Impacts to Man
- 5.7 URANIUM-FUEL-CYCLE IMPACTS
- 5.8 SOCIOECONOMIC IMPACTS
 - 5.8.1 Physical
 - 5.8.2 Social and Economic
- 5.9 DECOMMISSIONING
- 5.10 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING OPERATION
 - 5.10.1 Applicant's Commitments
 - 5.10.2 Staff Evaluation and Recommendations
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