NUCLEAR ENERGY INSTITUTE

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September 28, 2001

Mr. James B. Lyons, Director
New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20055-0001

Dear Mr. Lyons:

Enclosed is a copy of NEI 01-02, Revision A, *Guidance For Preparing An Early Site Permit Application*. This guidance provides an approach for implementing the requirements of 10 CFR Part 52, Subpart A.

The process outlined in the document is founded on industry experience and expertise in implementing early site permits. Where appropriate, it points the user to the applicable regulatory guidance. Our expectation is that using this guidance will make the early site permit application preparation process stable, predictable and efficient.

We are providing the guidance for NRC staff review and comment. We view the submittal of this document as a means of exchanging information with the NRC that is intended to support generic regulatory improvements. Therefore, we believe an exemption from any review fees is warranted based on the criteria in footnote 4 of 10 CFR Part 170.21.

Our goal is to have the guidance available for use by the end of this year. In this regard, receiving the NRC staff's comments by October 24 would be beneficial. We are not requesting NRC formally endorse our guidance in a Regulatory Guide, but we would appreciate some recognition, perhaps in the form of a letter from the NRC, that the guidance is an acceptable approach for preparing an early site permit applications.

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We should point out that the document is a working draft because some sections are incomplete. For example, Appendix C contains Plant Parameter Envelopes. The final document will have envelopes for all of the certified designs and we are working with the appropriate individuals on envelopes for non-certified designs such as the PBMR. We expect to have these envelopes within in the next month at which time we will update the guidance accordingly.

We look forward to working with the NRC staff on this document. Please contact Doug Walters at 202.739.8093 or by e-mail at djw@nei.org if you have comments or questions.

Sincerely,

Ronald L. Simard

Enclosure

c: Mr. Thomas Kenyon, NRC

NEI 01-02 (REVISION A)
INDUSTRY GUIDELINE FOR PREPARING AN EARLY SITE PERMIT APPLICATION – 10 CFR PART 52, SUBPART A

SEPTEMBER 2001

NUCLEAR ENERGY INSTITUTE

INDUSTRY GUIDELINE FOR PREPARING AN EARLY SITE PERMIT APPLICATION – 10 CFR PART 52, SUBPART A

ACKNOWLEDGMENTS

This guidance document, Industry Guideline For Preparing An Early Site Permit Application – 10 CFR Part 52, Subpart A, NEI 01-XX, was developed by the Nuclear Energy Institute (NEI) Early Site Permit Task Force and the NEI New Plant Executive Task Force. We appreciate the direct participation of the many utilities that contributed to the development of the guideline and the participation of the balance of the industry who reviewed and submitted comments to improve the document clarity and consistency. The dedicated and timely effort of the many Task Force participants, including their management's support of the effort, is greatly appreciated.

NEI also wishes to express its appreciation to the EPRI and the U.S. Department of Energy who devoted considerable time and resources to the development of this industry guideline.

NOTICE

INDUSTRY GUIDELINE FOR PREPARING AN EARLY SITE PERMIT APPLICATION

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1.0 INTRODUCTION

This guideline provides an acceptable approach for implementing the requirements of 10 CFR Part 52 Subpart A, Early Site Permits, hereinafter referred to as the Subpart. The process outlined in this guideline is founded on industry experience and expertise in implementing early site permits. It is expected that following this guideline will offer a stable and efficient process, resulting in the issuance of early site permits, separate from the filing of an application for a construction permit or combined license. However, applicants may elect to use other methods or approaches for satisfying the Subpart's requirements and completing an early site permit application.

This guideline uses terminology specific to early site permits. A copy of 10 CFR Part 52 Subpart A and other 10 CFR sections it references is provided as Appendix A and should be reviewed.

1.1 Background

In April 1989, the Nuclear Regulatory Commission (NRC) published 10 CFR Part 52 to govern the issuance of early site permits, standard design certifications, and combined licenses for nuclear power facilities. 10 CFR Part 52 does not create new substantive requirements, rather it provides a licensing process to resolve, with finality, safety and environmental issues early in the licensing process of a nuclear power facility. Since publishing the original rule, the NRC and the industry conducted various activities related to its implementation. The most significant changes to 10 CFR Part 52 are the amendments to incorporate the Design Certification Rules for the Advanced Boiling Water Reactor, System 80+ and AP600 in Appendices A, B and C.

1.2 Purpose and Scope

The major elements of the guideline include:

- Site Safety Analysis Report (Including plant parameters envelopes)
- Environmental Report
- Emergency Planning Information

Applicants interested in early site permits are responsible for preparing a plant-specific application for an early site permit. The early site permit application includes the following information:

- Site description and general location of each proposed facility
- Population profiles of the area surrounding the site

- Assessment of site features affecting the plant design; major systems, structures, and components that bear significantly on site acceptability. Alternatively, if a specific plant design is not selected, the applicant may establish a plant parameters envelope (PPE) that would accommodate one or more designs
- Seismic, meteorological, hydrologic, and geologic characteristics of the site
- Characteristics of the facilities proposed for the site
- A redress plan, if site preparation activities are planned
- An environmental report focusing on the environmental effects on the site of construction and operation of one or more reactors which have characteristics that fall within site parameters
- Emergency plan requirements - three options are available to the applicant ranging from identification of significant impediments and preliminary identification of agencies whose support would be required to implement an effective plan to a complete integrated plan

1.3 Applicability and Duration

This document is applicable to any proposed nuclear power facility licensed pursuant to Sections 103 or 104b of the Atomic Energy Act of 1954, as amended (68 Stat. 919), and Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242). An applicant may apply for an early site permit without filing a construction permit under 10 CFR Part 50 or a combined license under 10 CFR Part 52 for the site. Early site permit procedures do not replace those in Appendix Q of 10 CFR Part 52. Appendix Q applies only when NRC staff review of one or more site suitability issues is sought separately from and prior to the submittal of a construction permit.

An early site permit is valid for ten to twenty years and may be renewed for another 10 to 20 years. It may continue to be valid beyond the date of expiration if it is referenced in a proceeding on a construction permit or a combined license application. A site for which an early site permit has been issued may be used for purposes other than those described in the permit after review and possible modification of the original permit by the NRC. If a permit holder informs the NRC that the site is no longer intended for a nuclear power plant, then the NRC will terminate the permit following any required redress.

1.4 Qualifications of Applicants

Any person (see Appendix B for definition) who may apply for a construction permit or a combined license may file an application for an early site permit. The applicant may not be a citizen, national or agent of a foreign country, or entity, which is owned, controlled or dominated by an alien, a foreign corporation or a foreign government. The applicant need not be a utility company nor the entity that will subsequently build and operate a power plant. The financial qualifications of an early site permit applicant are required to be commensurate with early site permit responsibilities only. An early site permit applicant need not own the site, but must have legal control over its use. As for other licenses, early site permits can be amended to add or substitute another qualified applicant.

1.5 Utilization of Existing Programs

This guideline is intended to maximize the use of existing industry programs, studies, initiatives and databases. Specifically, the Early Site Permit Demonstration Program (ESPDP) initiated by the U.S. Department of Energy (DOE) in July 1990 will be of significant benefit. DOE initiated this program, through Sandia National Laboratories (SNL), to demonstrate the practical implementation of the then new NRC Regulation 10 CFR Part 52 concerning nuclear plant early site permitting. In April 1991, three utility-owned organizations, Southern Electric International (SEI), Commonwealth Research Corporation, and Public Service Corporation of New Jersey (called the Joint Contractors or JC), in cooperation with EPRI and NUMARC, provided a qualified response to SNL which incorporated the attributes of the NPOC Strategic Plan for Building New Nuclear Plants, Building Block 5, Siting. A contract was issued by DOE/SNL to the JC in January 1992.

The objective of the program was to successfully demonstrate the use of 10 CFR 52 to obtain, by the mid-1990s, Early Site Permits for one or more U.S. sites to eventually support future Advanced Light Water Reactor (ALWR) nuclear power plants. The ESPDP was composed of three phases:

- Phase I - Technical and regulatory analysis
- Phase II - Site selection and planning for Phase III
- Phase III - Site specific activities (Not implemented)

Numerous deliverables were developed for Phases I and II of the ESPDP including:

- Technical and licensing reviews
- Guidelines for determining site-specific design basis ground motions
- Technology toolkit
- Plant parameter envelopes
- Site selection criteria and procedures guide
- Public involvement plan

1.6 Regulatory Bases

This guideline is written to be consistent with existing regulatory requirements. The applicants shall demonstrate that the site is suitable for construction and operation of a plant with design features as specified for major structures, systems and components of the proposed future nuclear plants.

The regulatory bases for the Site Safety Analysis Report include:

- Atomic Energy Act
- NRC Regulations - 10 CFR Parts 50, 52 and 100
- NRC Regulatory Guide - 1.70, *Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants*
- NRC Regulatory Guide - 4.7, *General Site Suitability Criteria for Nuclear Power Stations*

- NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.*

The regulatory bases for the Environmental Report include:

- National Environmental Policy Act (NEPA)
- NRC Regulations - 10 CFR Parts 51 and 52
- NRC Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations*
- NUREG-1555, *Environmental Standard Review Plans*
- State Environmental Statues, as applicable.

The regulatory bases for the emergency planning information include:

- NRC Regulations - 10 CFR Parts 50 and 52
- NUREG-0396, *Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants*
- NUREG-0654, *Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants*
- NRC Regulatory Guide - 1.101, *Emergency Planning and Preparedness for Nuclear Power Plants (DG-1075, Proposed Revision 4 issued March 2000)*
- NRC Regulatory Guide - 1.183, *Alternate Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors*

1.7 Organization of the Guideline

Filing an application for an early site permit is a two-phase approach. The first phase is the technical work that must be performed to generate the information that is included in the early site permit application. The second phase is the preparation of the early site permit application. The remainder of this report is organized to support both of these phases.

Section 2 provides an overview of 10 CFR Part 52 and specifically Subpart A. Sections 3, 4 and 5 provide guidance on how to develop the Safety Analysis Report, the Environmental Report and the Emergency Planning Information, respectively. Section 6 discusses the early site permit application format. Appendix A provides sections of 10 CFR Part 50, 51 and 52 that are relevant to early site permits. Appendix B defines a list of acronyms and references, respectively, associated with this guide, while Appendix C provides a Plant Parameter Envelope.

Examples to illustrate the different steps involved in preparing an early site permit application are provided. Applicants are encouraged to review environmental reports and other material submitted to the NRC in the past regarding site permits that have been submitted as well as the resulting safety evaluation reports that are issued in the form of NUREGs.

2.0 OVERVIEW OF PART 52, SUBPART A

The provisions of Subpart A of 10 CFR Part 52 apply only to a licensee seeking an early site permit (ESP) separate from an application for a construction permit or for a combined operating license for a facility. The basic purpose underlying Subpart A is to resolve site suitability issues in licensing proceedings as early as possible. Subpart A does not establish new substantive safety or environmental standards, but rather provides a new licensing process to achieve early resolution of site-related issues associated with nuclear power utilization. This process makes it possible to bank sites, thereby improving the effectiveness of the nuclear power plant licensing process by enabling issues to be resolved before large resource commitments are made. A central element of the early site permitting process is ensuring that sufficient information is available to support sound judgements about environmental impacts of one or more facilities on a given site so as to enable the public, as well as state and local agencies, to participate effectively in the proceeding.

An applicant for an ESP need not necessarily be a utility or the entity that will ultimately build or operate a nuclear power plant. Because an ESP is, in a limited sense, a partial construction permit, the necessary financial and technical qualifications of an applicant should be commensurate with the need for the applicant to conduct the activities associated with applying for, receiving, and maintaining an ESP. Because an applicant need not be an electric utility, the permit may be amended at a future time to add or substitute another entity pursuant to 10 CFR 50.80.

The early site permitting process shown below in Figure 2-1 is comprised of a number of activities by the applicant and the NRC. The process begins with the filing of the application, which must include: (1) a description of the site; (2) an assessment of the site features affecting facility design, including an analysis of major systems, structures, and components that bear significantly on site acceptability; and (3) the seismic, meteorological, hydrologic and geologic characteristics of the site. The application must be accompanied by a complete environmental report focusing on the environmental effects of construction and operation of the facility. An assessment of the benefits of the proposed action is not required. The application must identify any physical characteristics of the site that might impede the development of a suitable emergency plan, and it may also propose major features of emergency plans or provide complete integrated emergency plans for NRC review and approval.

FIGURE 2-1. THE EARLY SITE PERMIT PROCESS

The ESP application will be reviewed by the NRC staff and also by the NRC's Advisory Committee on Reactor Safeguards (ACRS). The ACRS will provide a report to the NRC on their conclusions related to those portions of the application, which concern safety.

An applicant may wish to perform site preparation activities such as clearing, grading and construction of temporary access roads and temporary construction support facilities. In such a case, the applicant must provide a plan for redress of the site in the event the activities are performed but the site permit expires before an application for a construction permit or a combined operating license for the site is filed. The applicant must demonstrate that there is reasonable assurance that redress carried out under the plan will achieve an environmentally stable and aesthetically acceptable site suitable for any use that conforms to local zoning laws.

Because an ESP is considered a partial construction permit, it is subject to the procedural requirements of 10 CFR Part 2 which are applicable to construction permits, including the requirements for docketing and issuance of a Notice of Hearing. All hearings conducted on applications for early site permits are adjudicatory proceedings conducted in accordance with Subpart G of 10 CFR Part 2. The role of the Atomic Safety and Licensing Board in the ESP process is also delineated in 10 CFR Part 2. In the hearing process, the presiding officer is required to determine whether, taking into consideration the site criteria contained in 10 CFR Part 100, a nuclear reactor or reactors having characteristics that fall within the parameters of the site can be constructed and operated without undue risk to the health and safety of the public.

Upon the conclusion of the hearing held on the ESP application and upon receiving the report from the ACRS, the NRC will determine whether the ESP meets the applicable standards and requirements of the Atomic Energy Act and the Commissions regulations. If so, the Commission will issue an ESP, containing such conditions and limitations as the Commission deems appropriate and necessary.

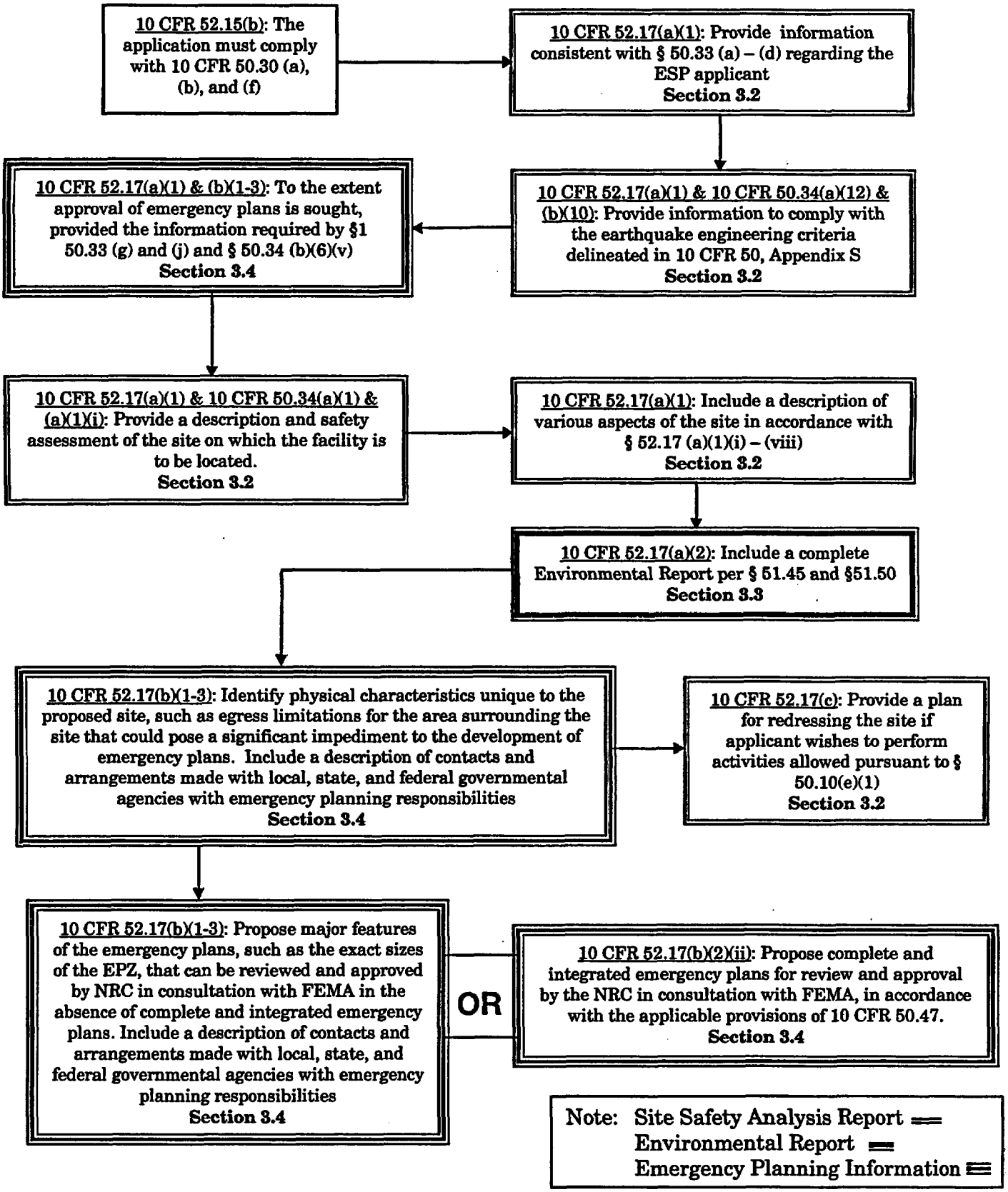
The findings of the NRC in granting the early site permit are final and not reexamined as part of the COL review. In consideration of a COL application, the Commission must only find that the terms of the ESP have been met. This finding presumably would be incorporated in the Commission conclusion to issue a COL.

An ESP is valid for not less than 10 nor more than 20 years from the date of issuance as the applicant may request. An ESP continues to be valid beyond its date of expiration in any proceeding on a construction permit or a COL application which references the ESP and is docketed before the date of expiration of the permit or, if a timely application for renewal of the permit has been filed, before the NRC has determined whether to renew the permit. An ESP also continues to be valid beyond the date of expiration in any proceeding on an operating license application which is based on a construction permit which references the ESP during its valid term and in any hearing held pursuant to 10 CFR Section 52.103 before operation begins under a combined license which references the ESP.

An ESP may be renewed for a period of not less than 10 nor more than 20 years. A renewal application must be filed by the permit holder not less than 12 nor more than 36 months prior to the end of the initial term. An ESP either original or renewed, for which a timely application for renewal has been filed remains in effect until the NRC has determined whether the permit should be renewed. The Commission will grant the renewal if it determines that the site complies with the Atomic Energy Act, the Commission's regulations and orders in effect at the time the site permit was originally issued, and any new requirements that the Commission may wish to impose if it determines (1) that there is a substantial increase in overall protection of the public health and safety to be derived from the new requirements and (2) that the direct and indirect costs of implementation of those new requirements are justified in view of the increased protection they would provide.

Requirements for the content of an ESP application are found in various sections of 10 CFR Parts 50, 51, 52 and 100. An overview of these requirements is shown in Figure 2-2.

Figure 2-2.
EARLY SITE PERMIT APPLICATION REQUIREMENTS



3.0 FILING AND CONTENTS OF EARLY SITE PERMIT APPLICATIONS

Part 52 Reference

§52.15 Filing of applications

(a) Any person who may apply for a construction permit under 10 CFR part 50, or for a combined license under 10 CFR part 52, may file with the Director of Nuclear Reactor Regulation an application for an early site permit. An application for an early site permit may be filed notwithstanding the fact that an application for a construction permit or a combined license has not been filed in connection with the site or sites for which a permit is sought.

(b) The application must comply with the filing requirements of 10 CFR 50.30 (a), (b), and (f) as they would apply to an application for a construction permit. The following portions of §50.4, which is referenced by §50.30(a)(1), are applicable: paragraphs (a), (b) (1) - (3), (c), (d), and (e).

In addition to administrative information on the applicant, the early site permit application must include three major elements: a site safety analysis report (SSAR), an environmental report (ER), and emergency planning information as shown in Table 3-1. Specific guidance for preparation of each of these application elements is provided in Sections 3.1, 3.2, 3.3, and 3.4 respectively.

Table 3-1.
STANDARD FORMAT - EARLY SITE PERMIT APPLICATION

1.0	ADMINISTRATIVE INFORMATION
2.0	SITE SAFETY ANALYSIS REPORT
3.0	ENVIRONMENTAL REPORT
4.0	EMERGENCY PLANNING INFORMATION (Complete and Integrated Emergency Plans Option) or (Major Features of the Emergency Plans Option)

3.1. Administrative Information

Part 52 Reference

§52.17 Contents of applications.
(a)(1)

The application must contain the information required by §50.33 (a) thru (d)

§50.33 Contents of applications; general information.
Each application shall state:
(a)Name of applicant;
(b)Address of applicant;
(c)Description of business or occupation of applicant;
(d)(1) If applicant is an individual, state citizenship.
(2) If applicant is a partnership, state name, citizenship and address of each partner and the principal location where the partnership does business.
(3) If applicant is a corporation or an unincorporated association, state:
(i)The state where it is incorporated or organized and the principal location where it does business;
(ii)The names, addresses and citizenship of its directors and of its principal officers;
(iii)Whether it is owned, controlled, or dominated by an alien, a foreign corporation, or foreign government and if so, give details.
(4) If the applicant is acting as agent or representative of another person in filing the application, identify the principal and furnish information required under this paragraph with respect to such principal.

This information is unique to each applicant and will be completed based on the specific business identity and organization submitting the ESP application.

3.2 Site Safety Analysis Report

Part 52 Reference

§52.17 Contents of applications
(a)(1)

In addition, the application should describe the following:

(i) The number, type, and thermal power level of the facilities for which the site may be used;
(ii) The boundaries of the site;
(iii) The proposed general location of each facility on the site;
(iv) The anticipated maximum levels of radiological and thermal effluents each facility will produce;
(v) The type of cooling systems, intakes, and outflows that may be associated with each facility;
(vi) The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site;
(vii) The location and description of any nearby industrial, military, or transportation facilities and routes; and
(viii) The existing and projected future population profile of the area surrounding the site.

The Site Safety Analysis Report (SSAR) consists of two parts: 1) a description of the proposed facility, and 2) a description of the site characteristics. Key topics to be addressed in the SSAR include: description of the site, description of proposed facilities, assessment of site features affecting the facility design(s), seismic, meteorological, hydrologic and geologic characteristics of the site as well as a site redress plan if site preparation activities are planned.

Each guidance section that follows provides:

- A discussion of the need for and uses of the information specified,
- An identification of other guidance documents where more detailed guidance may be found, and
- A summary of practical factors associated with developing the required information.

NOTE: Regulatory Guide 1.70 is the primary guidance reference for data required in the ESP application. NUREG-800, "Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants" contains information on the process and bases for NRC's review of submitted information. Although the SRP focuses primarily on procedural approaches and bases for NRC's analysis of information specified in RG 1.70, applicants may wish to consult the NUREG for additional insights where RG 1.70 is listed as a source of guidance.

3.2.1 Description of Proposed Facilities

A description of facilities that would eventually be developed at the site is necessary for:

1. Evaluation of site-related aspects of plant design to ensure that the site characteristics are consistent with design requirements of the facilities for which a future COL will be sought, and
2. Preparation of an analyses of environmental impacts of construction and operation of the proposed facilities; the impact analysis is submitted in the ER and is used by NRC to prepare its Environmental Impact Statement (EIS) in support of the ESP issuance (see Section 3.3).

Because the facility description, as submitted in the application, will form the basis on which NRC issues the ESP, a future COL application referencing the ESP will be limited to the type, size and number of units listed in the ESP application. To optimize utilization of the ESP, applicants should ensure that the proposed facilities information addresses the spectrum of potential plans for developing nuclear facilities at the site. For example, applicants may wish to complete this section of the application to reflect the maximum number of units that they may desire to develop and/or the widest range of plant designs. This approach will preserve the option of maximum site utilization and will provide the most flexibility in ultimate selection of unit vendor(s) at the COL.

The balance of this section provides guidance on the information required for the ESP application SSAR as codified at 10 CFR 52 (a)(1). This information must include:

> "a description and safety assessment of the site on which the facility is to be located. The assessment must contain an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified" in 10 CFR 50.34(a)(1).

In addition to site characteristics, plant design information is required to develop this information. The set of plant design parameters that are used to characterize a facility for selecting a site and developing an ESP application is called a Plant Parameters Envelope (PPE). An example PPE is provided in Appendix C and discussed in more detail in Section 3.2.1.1. Additional guidance on SSAR information requirements is provided in Sections 3.2.1.2 through 3.2.1.4.

3.2.1.1 Plant Parameters Envelopes

This section addresses the requirements of §52.17(a)(1) *(i), (iv) and (v)* regarding information about the proposed facilities. While §52.17 requires only a limited amount of information, there is the need to characterize the important plant-site interface features of the proposed facilities for supporting the information and analysis requirements of the SSAR and the Environmental Report. Specifically, the following three categories of information regarding interfaces of the proposed site and facilities' are needed:

- Functional or operational needs of the facilities from the site's natural and environmental resources

- Capability of the facilities to withstand the natural and man-made environmental hazards of the site
- Direct impact of the facilities on the site's natural and environmental resources

The set of parameters that are used to characterize a facility for selecting a site and developing an ESP application is called a Plant Parameters Envelope (PPE). A PPE can be developed for a single type of facility or a group of candidate facilities by selecting the most limiting parameter values among the group. The broader the envelope of candidate design characteristics represented in a composite PPE, the greater the conservatism. The amount of conservatism inherent in the composite PPE may have implications regarding the selection and suitability of specific sites as well as the applicability of the ESP once the actual facilities are selected. For example, the proposed site will need to have sufficient assets to support the conservatively selected functional and operational needs of the facilities characterized by the composite PPE. Thus the tradeoff between the flexibility and more stringent demands on site characteristics implicit in representing a broad set of plant options in the composite PPE needs to be carefully considered.

A PPE template is provided in Appendix C. It provides composite values that envelope six plant designs: ABWR, AP600, AP1000, System 80+, SWR 1000 and GT-MHR. Specific plant parameters relevant to individual information items mandated under §52.17(a)(1) are identified in the following subsections.

3.2.1.2 Guidance On Description for Proposed Facilities [§52.17(a)(1)(i)] – Facility Information

Section §52.17(a)(1)(i) requests the number, type, and thermal power level of the facilities for which the site may be used. This information will provide a basic understanding of the applicant's ultimate plans for the site; the description should provide an "envelope" of potential future plans. For example, if the applicant expects to develop a single unit but may wish to preserve the option of deploying two units at the ESP site, the two-unit configuration should be described. The response should include the range in the number, type and thermal power level of the facilities that are being considered.

3.2.1.3 Guidance On Description for Proposed Facilities [§52.17(a)(1)(iv)] - Effluents

Section §52.17(a)(1)(iv) requests the anticipated maximum levels of radiological and thermal effluents each facility will produce. These data are used to verify that plant effluents will meet applicable regulatory standards and for developing the environmental impact analyses presented in the Environmental Report.

As discussed below, the PPEs provide an acceptable basis for responding to this ESP requirement for standard plant designs. Additional background on data required for plant effluents can be found in RG 4.2, Section 3.5. For evolutionary and passive standard plant designs, the maximum levels of radiological effluents are developed as part of the PPE in Sections 2,3 and 4 while those for the radiological effluents are part of Sections 9 through

11 of the PPE. Applicants proposing to construct and operate other plant designs at an ESP site must develop analogous effluent estimates in cooperation with the plant vendor.

3.2.1.4 Guidance On Description for Proposed Facilities [§52.17(a)(1)(v)] – Cooling Systems

Section §52.17(a)(1)(v) requests the type of cooling systems, intakes, and outflows that may be associated with each facility. Information on the cooling system design parameters for is provided in Sections 2,3 and 4 of the PPE. Additional information describing how cooling system facilities will be deployed on the site should also be provided. These data should include:

- Basic plant cooling approach and system configuration (e.g., mechanical or natural draft cooling towers, cooling reservoir, once-through cooling).
- Source(s) of make-up or condenser cooling water (e.g., river, reservoir, ocean, ground water).
- Blowdown and other effluent receiving body.
- General design characteristics (e.g., travelling screens, fish ladders, diffusion structures) of intake and discharge structures.
- Identification of Ultimate Heat Sink.
- Location of major cooling system structures in relation to plant facilities, site

Additional guidance on the information necessary to describe cooling systems is found in RG 4.2, Section 3.4.

These preliminary plant design/layout characteristics will be developed by the applicant, with engineering and reactor vendor assistance.

3.2.2 Site Characteristics

Part 52 Reference

§52.17 Contents of applications
(a)(1)

In addition, the application should describe the following:

(i) The number, type, and thermal power level of the facilities for which the site may be used;
(ii) The boundaries of the site;
(iii) The proposed general location of each facility on the site;
(iv) The anticipated maximum levels of radiological and thermal effluents each facility will produce;
(v) The type of cooling systems, intakes, and outflows that may be associated with each facility;
(vi) The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site;
(vii) The location and description of any nearby industrial, military, or transportation facilities and routes; and
(viii) The existing and projected future population profile of the area surrounding the site.

3.2.2.1 Guidance On Description for Proposed Facilities [§52.17(a)(1)(ii) & (iii)] - General Site Description

The purpose of this information is to describe the overall geographical context of the ESP site, as it would be developed for eventual construction and operation of a nuclear power plant. This description should place the proposed facilities into geographical context with existing facilities (if any) and major geographic features in the site vicinity. The site description includes the boundaries of the site and the proposed general location of each facility on the site. This will require descriptive information about the location of the site as well as drawings of the site, which indicate the general arrangements for the proposed facilities.

More detailed guidance on the content of site description information is found in RG 1.70, Section 2.1.1. Data items include facilities locations, site boundary, site property lines, exclusion area boundary, nearby facilities, and major nearby features (e.g., highways, waterways, and railroads. Information on plant facility locations will be developed by the applicant, with engineering and reactor vendor assistance; some consultation with ecological experts may be appropriate in locating intake and discharge structures, as well as other plant components (e.g., cooling reservoirs) with potentially significant environmental impacts. Some of the off-site data will be available from USGS maps, aerial photographs, and/or land use maps available from local or state land use planners; consultation with planners will be necessary to identify plans for future facilities in the site area.

3.2.2.2 Guidance On Description for Proposed Facilities [§52.17(a)(1))(vi)] – Meteorology and Hydrology

NOTE: Seismic and geologic characterization of the ESP site is specified under §52.17(a)(1))(vi); additional information on seismic issues is specified in §52.17(a)(1). Because the interface between site seismic characteristics and plant design is a critical component of the ESP application and because geologic and seismic investigations and data are technically and logistically intertwined, guidance on geology and seismology is discussed separately in Section 3.2.2.5.

Meteorology

Meteorological information is used in a number of plant design, safety, and environmental evaluations, including estimating dispersion and downwind effluent concentrations, evaluating accident impacts, cooling system performance, design bases for severe weather phenomena, and estimating environmental impacts of plant operation. Required meteorological information is summarized below; detailed guidance is found in RG 1.70, Section 2.3 and RG 4.2, Section 2.3.

Specified information includes:

- Regional Climatology: General climate; regional meteorological conditions for design and operating bases; data used in evaluating Ultimate Heat Sink performance; and design basis tornado information
- Local Meteorology: Normal and extreme values of meteorological parameters (e.g., wind, temperature, humidity, precipitation, and atmospheric stability); potential influence of the plant and its facilities on local meteorology; and local meteorological conditions for design and operating bases.
- On-site Meteorological Monitoring Program: Description of facilities and equipment; and hourly data summaries.
- Short-term Diffusion Estimates
- Long-term Diffusions Estimates

Additional guidance relevant to site meteorological data acquisition, analysis, presentation, and use can be found in the following:

- RG 1.3 - Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Boiling Water Reactors
- RG 1.4 - Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Pressurized Water Reactors
- RG 1.23 - Onsite Meteorological Programs
- RG 1.27- Ultimate Heat Sink for Nuclear Power Plants
- RG 1.76 - Design Basis Tornado for Nuclear Power Plants
- RG 1.117 - Tornado Design Classification

Meteorological information is developed from a variety of sources, including published summaries available from the National Oceanic and Atmospheric Administration (NOAA) and commercial weather data concerns. Existing data is obtained from meteorological stations proximal to the ESP site and is interpolated or extrapolated to infer meteorological conditions at the site. Deployment of onsite data programs requires procurement of specialized instruments and data recording equipment, installation of meteorological towers and support facilities, and establishing methods for routine data collection. Development of other required information derived from meteorological data requires subject matter experts with specific expertise in data reduction and analysis; applicants typically will procure these, and measurement program support, from specialty contractors.

Hydrology

Hydrological information is used in a number of plant design, safety, and environmental evaluations, including evaluating adequacy of water sources, evaluating the ability of receiving waters to accept thermal and chemical effluents, cooling system performance, design bases for natural phenomena events, and estimating environmental impacts of plant operation. Required meteorological information is summarized below; detailed guidance is found in RG 1.70, Section 2.4 and RG 4.2, Section 2.4.

Hydrological information to be addressed in the ESP application include the following subjects:

- Hydrologic Description
- Floods
- Probable Maximum Flood (PMF) on Streams and Rivers
- Potential Dam Failures, Seismically Induced
- Probable Maximum Surge and Seiche Flooding
- Probable Maximum Tsunami Flooding
- Ice Effects
- Cooling Water Canals and Reservoirs
- Channel Diversions
- Flooding Protection Requirements
- Low Water Considerations
- Dispersion, Dilution, and Travel Times of Accidental Releases of Liquid Effluents in Surface Waters
- Groundwater

Additional guidance relevant to site hydrological information, analysis, and use can be found in the following:

- RG 1.59 - Design Basis Floods for Nuclear Power Plants
- RG 1.102 - Flood Protection for Nuclear Power Plants

Typical sources and availability of existing hydrological information include:

- US Geological Survey (USGS) - surface and ground water flow characteristics
- Federal Emergency Management Agency (FEMA) - information on magnitude and frequency of floods
- Environmental Protection Agency (EPA) - water quality
- State Agencies - water quality and water availability
- National Oceanic and Atmospheric Administration (NOAA) - extreme rainfall events
- Depending on individual site characteristics, applicants may wish to establish on-site monitoring programs to document pre-construction water flow and quality information.

Development of other required hydrologic information (e.g., flood elevations, tsunami) requires subject matter experts with specific expertise in data reduction and analysis; applicants typically will procure this expertise from specialty contractors.

3.2.2.3 Guidance On Description for Proposed Facilities [§52.17(a)(1)(vii)] - Nearby industrial, military and transportation facilities and routes

Nearby industrial, military and transportation facilities and routes must be described and their location relative to the site provided. The purpose of this information is to:

> "establish whether the effects of potential accidents in the vicinity of the site from present and projected industrial, transportation, and military installations and operations should be used as design basis events for plant design and to establish the design parameters related to the accidents so selected." [RG 1.70]

also,

> "Potential hazards associated with nearby transportation routes, industrial and military facilities must be evaluated and site parameters established such that potential hazards from such routes and facilities will pose no undue risk to the type of facility proposed to be located at the site." [10 CFR 100.21(e)]

Guidance on the identification of relevant facilities and the type of information required for each facility type is provided in Sections 2.2.1 and 2.2.2 of RG 1.70. For some facility types (e.g., airports), RG 1.70 also provides guidance on distance radii within which facilities should be characterized. Data requirements for the identified facilities, while differing in detail by facility type, focus primarily on characterization of hazardous materials (e.g., propane, explosives) or activities (e.g., aircraft operations, artillery training) that could pose a threat to safe operation of a nuclear plant built at the ESP site.

RG 4.7 provides additional guidance on how the presence of these facilities can affect site suitability. Guidance includes additional clarification of distance increments within which certain facilities should be identified (e.g., potentially hazardous materials or activities

within 5 miles, airports within 10 miles) and accident consequence probabilities below which mitigating design measures are not required (10^{-7} per year).

Although much of the location data and the general information on activities conducted at these facilities can be obtained from maps, aerial photos, company brochures and other publicly available information, collecting some of the quantitative data to support this aspect of ESP application may require direct contact with owners and/or operators of the facilities identified.

3.2.2.4 Guidance On Description for Proposed Facilities [§52.17(a)(1)(viii)] - Existing and projected future population

Population data are required to support NRC's evaluation of population-related site suitability criteria (e.g., Low Population Zone, distance to population center, population density), to provide data for use in the accident analyses that confirm conformance to design criteria, to allow human health impact analyses, and to evaluate the adequacy of emergency plans.

Guidance on the population data required in the ESP application is provided in Section 2.3.1 of RG 1.70. This information includes:

- Population Within 10 Miles (current and projected to the end of plant life)
- Population Between 10 and 50 Miles (current and projected to the end of plant life)
- Transient Population (daily and seasonal variations from commuters, recreational population, etc.)
- Low Population Zone (map showing population and other features [RG 1.70, Section 3.1.3.4])
- Population Center (distance from plant, political boundaries, population & distribution)
- Population Density (current and projected to the end of plant life)

Population data is available from the US Census Bureau and, in many locations, from local and state agencies and universities; often, population projections are also available from these sources. Normally, these data are provided on the basis of political subdivision (e.g., county). Accordingly, the bases for data development (especially population projections) may not be consistent for each source, and data may not be available at all for isolated areas. For these reasons, and because RG 1.70 prescribes that data be presented for specified radii and directional segments, applicants will need to carefully synthesize these data for consistency in the ESP submittal.

In most cases, adequate population data are available from existing sources, although windshield surveys or door-to-door canvassing has proved necessary in some cases. Synthesis of population data into the prescribed form usually requires subject matter experts with specific expertise in demography; applicants typically will procure this expertise from specialty contractors.

3.2.2.5 Guidance On Description for Proposed Facilities [§52.17(a)(1) and §52.17(a)(1))(vi)] – Geology and Seismic and Earthquake Engineering

Part 52 Reference

§52.17 Contents of applications.
(a)(1)

The application must contain the information required by §50.34 (a)(12) and (b)(10)

§50.34 Contents of applications; technical information.
(a)(12) On or after January 10, 1997, stationary power reactor applicants who apply for a construction permit pursuant to this part, or a design certification or combined license pursuant to part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria in Appendix S to this part.

(b)(10) On or after January 10, 1997, stationary power reactor applicants who apply for an operating license pursuant to this part, or a design certification or combined license pursuant to part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria of Appendix S to this part. However, for those operating license applicants and holders whose construction permit was issued prior to January 10, 1997, the earthquake engineering criteria in Section VI of Appendix A to part 100 of this chapter continues to apply.

In addition, the application should describe the following:
(vi) The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site.

The primary objective of geologic, seismic, and earthquake engineering information provided in the ESP application is to demonstrate that site seismic characteristics conform to the seismic design requirements of the plant design for which a COL is planned. Section 1.3 of the PPEs provides information on seismic performance for the plant designs.

This section provides guidance on the process to be carried out to satisfy governing regulations for determining seismic design motions for plant designs. This guidance addresses the field investigations that must be conducted, the analyses that must be performed and the deliverables to be provided for incorporation in an ESP application.

3.2.2.5.1 Background - Geologic and Seismic Siting Requirements

Prior to January 10, 1997, the regulation governing seismic siting issues and the determination of the design basis ground motions for nuclear power facilities was Appendix A to 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." The approach in Appendix A is a deterministic methodology. Past licensing experience in applying Appendix A and the lessons associated with addressing the Charleston

earthquake issue in the 1980's, demonstrated the need to adopt methodologies and procedures that quantitatively identify and incorporate uncertainties associated with geologic and seismologic data, the range of credible scientific interpretations based on these data and their role in the evaluation of seismic hazards (See Regulatory Guide 1.165).

For applications on or after January 10, 1997, 10 CFR 100.23 and Appendix S of 10 CFR 50 were added to adopt new methods and procedures. The objectives of these new regulations are stated in 10 CFR100.23:

> "The geological, seismological, and engineering characteristics of a site and its environs be investigated in sufficient scope and detail to permit an adequate evaluation of the proposed site, to provide sufficient information to support evaluations performed to arrive at estimates of the Safe Shutdown Earthquake Ground Motion (SSE), and to permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site."

The regulation further states:

> "Uncertainties are inherent in such estimates (of the SSE). These uncertainties must be addressed through an appropriate analysis, such as a probabilistic seismic hazard analysis or suitable sensitivity analyses."

With the publication of Regulatory Guide 1.165 in March 1997, the NRC has provided specific guidance with respect to the regional and site geological, seismologic and geophysical investigations and probabilistic evaluations that should be conducted to address the uncertainties associated with geologic and seismic siting and in determining the seismic design ground motion for a plant.

3.2.2.5.2 Seismic Issues

10 CFR Part 100.23 contains the principal geologic and seismic requirements that apply to applications for ESP or COL for a nuclear power plant submitted on or after January 10, 1997. This and associated regulations and regulatory guides address the information requirements that must be satisfied as part of an ESP application as they relate to geologic and seismic hazards. These hazards include:

- vibratory ground motion
- surface faulting
- soil liquefaction
- seismically initiated dam failures
- tectonic surface deformation
- non-tectonic deformation
- seismically induced water waves

The investigations that are required by Regulatory Guide 1.165 as part of the seismic siting process are conducted to address a number of the geologic and seismic hazards listed.

Further, as part of the overall siting evaluation for a proposed facility, there are other site and regional investigations for which there is a related site geologic or geotechnical element. Coordination of these investigations is recommended, but is not addressed in this section. This section focuses on requirements for the assessment of seismic design motions.

3.2.2.5.3 Seismic Siting Process

The process of addressing the geologic and seismic requirements for ESP applications can be divided into the following primary elements:

- Governing USNRC Regulations
- Steps to Implement a Seismic Siting Process that Satisfy USNRC Regulations
- Products and Deliverables for Incorporation into the ESP Application
- Applicant Interface with the NRC Staff

3.2.2.5.4 Siting Alternatives

In its consideration of candidate sites for purposes of submitting an ESP application for a proposed plant, there are various alternatives an applicant may consider. The siting alternatives are grouped into the following site categories:

- Greenfield - a site that is not occupied by a nuclear or non-nuclear power facility or other industrial operation.

- Industrial - a site occupied by a non-nuclear (e.g., fossil) power generating facility or other industrial operation.

- Existing - a site occupied by a licensed nuclear power plant. Alternatively, this may be a site that has a construction license or had an operating license (e.g., the plant is currently shut down and/or is being retired).

From the perspective of addressing geologic and seismic siting issues as required by NRC regulations, greenfield and industrial sites are equivalent. For both locations it is unlikely that geologic, seismologic or geophysical information will be available in sufficient detail to satisfy NRC siting requirements and to support evaluations required to determine a seismic design basis. For sites currently occupied by a licensed nuclear power plant, it is reasonable to expect there are geologic and seismic information economies that may support an effort to site a new plant.

3.2.2.5.5 Seismic Siting Process for Existing Sites

The safety analysis report (SAR) for an existing nuclear power plant will be a good starting point to plan data collection activities and focus geological, geophysical and geotechnical investigations that are required by current regulations. However, since current geologic and seismic siting regulations require the uncertainties associated with data and their interpretations be evaluated as part of the siting process, the scope of regional site

investigation requirements is more focused and the breadth of the evaluations that are conducted, more extensive than required by past regulations (before January 10, 1997).

The SAR for a facility at an existing site (Section 2.5 Geology, Seismology, and Geotechnical Engineering) contains information on geological, seismological and geotechnical characteristics of a site. However, three aspects related to current conditions and regulations require that this information for previously licensed facilities be reviewed and updated:

(1) the SAR may need to be updated to make the information current,
(2) current regulations (e.g., 10 CFR 100.23, Regulatory Guide 1.165) are different than regulations in-place at the time the geologic and seismic siting information was gathered, and
(3) current (or proposed) requirements with respect to site geotechnical investigations (e.g., 10 CFR 100.2(c), 10CFR 100.2(d) and DG-1101) that are needed to support the evaluation of site response and a determination of the SSE are more extensive than previous requirements.

For ESP applications that involve a certified design with a seismic design basis such as an ALWR, consideration should be given to the fact these designs are based on a ground motion level that exceeds the SSEs for all existing nuclear power plant sites in the CEUS. For sites in the CEUS, Regulatory Guide 1.165 indicates applicants may use the seismic source interpretations developed by Lawrence Livermore National Laboratory (LLNL, 1993) or the Electric Power Research Institute (EPRI) (EPRI 1986) as inputs for a site-specific analysis. Utilizing procedures in RG 1.165 and the margin available in the ALWR design, there may be an opportunity for improving resource effectiveness by developing site specific seismic design motions for new sites using existing seismic source interpretations. These opportunities should be considered on a site-specific basis.

3.2.2.5.6 Relevance of Dry Cask Storage Facility Information

In some cases an independent dry cask storage facility may exist at a proposed plant site. Current NRC regulations associated with the seismic design of a fuel storage facility are defined in 10 CFR Part 72.102. This regulation calls for a deterministic assessment of seismic design motions based on Appendix A to 10 CFR Part 100. Part 72 has not been revised in a manner consistent with the revisions in 10 CFR Part 100.23 for nuclear power plants. However, the rulemaking plan (SECY-98-126) indicates probabilistic approaches should be used for dry cask storage facilities, as is the case for nuclear power plants. If a probabilistic evaluation to assess the design basis for a dry cask storage facility has been developed in a manner consistent with Regulatory Guide 1.165, this may offer an applicant a good starting point for meeting ESP or COL application needs for a power plant.

If a dry cask storage facility has been designed to the current Part 72 regulation (i.e., an Appendix A to 10 CFR Part 100 analysis), the information gathered for its design and construction will provide support for an ESP application for a proposed plant in a manner similar to that offered in the SAR for an existing power plant. In the case of a dry cask storage facility, the geologic and seismologic information contained in the SAR may be more

current than the information available for a power plant. The design ground motions for a dry cask storage facility determined using an Appendix A analysis will have no applicability to a proposed power plant.

The commission has recognized that the radiological hazard associated with a storage facility is less than that posed by a power reactor (SECY-98-126). Thus, the NRC has recommended the hazard consistent probability of exceedance of seismic design motions for a dry cask storage facility should be higher (i.e., the design ground motions are lower) than for a nuclear power plant. In this case, the seismic design motion determined for an existing dry cask storage facility should be lower than for a proposed power plant. If the design motions have been determined using the process recommended in Regulatory Guide 1.165, this analysis should provide insight to the SSE motion that will be determined for a proposed power plant.

3.2.2.5.7 Governing Regulations and Regulatory Guides

This section summarizes regulations and regulatory guides that are applicable to geologic and seismic siting of new plants.

10 CFR Part 50, Appendix A - *General Design Criteria for Nuclear Power Plants,* describes high level criteria for design of nuclear power plants. Among the criteria, Criterion 2 – *Design bases for protection against natural phenomena* – provides that "structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions."
10 CFR Part 100 – *Reactor Site Criteria* – Appendix A – *Seismic and Geologic Siting Criteria for Nuclear Power Plants* – describes regulatory requirements that must be met to satisfy General Design Criterion 2 of 10 CFR Part 50. Seismic design of all existing nuclear power plants have been licensed to the requirements of Appendix A. Appendix A addresses the geologic and seismologic investigations required to determine the Safe Shutdown Earthquake (SSE) ground motion.

The ground motion derived from the Appendix A analysis is used to scale a site-independent response spectrum shape defined in Regulatory Guide 1.60 to determine the seismic design spectrum. Regulatory Guide 1.60 – *Design Response Spectra for Seismic Design of Nuclear Power Plants* – defines the shape (amplitude and bandwidth) of ground motion spectra used for seismic design evaluations of nuclear power plant units since the guide was issued in 1973. For several years prior to the 1973, seismic design analyses were based on the so-called Newmark spectrum, which was essentially a preliminary version of the spectrum finally approved as Regulatory Guide 1.60. The earliest plants that had dynamic seismic design, dating from about 1958, used the Housner spectrum, which was less broad-band.

The recent revisions of NRC regulations separated seismic and geologic siting from earthquake engineering design. The revised seismic and geologic siting requirements were placed in 10 CFR Part 100.23 – *Geologic and seismic siting criteria* -- and revised earthquake engineering requirements were placed in a new Appendix S – *Earthquake*

Engineering Criteria for Nuclear Power Plants – to 10 CFR Part 50. This revision removed detailed technical implementation guidance from the regulation and placed it in new regulatory guides. Appendix A to 10 CFR Part 100 continues to be the controlling regulation governing seismic and geologic considerations for nuclear power plants licensed prior to January 10, 1997.

10 CFR Part 100.23 contains the principal geologic and seismic requirements that apply to applications for early site permit or combined license, or a construction permit or operating license for a nuclear power plant submitted on or after January 10, 1997. Paragraph (d) – *Geologic and Seismic Siting Factors* – requires a determination of the SSE for the site, determination of the potential surface tectonic deformation, determination of the design bases for seismically induced floods and water waves, and other design conditions, including soil and rock stability, liquefaction potential, natural and artificial slope stability, cooling water supply, and remote siting of safety-related structures. The most important technological advance contained in the revised regulation however, is contained in Paragraph (d)(1) – *Determination of the Safe Shutdown Earthquake Ground Motion* – which requires that uncertainties inherent in this determination be addressed through appropriate analysis, such as a probabilistic seismic hazard analysis (PSHA) or suitable sensitivity analyses. Technical guidance for implementing the requirements of Part 100.23 has been updated and expanded to incorporate regulatory experience and technological advances and placed in Regulatory Guide 1.165 – *Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion* – discussed below, issued in March 1997.

10 CFR Part 50 Appendix S – *Earthquake Engineering Criteria for Nuclear Power Plants* - - describes earthquake engineering design requirements that must be satisfied for a design certification or combined license or for a construction permit or operating license on or after January 10, 1997. Nuclear plants that have an operating license or a construction permit issued before January 10, 1997 must meet the earthquake engineering criteria in 10 CFR Part 100, Appendix A (VI). Appendix S to Part 50 incorporates three important changes with respect to Appendix A (VI) of Part 100. Paragraph IV (a)(1)(i) – *Safe Shutdown Earthquake Ground Motion* – requires the motion to be determined at the free-field ground surface. Paragraph IV (a)(1(iv) requires that the design evaluation include the effects of soil-structure interaction and the duration of the SSE ground motion. Paragraph IV (a)(2) – *Operating Basis Earthquake Ground Motion* -- permits an applicant to set the level of the OBE motion. If the level is set at one-third or less of the SSE ground motion, no explicit design analysis is required. If it is set greater than one-third, analysis and design incorporating soil-structure interaction and duration are required to demonstrate compliance with OBE design criteria.

Regulatory Guide 1.165 – *Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion.* The NRC issued Regulatory Guide 1.165 in March 1997 in order to provide technical guidance for nuclear plant applicants to meet the requirements of 10 CFR Part 100.23. The guide implements a probabilistic approach and provides a hazard-consistent procedure for determining the seismic design basis ground motion for a site. The guidance distinguishes between sites

located in the Western United States (WUS) (west of 105 degrees longitude) from those in the Central and Eastern United States (CEUS).

Following the guidance provided in Regulatory Guide 1.165, an applicant conducts a site-specific PSHA for a site. However, for sites in the CEUS, REGULATORY GUIDE 1.165 indicates applicants may use the seismic source interpretations developed by Lawrence Livermore National Laboratory (LLNL, 1993) or the Electric Power Research Institute (EPRI) (EPRI 1986) as inputs for a site-specific analysis. Whereas the LLNL and EPRI seismic source interpretations were based on earth sciences information gathered in the mid-1980's, Regulatory Guide 1.165 requires an applicant to evaluate whether the existing seismic source interpretations must be updated, taking into account relevant new information gathered as part of the geologic, seismologic and geophysical investigations required by Appendix D. Alternatively, the applicant may choose to develop new interpretations for input to a site-specific PSHA. If this option is taken, the interpretations and the probabilistic hazard assessment will be performed following the guidelines developed by the Senior Seismic Hazard Analysis Committee (SSHAC) (USNRC, 1997). In any case, the applicant will be required to use up-to-date ground motion attenuation models and site response model in the case of soil sites.

For sites in the WUS, applicants must develop site-specific interpretations for input to the PSHA following the SSHAC procedures (USNRC, 1997).

Regardless of whether an applicant elects to use the LLNL or EPRI interpretations or develop new site-specific interpretations, a comprehensive geological, geophysical and seismological investigation is required for all proposed sites (CEUS and WUS). As described in Appendix D to Regulatory Guide 1.165 the investigative level of detail varies with distance from the site: beyond 40 km and extending to 320 km the investigations consist primarily of a compilation of the published literature; between 40 km and 8 km specific geologic structures that are potential sources of earthquakes must be investigated in detail; within 8 km of the site an adequately detailed investigation must be performed to determine the potential for surface tectonic deformation; detailed geotechnical investigations are required within 1 km around the site.

Draft Regulatory Guide 1101 (proposed revised Regulatory Guide 1.132) - *Site Investigations for Foundations of Nuclear Power Plants.* Investigations of the foundations of all future nuclear units must be of the scope and in the detail provided in Draft Regulatory Guide DG-1101 (Proposed Revision 2 of Regulatory Guide 1.132). DG-1101 brings geotechnical site investigations technologies up to current state of practice and implements the site investigation requirements of the revised geologic and seismic regulation 10 CFR Parts 100.20(c), 100.21(d), and 100.23. It describes the scope and detail site investigations for determining the geological, engineering, and hydrological parameters for engineering design of a proposed plant, including sampling and laboratory testing required to determine the dynamic properties of foundation materials. The scope of the investigation, the types of technical approaches used, and the types and extent of testing needed should be designed to meet the specific conditions for each site.

To determine a site-specific seismic design basis ground motion for a site, Regulatory Guide 1.165 establishes the median reference probability of 1E-5 per year. Procedures are provided for determining controlling earthquakes defined by magnitude and distance for both the high frequency (average of 5 Hz and 10 Hz) motions and low frequency (average of 1 Hz and 2.5 Hz) motions, for computing the ground motions at the site that result from these controlling earthquakes, and for scaling the resulting motions to be consistent with the reference probability level. The motions are computed for rock conditions.

Regulatory Guidance (Anticipated) – *Evaluation of Site Response to Vibratory Ground Motions.* Current requirements for seismic siting are designed to determine site-specific ground motions. This is a departure from previous regulation in which seismic design motions were determined on a standardized or site independent basis. Based on improved methods for modeling soil deposits, it is anticipated the NRC will be developing regulatory guidance with respect to acceptable approaches for modeling the wave propagation effects of overlying soil to obtain the free-field motions at the ground surface at soil sites. It is anticipated this guidance will be provided in a forthcoming regulatory guide or a revision of Regulatory Guide 1.165. These procedures significantly advance the state of practice for determination of site-specific seismic design basis ground motions by establishing hazard consistent motions at all sites and by accounting for the effects of site-specific, controlling earthquakes on the frequency content of ground motion.

A standard site independent response spectrum shape such as Regulatory Guide 1.60, which is the basis for seismic design of current standard plants, may still be used for seismic design. In order to qualify a site for a standard plant design however, the applicant must demonstrate that the Regulatory Guide 1.60 5% damped response spectrum scaled at 33 Hz to 0.3g (the design basis ground motion for the standard nuclear plants) envelopes the hazard-consistent site-specific 5% damped response spectrum determined using procedures provided in Regulatory Guide 1.165 Section 4. The shape of the Regulatory Guide 1.60 spectrum is conservative for rock sites at structural frequencies below 10 Hz and for distances exceeding about 10 km. For structural frequencies higher than 10 Hz the spectral shape may not be conservative relative to site-specific spectra. Ground motions above 20 Hz structural frequency are not likely to be damaging, except to brittle components such as relays and ceramic insulators. The applicant may be able to use the results of recent EPRI research that provides a basis for truncating high frequency ground motion response spectra.

For soil and alluvial sites determination of hazard-consistent spectra at the ground surface constitutes a significant portion of the effort to determine the SSE ground motion. Regulatory Guide 1.165 does not address procedures for soil response analysis in adequate detail because no acceptable procedures were available at the time (March 1997) the guide was issued. This lack of technical procedures to determine appropriate free-field rock spectral shapes for controlling earthquakes, and methods for modifying hazard-consistent spectra (with constant annual non-exceedence probability) to obtain risk-consistent spectra (with constant annual frequency of component or plant failure) has been addressed by the NRC in a recently completed research project. The results of this research, which are intended to form the basis for a future new regulatory guide or for revising Regulatory Guide 1.165, are scheduled to soon be published by the NRC as a NUREG/CR. Applicants

for new nuclear units at existing or new sites likely will be required to apply the results of this research in determining the SSE ground motion at a site.

The seismic siting process, (e.g., site investigations and evaluations) must be conducted under a Quality Assurance program that is part of the overall QA program for the plant design and construction. The QA program must satisfy the requirements of 10 CFR Part 50 Appendix B, which is implemented by Regulatory Guide 1.28.

3.2.2.5.8 Implementation Steps

The applicant will need to develop an implementation plan based on the governing NRC regulations, applicable regulatory guides, and NUREG/CRs, etc. that support these steps.

3.2.2.5.9 Project Team

As described in NUREG/CR-6372, a seismic hazards evaluation team is required that has experience in developing seismic design basis ground motions and performing geotechnical site investigations for nuclear facility licensing. The team's responsibilities include planning and performing seismic siting implementation activities.

3.2.2.5.10 Schedule

The time required to conduct the seismic siting evaluation process will vary depending on site conditions. This process as the potential to become a critical path item in the overall schedule for developing an ESP application.

3.2.2.5.11 Deliverables

The seismic siting process must develop deliverables that support the ESP application in general and contribute specific sections to the SAR part of the application package in particular. These deliverables can be grouped into two categories; project reports that document the elements of the seismic siting investigations and evaluations and applicable sections of the SAR, such as Section 2.5 Geology, Seismology and Geotechnical Engineering.

3.2.2.5.12 Interaction With The NRC Staff

It is recommended that an ongoing interface with the NRC Staff be established and maintained during the course of the seismic siting evaluations. The meetings and exchanges that occur provide a mechanism for information exchange, including review and feedback, and issue resolution.

3.2.2.5.13 References

Electric Power Research Institute, "Seismic Hazard Methodology for the Central and Eastern United States," EPRI Report NP-4726, vols. 1-10, 1986-1991.

Lawrence Livermore National Laboratory, "Eastern Seismic Hazard Characterization Update," prepared for the U.S. Nuclear Regulatory Commission, UCRL–ID-115111, June 1993.

Senior Seismic Hazard Analysis Committee, "Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts," prepared for the U.S. Nuclear Regulatory Commission, UCRL-ID-122160, NUREG/CR-6372, 1997.

3.2.3 Site Redress

Part 52 Reference

§52.17 Contents of applications
(c)

If the applicant wishes to be able to perform, after grant of the early site permit, the activities at the site allowed by 10 CFR 50.10(e)(1) without first obtaining the separate authorization required by that section, the applicant shall propose, in the early site permit, a plan for redress of the site in the event that the activities are performed and the site permit expires before it is referenced in an application for a construction permit or a combined license issued under subpart C of this part. The application must demonstrate that there is reasonable assurance that redress carried out under the plan will achieve an environmentally stable and aesthetically acceptable site suitable for whatever non-nuclear use may conform with local zoning laws

The need for redress information is dependent on the applicant's plans for the site. Specifically, the applicant must determine the scope and extent of any pre-construction site preparation activity (e.g., grading, establishment of construction support facilities, dredging for intake/discharge structures) that will be conducted prior to application for a construction permit. Site redress activities described in the ESP application should be appropriate to the level of ecological and land use damage associated with the planned activities. For example, redress for continued maintenance of a meteorological monitoring program will be much smaller in scope than activities required to remediate large-scale clearing, grading or dredging activities.

The scope of redress plans will vary as widely as the desired level of pre-construction activity anticipated under individual applicant's overall development plans. Because land use and zoning requirements are typically administered at the local level, redress requirements may also be very different at different geographic locations and political units. Development of the redress plan will require consultation with the zoning and/or land use authority in most cases; formal agreement with cognizant agencies should be obtained, if possible, prior to submitting the ESP application.

While this portion of the ESP application will be unique to each site and each applicant's planned pre-construction permits activities, the following issues provide examples of considerations which should be taken into account in formulating redress plans.

- Future site ownership and use (e.g., recreation, residential or industrial development, wildlife preserve)
- Use of applicant-constructed facilities (e.g., roads, structures) for future use
- Habitat replacement (e.g., wetlands, T&E species)
- Restoration of sensitive water resource features (e.g., river banks) where disturbed for intake or discharge structures
- Re-contouring, re-vegetation, and replanting cleared areas

- Potential liabilities associated with any facilities or structures which are left following redress
- Potential contamination left on the site, either pre-dating, or as a result of, applicant's actions.

3.3 Environmental Report

Part 52 Reference

§52.17 Contents of applications
(a)(2)

A complete environmental report as required by 10 CFR 51.45 and 51.50 must be included in the application, provided, however, that such environmental report must focus on the environmental effects of construction and operation of a reactor, or reactors, which have characteristics that fall within the postulated site parameters, and provided further that the report need not include an assessment of the benefits (for example, need for power) of the proposed action, but must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed.

A complete environmental report is required per 10 CFR Part 51, Sections 45 and 50. The report must focus on the environmental effects of construction and operation of the proposed facilities, which have characteristics that fall within the plant parameter envelope specified in the Site Safety Analysis Report. The Environmental Report (ER) for an ESP application does not need to include an assessment of the benefits of the proposed action, but must include an evaluation of alternative sites to determine whether there is an obviously superior alternative site.

Detailed guidance on the Environmental Report is provided in Regulatory Guide 4.2, *Preparation of Environmental Reports for Nuclear Power Stations*, Revision 2, July 1976. Table 3-2 provides a Table of Contents, extracted from this Regulatory Guide, for the Environmental Report. Additional guidance on preparation of each chapter of the ER is provided in the following paragraphs.

3.3.1 Purpose of the Proposed Facility and Associated Transmission (Chapter 1)

ER Chapter 1, as specified in the same chapter of Regulatory Guide 4.2, contains information describing the need for the proposed action. As discussed above, NRC's ESP regulations (10 CFR 52.17 (a)(2)) state that "...the [Environmental] report need not include an assessment of the benefits (for example, need for power) of the proposed action..." Because an ESP is valid for twenty years or more from initial approval, these information details may not be available at the time of application. Accordingly, the applicant would complete this chapter by stating the intent to obtain an ESP, with the additional information specified in Chapter 1 to be supplied in a future (i.e., CP or COL) application.

Table 3-2.
CONTENTS OF AN ENVIRONMENTAL REPORT

1.0 PURPOSE OF PROPOSED FACILITY AND ASSOCIATED TRANSMISSION
1.1 System Demand and Reliability
1.2 Other Objectives
1.3 Consequences of Delay
2.0 THE SITE AND ENVIRONMENTAL INTERFACES
2.1 Geography and Demography
2.2 Ecology
2.3 Meteorology
2.4 Hydrology
2.5 Geology
2.6 Regional, Historic, Archeological, Architectural, Scenic, Cultural and Natural Features
2.7 Noise
3.0 THE STATION
3.1 External Appearance
3.2 Reactor and Steam-Electric System
3.3 Station Water Use
3.4 Heat Dissipation System
3.5 Radwaste System and Source Term
3.6 Chemical and Biocide Wastes
3.7 Sanitary and Other Waste Systems
3.8 Reporting of Radioactive Material Movement
3.9 Transmission Facilities
4.0 ENVIRONMENTAL EFFECTS OF SITE PREPARATION, PLANT CONSTRUCTION AND TRANSMISSION FACILITIES
4.1 Site Preparation and Station Construction

Table 3-2.
CONTENTS OF AN ENVIRONMENTAL REPORT

4.2 Transmission Facilities Construction
4.3 Resources Committed
4.4 Radioactivity
4.5 Construction Impact Control Program
5.0 ENVIRONMENTAL EFFECTS OF PLANT OPERATIONS
5.1 Effects of Operation of Heat dissipation System
5.2 Radiological Impact From Routine Operation
5.3 Effects of Chemical and biocide Discharges
5.4 Effects of Sanitary Waste Discharges
5.5 Effects of Operation and Maintenance of the Transmission Systems
5.6 Other Effects
5.7 Resources Committed
5.8 Decommissioning and Dismantling
6.0 EFFLUENT AND ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS
6.1 Applicants Pre-Operational Environmental Program
6.2 Applicants Proposed Operational Monitoring Program
6.3 Related Environmental Measurements and Monitoring Programs
6.4 Pre-Operational Environmental Radiological Monitoring Data
7.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS
7.1 Station Accidents Involving Radioactivity
7.2 Transportation Accidents Involving Radioactivity
7.3 Other Accidents
8.0 ECONOMIC AND SOCIAL EFFECTS OF STATION CONSTRUCTION AND OPERATION
8.1 Benefits (Not Required)
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9.0 ALTERNATE ENERGY SOURCES AND SITES

Table 3-2.
CONTENTS OF AN ENVIRONMENTAL REPORT

9.1 Alternatives Not Requiring the Creation of New Generating Capacity
9.2 Alternatives Requiring the Creation of New Generating Capacity
9.3 Cost-Effectiveness Analysis of Candidate Site-Plant Alternatives
9.4 Cost of Alternative Power Generation Methods
10.0 STATION DESIGN ALTERNATIVES
10.1 Circulating System (Excluding Intake and Discharge)
10.2 Intake System
10.3 Discharge System
10.4 Chemical Waste Treatment
10.5 Biocide Treatment
10.6 Sanitary Waste Systems
10.7 Liquid Radwaste Systems
10.8 Gaseous Radwaste Systems
10.9 Transmission Facilities
10.10 Other Systems
11.0 SUMMARY COST-BENEFIT ANALYSIS (Benefits Not Required)
12.0 ENVIRONMENTAL APPROVALS AND CONSULTATION
13.0 REFERENCES

However, applicants who wish to immediately follow an ESP with a COL application (or to proceed with parallel reviews of the two applications) should consider providing information that justifies the need for a nuclear plant at the proposed site. In crafting these discussions, it will be important to note that guidance provided in the current version of Regulatory Guide 4.2 applies to regulated utilities in the electric power industry as it existed when the Regulatory Guide was issued (1976). How the scope of "need for power" justifications should be framed in a deregulated environment with merchant plants has not been determined. Accordingly, applicants who decide to include more detailed information in Chapter 1 of the ER should consider early discussions with NRC to identify the appropriate basis for and content of this material.

3.3.2 The Site and Environmental Interfaces (Chapter 2)

In this chapter, the applicant provides data that characterize the environmental baseline against which the impacts of constructing and operating a nuclear power plant are evaluated. In addition to the environmental analyses in Chapter 5 of the ER, NRC uses these data for the independent evaluation of environmental impacts in its Environmental Impact Statement (EIS). Information requirements, by technical area, are specified in detail in Section 2 of Regulatory Guide 4.2.

Sources for information presented in Chapter 2 will vary somewhat by site, but will generally include both the literature and field data collected on-site and in the surrounding area (see Section 3.3.6). Applicants may also find it useful to obtain additional expertise and data by retaining local experts (e.g., university professors, archeologists, and biologists) in individual technical resource areas.

Field data collection programs typically include the following technical disciplines: archeology, meteorology, hydrology, aquatic ecology, terrestrial ecology, and geology. In addition, visits to local and state offices are usually necessary to collect the full spectrum of data necessary for land use and demographic characterization of the site and its environs. Descriptions of the data collection programs themselves are described in ER Chapter 6, as discussed in Section 3.3.6 below.

For existing sites, site data developed in previous licensing actions may provide a significant portion of the information necessary to complete Chapter 2. Construction Permit and Operating License applications for existing units and for independent spent fuel storage facilities will be important potential sources. Even more important, the applicant's operational monitoring programs on-site and in the site vicinity will provide much of the information that, for greenfield sites, would have to be derived from new site characterization investigations. The site meteorological monitoring and environmental radiological monitoring programs, in particular, may dramatically reduce the effort required for these technical resource areas at existing sites. Depending on the scope and detail of data developed in earlier development work, some of these benefits will also apply to previously studied sites.

In utilizing data from existing or previously studied sites, applicants must ensure that the scope and timeliness of data are appropriate to the ESP application. In particular, data (e.g., demography) must be up-to-date as of the application date and must be relevant to the action being proposed. For example, the data must support evaluation of impacts of the newly proposed nuclear power plant site; impacts of previous licensing actions, while relevant, cannot be substituted for an analysis of the new proposal.

3.3.3 The Station (Chapter 3)

Chapter 3 of the ER provides a description of the plant design and site development plans; this information is used to identify and characterize the impacts of constructing and operating a nuclear power plant at the site. Information must be of adequate scope and detail to allow evaluation of the impacts identified in Regulatory Guide 4.2, Chapter 5; guidance on plant information that NRC expects in an ESP application is provided in Chapter 3 of the Regulatory Guide.

Because the ESP application is for a site approval only (i.e., no specific plant design is being proposed), applicants must use information in the ER that allows a bounding environmental analysis to be conducted. That is, impacts presented in the ER must allow NRC to identify the envelope of environmental effects that will attend development of the site for a nuclear power plant. In cases where the applicant wishes to preserve the possibility of selecting more than one plant design, the plant data provided in ER Chapter 3 should be a composite of plant parameters that would result in the largest impacts.

In considering design alternatives, the applicant should address major plant systems (e.g., cooling system: mechanical draft, natural draft, cooling ponds, and once-through), as well as alternative vendors. Because the impact magnitude for a given plant parameter can vary by technical resource area, the process of identifying appropriate data must consider both the plant characteristics and the type of impact. For example, once-through cooling would yield the largest impacts on aquatic resources but the smallest fogging/icing potential; mechanical draft cooling towers and cooling ponds would be the bounding alternative for fogging/icing.

Plant Parameters Envelope (PPE) values (Appendix C) developed for the candidate plant designs provide much of the data required in Chapter 3 of the ER. However, because some impacts will be specific to details of the site development plan (e.g., facility locations and orientation), applicants may need to develop additional data in order to accurately assess impacts. Consultations with the reactor vendor and/or the architect-engineer may be necessary. An example of additional data detail is the assessment of impingement/ entrainment of aquatic species at the makeup water intake structure, an evaluation for which intake approach velocities are required.

3.3.4 Environmental Effects of Site Preparation, Station Construction, and Transmission Facilities Construction (Chapter 4)

Impacts of site preparation and station construction on the environmental resources described in Chapter 2 are presented in this section. The analysis must address both

temporary (e.g. construction facilities, lay-down areas) and permanent (e.g., removal of land from production, visual impacts of facilities) impacts; resource commitments (e.g., steel, concrete) should also be identified. These discussions should clearly indicate those components of site preparation that the applicant proposes to conduct after issuance of the ESP but prior to obtaining a Construction Permit. Any mitigating actions (e.g., dust suppression, silt fencing) that are required or planned to control construction impacts should also be described.

For existing sites, estimates of the annual doses to construction workers from radiation sources at the existing units must be provided. Data from the plant operational effluent and environmental radiological monitoring programs may provide much of the information necessary for this analysis.

Section 4.2 of Regulatory Guide 4.2 specifies that "...the effects of clearing the rights-of-way and installing transmission line towers and conductors..." be analyzed. Thus, the ER should include an analysis of the impacts of transmission facilities that the applicant will construct (e.g., plant switchyard, on-site connections); off-site transmission facilities that will be constructed by the applicant should also be addressed. However, in a deregulated business environment, it is anticipated that construction and operation of transmission lines necessary to connect a new plant to the grid will be the responsibility of a Regional Transmission Operator (RTO) regulated under the Federal Energy Regulatory Commission (FERC). Because NEPA compliance will be the responsibility of a separate Federal agency, the applicant need only provide a general discussion of the transmission capacity requirements and a qualitative discussion of potential impacts. Reference should be made to the FERC approval process and the associated NEPA documentation; if available, at the time of ESP application, a summary of the RTO's and/or FERC's environmental analyses should be provided.

3.3.5 Environmental Effects of Station Operation (Chapter 5)

Detailed guidance on appropriate content of ER Chapter 5 is provided in the corresponding Section of Regulatory Guide 4.2. Significant focus should be provided on analyzing the heat dissipation system impacts and radiological impacts from operation of the nuclear plant itself.

Plant parameter envelope values characterizing the plant's environmental interfaces are provided for several candidate plant designs in Appendix D. As discussed in this Appendix, individual PPE values used in the ER should be those that would result in the highest predicted impacts for the suite of alternative designs under consideration. By bounding the impacts of all designs under consideration, the applicant will be able to demonstrate at the COL stage that the environmental analysis has been adequately addressed, regardless of which design is ultimately selected.

Because an ESP application may precede cooling system selection and design, applicants' may wish to provide an environmental analysis that bounds impacts of multiple alternative systems that may be considered for a future COL. In this case, applicants must identify the main condenser cooling system alternatives (e.g., mechanical or natural draft cooling

towers, cooling ponds, and once-through cooling) that may be deployed. To maintain multiple options, the most restrictive value for each cooling system PPE section should be used in the ESP application (e.g., 550 feet cooling tower height selected if both mechanical and natural draft towers are being considered).

Environmental monitoring data available at existing and previously studied sites may be useful in conducting impact analyses for this chapter. In particular, the analyses will benefit from a knowledge of pathways identified, actual measurement of radiation levels in environmental media, and impact assessments (e.g., computed doses from existing unit effluents). Operational assessments of cooling system effects (e.g., impingement, entrainment, thermal impacts) may be utilized to estimate impacts from operation of the proposed new plant. Used as a technical resource for the ER, previously available impact assessments may significantly decrease the need for new data collection programs and/or analyses. However, careful integration of previously developed information with Chapter 5 requirements is necessary. For example, applicants must ensure that the ER focuses on impacts of operation of the proposed new plant; simply referring to environmental analyses from previous NEPA documentation will not be adequate.

Section 5.5 of Regulatory Guide 4.2 specifies that the ER must address "...environmental effects of operation and maintenance of the transmission system required to tie in the proposed facility to the pre-existing network...." This discussion should reflect the same approach as for transmission construction impacts, as described for Chapter 4, above.

Environmental impacts of the uranium fuel cycle are addressed by incorporating Summary Table S-3 of 10 CFR 51.20 by reference.

3.3.6 Effluent and Environmental Measurements and Monitoring Programs (Chapter 6)

Chapter 6 of Regulatory Guide 4.2 requires that the applicant address four categories of monitoring programs, as discussed below; applicants should refer to the Regulatory Guide for detailed guidance on the objectives of these program descriptions.

3.3.6.1 Preoperational Environmental Programs

These are programs that were conducted to provide baseline data characterizing environmental conditions prior to construction and operation of the proposed plant; data derived from these programs will have been used to support preparation of ER Chapter 2. Both literature survey and field data collection programs should be addressed.

The following listings provide examples of typical field program components that would be described in this section. Additional data collection program characteristics specific to individual sites (e.g., beach erosion monitoring at coastal sites) may also be required.

- Meteorology – Tower location, parameters measured, instrument descriptions (e.g., type, sensitivity), data collection system, calibration, and maintenance.

- Water Quality – Sample collection points (i.e., map of stream, well and lake/pond locations), list of analytes, sample preservation methods, laboratory analysis methods, data quality objectives, and reporting protocols.
- Air Quality – Pollutants measured, monitoring locations, sample collection and analysis methods, equipment identification, calibration, and maintenance.
- Aquatic Ecology – Transect and sampling locations, collection methods by type (e.g., sediment, benthic organisms, macrophytes, fish), laboratory identification methods, habitat location methods.
- Terrestrial Ecology – Transect and sampling locations, collection methods by type (e.g., plant species, terrestrial biota, birds), laboratory identification methods; habitat definition methods.
- Hydrology – Well and gaging station locations, measurement methods (e.g., dropline, weir), data reduction and analysis methods, and computational methods (e.g., ground water transport and streamflow/flood analysis codes).
- Geology – Surface survey methods and locations, borehole locations, borehole logging and cuttings analysis methods, and data reduction and analysis methods.
- Archeology – Surveying and excavation protocols, identification and characterization methods, use of and reports from local and subject-matter experts.

3.3.6.2 Proposed Operating Monitoring Programs

Programs that will be implemented to measure actual impacts during plant operation are the focus of this section. Since, at the ESP stage, these programs may not have been fully designed, the applicant may describe the overall scope of programs with additional detail provided with the COL application when a specific plant design is proposed. The operating monitoring program discussion in the ESP should describe the environmental media to be monitored (e.g., plant effluents, air quality, water quality) and should provide a general description of the monitoring locations and parameters (e.g., plant effluents, cooling water discharge outfall temperatures, environmental pathways for radionuclide transport, impingement on intake structure travelling screens).

At existing sites, where operational monitoring programs are already in effect, applicants may wish to describe how programs for the proposed new plant will be integrated into ongoing monitoring and sampling. Added operational monitoring program detail in the ESP application for existing sites may reduce the licensing effort required at the COL stage.

3.3.6.3 Related Environmental Measurement and Monitoring Programs

Applicants will describe in this section those environmental measurement and monitoring programs operated by other entities that provide information relevant to environmental impacts of the proposed plant. These data could provide baseline or operational impact information, or both. Normally federal, state, and local government organizations will be

the operators of such programs, although private entities (e.g., industrial facility operators) may collect environmental data that, if publicly available, would be relevant. Existence of such programs is typically identified in the literature surveys conducted to support preparation of Chapter 2 of the ER.

Examples of programs likely to be found in the vicinity of most proposed nuclear power plant sites are:

- National Oceanic and Atmospheric Administration (NOAA) meteorological monitoring stations.
- United States Geologic Survey stream flow gaging stations.
- State ambient air quality and water quality monitoring programs.
- State or university biological research programs.

3.3.6.4 Preoperational Environmental Radiological Monitoring Data

Data from this program may not be available for the ESP application and may not be complete even at the time of Construction Permit application. For the ESP, applicants should provide a qualitative description of the program – to be implemented prior to operation – to characterize baseline radiological data in the vicinity of the site.

At existing sites, ongoing plant environmental monitoring programs will provide most of the data necessary to satisfy the requirements of this section. Accordingly, applicants proposing an existing site may wish to provide this data in the ESP application to simplify consideration of baseline radiological data at the COL stage.

3.3.7 Environmental Effects of Accidents (Chapter 7)

Regulatory Guide 4.2 specifies that the applicant must provide, in this chapter of the ER, an analysis of the environmental effects of potential accidents at the proposed nuclear power plant. Meteorological data for this analysis can be obtained from the onsite monitoring program or can be derived from Regulatory Guides 1.3 or 1.4, adjusting the X/Q values to reflect 50th-percentile, versus 95th-percentile, statistics. For ESP applications, radiological source terms for accident scenarios must be derived from design data or from design certification applications and reviews. Tables in Chapter15 of Regulatory Guide 1.70 list the design and accident sequence parameters necessary to derive these source terms. Applicants must obtain calculated release values from the vendor/architect-engineer for the plant designs under consideration.

In addition to accidents involving radioactive releases, applicants must also provide an analysis of non-radiological accidents (e.g., releases of hazardous chemicals, such as chlorine used in cooling water treatment). Information necessary to characterize the nature and environmental impacts of these scenarios can be obtained from the architect-engineer or from operating experience at existing units.

Environmental impacts of transportation of fuel and wastes within the scope of 10 CFR 51.20 are addressed by incorporating Summary Table S-4 of 10 CFR 51 by reference.

3.3.8 Economic and Social Effects of Station Construction and Operation (Chapter 8)

The required analyses of benefits and costs are described in Sections 8.1 and 8.2 of Regulatory Guide 4.2; however, as stated in 10 CFR 52.17(a)(2), the ER "...need not include an assessment of the benefits (for example, need for power) of the proposed action..." This guidance may be interpreted to mean that material specified in Section 8.1 is not required in an ESP ER. Because the material in this section describes potential benefits to communities surrounding the site, applicants should consider providing this information to formally document these benefits and to "advertise" any plans the applicant has for community enhancements. Such discussions will also be relevant to the applicant's public involvement program.

Detailed guidance on cost information specified in Section 8.2 is provided in Tables 2 through 4 of Regulatory Guide 4.2. In addition to "dollar" costs, applicants must also provide an analysis of socioeconomic impacts of plant construction and operation on the regional and local economies. One focus of this analysis should be the potential for "boom-and-bust" cycles associated with the large, temporary work force required during construction (e.g., adequate housing, traffic pattern modification). Any mitigating actions planned by the applicant to ameliorate impacts to local services or infrastructure (e.g., providing temporary housing, road improvements) should also be described.

Applicants proposing an existing site may be able to use the actual history of the economic growth accompanying development of the currently operating units to project future impacts on nearby communities.

3.3.9 Alternative Energy Sources and Sites (Chapter 9)

This chapter contains 4 sections. Section 9.1 is devoted to a discussion of alternatives that do not require addition of generation capability. For the ESP application, this material is not relevant, in that the applicant is not proposing to build a power plant. Also, in a deregulated business environment, merchant plants will be selling the power produced into the marketplace, without a traditional service area or reserve margin objective. The purpose of such plants will be to produce power for profit. For Section 9.1, the applicant should provide a non-proprietary description of the business case for obtaining an ESP to maintain the option of building a nuclear power plant in the future.

Applicants should provide, in Section 9.2, a summary of the rationale for selecting the site being proposed in the ESP application; this discussion should include a description of the process by which the proposed site was compared to and selected over alternative sites. Detailed guidance for the content of this section is provided in Section 9.2 of Regulatory Guide 4.2; additional guidance on the conduct and documentation of an acceptable site selection process for use in an ESP application is provided in the *Siting Guide: Site Selection and Suitability Criteria for an Early Site Permit Application*, June 2001.

Regulatory Guide 4.2, Section 9.3, directs applicants to provide a discussion of the cost-effectiveness of candidate site-plant alternatives and to provide the basis on which applicants have decided build a nuclear power plant at the proposed site. Because an ESP application seeks site approval only, this material is not directly relevant to the ESP ER. However, applicants may wish to provide a brief rationale for the business case to seek an ESP at the time of application (see the discussion on Section 9.1, above).

Similarly, summary cost comparisons of alternative means (e.g., coal, oil, natural gas) of producing power are specified in Section 9.4. Since 1) power production costs (e.g., dollars per megawatt hour) computed at the time of an ESP application may not be accurate for the time the plant is built and 2) power production costs for merchant plants will be proprietary business information, these comparisons are not meaningful and may be deferred to the COL stage. However, applicants may wish to include a brief, qualitative discussion stating their rationale for establishing the option of building a nuclear power plant at the proposed site. This discussion could be supplemented by generic power production cost projections prepared by industry or government organizations. For example, the U. S. Department of Energy's Energy Information Administration provides annual projections of power demand, supply, and costs; these data and assumptions are available at www.eia.doe.gov.

NOTE: In July of 2001, the NEI filed a Petition for Proposed Rulemaking that would eliminate the requirement for consideration of need for power, alternative sites, and alternative sources of power from NRC's review of ESP applications. Applicants should consult with NEI or NRC to determine the status and effect of this Petition on the required content of ER Chapter 9.

3.3.10 Station Design Alternatives (Chapter 10)

This chapter of the ER is devoted to a description of alternative designs for several nuclear power plant support systems; systems to be addressed are discussed in Sections 10.1 through 10.10 of Regulatory Guide 4.2. The detail provided in this section of the applicant's ESP ER will depend on whether final decisions have been made, first, on a vendor design, and, second, on the design of individual systems (e.g., intake and discharge structure locations). To the degree that design decisions have been made, the applicant may wish to describe the alternatives considered and the rationale for selecting the proposed design. If, however, design details are not available at the time of ESP application, or the applicant wishes to maintain several system design options, information specified for this ER chapter should be deferred to the COL stage, when the full spectrum of design information will be available.

3.3.11 Summary Cost Benefit Analysis (Chapter 11)

As described in Section 11 of Regulatory Guide 4.2, the intent of this ER section is to provide an overview of the cost-benefit analysis conducted by the applicant in arriving at the decision to obtain an ESP for the proposed site. As discussed above, many of the alternatives that must be considered in the ER may not have been finalized at the time of ESP application, and some of the cost and economic information requested may not be available or meaningful. Accordingly, the applicant should, within the limits of information

presented in previous chapters, provide a qualitative non-proprietary overview of the business case for maintaining, through an ESP, the option to build a nuclear power plant in the future. Also included should be a summary of the environmental tradeoffs that were considered in selecting the ESP proposed site.

3.3.12 Environmental Approvals and Consultation (Chapter 12)

The applicant should provide an overview of the status of its interactions with other agencies (i.e., local, state, federal) regarding permits, reviews, and approvals that will be required to construct and operate the plant. Since the timing of other environmental approvals will depend on the overall plant development schedule, information at the time of ESP application may be limited. Applicants should list the permits and approvals that will be required and provide a discussion of the status of any official discussions with the cognizant agencies. Actual timing of future permit applications, in relation to a COL application should also be provided.

3.3.13 References (Chapter 13)

The applicant should provide, in this chapter, a list of the references used in preparing the Environmental Report.

3.4 Emergency Planning Information

Part 52 Reference

§52.17 Contents of applications.
(b)(1)

The application must identify physical characteristics unique to the proposed site, such as egress limitations from the area surrounding the site that could pose a significant impediment to the development of emergency plans.

§52.17 Contents of applications.
(b)(2)
The application may also either:

(i) Propose major features of the emergency plans, such as the exact sizes of the emergency planning zones, that can be reviewed and approved by NRC in consultation with FEMA in the absence of complete and integrated emergency plans; or

(ii) Propose complete and integrated emergency plans for review and approval by the NRC, in consultation with the Federal Emergency Management Agency, in accord with the applicable provisions of 10 CFR 50.47.

§52.17 Contents of applications.
(b)(3)

Under paragraphs (b)(1) and (2)(i) of this section, the application must include a description of contacts and arrangements made with local, state, and federal governmental agencies with emergency planning responsibilities

§52.17 Contents of applications.
(a)(1)

The application must contain, to the extent approval of emergency plans is sought under paragraph (b)(2)(ii) of this section, the information required by §50.33 (g) and (j), and §50.34 (b)(6)(v) of this chapter.

The requirements of 10 CFR Part 52 Section 17 (b) provide some flexibility in the content of information required for emergency planning/preparedness.

As a starting point, the applicant must identify physical characteristics unique to the proposed site, such as egress limitations from the area surrounding the site that could pose a significant impediment to the development of emergency plans.

Beyond site characteristics, applicants for an ESP may propose complete and integrated emergency plans for review and approval by the NRC, in consultation with the Federal Emergency Management Agency (FEMA), in accordance with the applicable provisions of 10 CFR 50.47. However, applicants may instead propose major features of the emergency plan, such as the exact sizes of the emergency planning zones, that can be reviewed and approved by NRC in consultation with FEMA in the absence of complete and integrated emergency plans.

If complete and integrated emergency plans are proposed, then the applicant must make good faith efforts to obtain from the same governmental agencies certifications that: (1) The proposed emergency plans are practicable; (2) These agencies are committed to participating in any further development of the plans, including any required field demonstrations, and (3) that these agencies are committed to executing their responsibilities under the plans in the event of an emergency. Table 3-4 is a table of contents for a complete and integrated emergency plan as specified in 10 CFR 50.47.

If a complete and integrated plan is not proposed, the applicant must include a description of contacts and arrangements made with local, state and federal governmental agencies with emergency planning responsibilities. In this case, the applicant would provide the information required to describe the major features of the plan using a table of contents similar to Table 3-3.

The application must contain any certifications that have been obtained. If these certifications cannot be obtained, the application must contain a utility plan, sufficient o show that the proposed plans nonetheless provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the site.

The information documented and retained by the applicant will form the bases of the information contained in the application.

Table 3-3.
EMERGENCY PLANNING INFORMATION

1.0	**PHYSICAL CHARACTERISTICS UNIQUE TO THE PROPOSED SITE, SUCH AS EGRESS LIMITATIONS FROM THE AREA SURROUNDING THE SITE THAT COULD POSE A SIGNIFICANT IMPEDIMENT TO THE DEVELOPMENT OF EMERGENCY PLANS**
2.0	**EMERGENCY RESPONSE PLAN**
2.1	Primary Responsibilities for Emergency Response
2.2	On-shift Facility Licensee Responsibilities for Emergency Response
2.3	Arrangements for requesting and effectively using assistance resources
2.4	Standard emergency classification and action level scheme
2.5	Procedures for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations
2.6	Provisions for prompt communications among principal response organizations to emergency personnel and to the public
2.7	Information to be made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency
2.8	Emergency facilities and equipment to support the emergency response
2.9	Methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition
2.10	Range of protective actions for the plume exposure pathway EPZ for emergency workers and the public
2.11	Means for controlling radiological exposures, in an emergency for emergency workers
2.12	Arrangements for medical services for contaminated injured individuals
2.13	General plans for recovery and reentry
2.14	Periodic exercises to evaluate major portions of emergency response capabilities
2.15	Radiological emergency response training for those who may be called on to

Table 3-3.
EMERGENCY PLANNING INFORMATION

	assist in an emergency
2.16	Responsibilities for plan development and review and for distribution of emergency plans and planners training
3.0	**EMERGENCY PLANNING ZONES**
3.1	Plume Exposure Pathway
3.2	Ingestion Pathway
4.0	**REFERENCES**

APPENDIX A

Regulations For Early Site Permits
From
10 CFR Parts 50, 51 & 52

Regulations For Early Site Permits From 10 CFR 50, 51 & 52

Table of Contents

10 CFR Part 52 GENERAL PROVISIONS

§52.1 Scope.

This part governs the issuance of early site permits, standard design certifications, and combined licenses for nuclear power facilities licensed under Section 103 or 104b of the Atomic Energy Act of 1954, as amended (68 Stat. 919), and Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242). This part also gives notice to all persons who knowingly provide to any holder of or applicant for an early site permit, standard design certification, or combined license, or to a contractor, subcontractor, or consultant of any of them, components, equipment, materials, or other goods or services, that relate to the activities of a holder of or applicant for an early site permit, standard design certification, or combined license, subject to this part, that they may be individually subject to NRC enforcement action for violation of §52.9.

§52.3 Definitions.

As used in this part,
(a) *Combined license* means a combined construction permit and operating license with conditions for a nuclear power facility issued pursuant to subpart C of this part.
(b) *Early site permit* means a Commission approval, issued pursuant to subpart A of this part, for a site or sites for one or more nuclear power facilities.
(c) *Standard design* means a design which is sufficiently detailed and complete to support certification in accordance with subpart B of this part, and which is usable for a multiple number of units or at a multiple number of sites without reopening or repeating the review.
(d) *Standard design certification, design certification*, or *certification* means a Commission approval, issued pursuant to subpart B of this part, of a standard design for a nuclear power facility. A design so approved may be referred to as a *certified standard design*.
(e) All other terms in this part have the meaning set out in 10 CFR 50.2, or section 11 of the Atomic Energy Act, as applicable.

§52.5 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding upon the Commission.

§52.8 Information collection requirements: OMB approval.

(a) The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act (44 U.S.C. 3501 et seq.). The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. OMB has approved the information collection requirements contained in this part under control number 3150090151.
(b) The approved information collection requirements contained in this part appear in §§52.15, 52.17, 52.29, 52.35, 52.45, 52.47, 52.57, 52.63, 52.75, 52.77, 52.78, 52.79, 52.91, 52.99, 52.103, and appendices A and B.
[62 FR 52188, Oct. 6, 1997]

10 CFR Part 52 Subpart A-Early Site Permits

§52.11 Scope of subpart.

This subpart sets out the requirements and procedures applicable to Commission issuance of early site permits for approval of a site or sites for one or more nuclear power facilities separate from the filing of an application for a construction permit or combined license for such a facility.

§52.13 Relationship to subpart F of 10 CFR part 2 and appendix Q of this part.

The procedures of this subpart do not replace those set out in subpart F of 10 CFR part 2 or appendix Q of this part. Subpart F applies only when early review of site suitability issues is sought in connection with an appliction for a permit to construct certain power facilities. Appendix Q applies only when NRC staff review of one or more site suitability issues is sought separately from and prior to the submittal of a construction permit. A Staff Site Report issued under appendix Q in no way affects the authority of the Commission or the presiding officer in any proceeding under subpart F or G of 10 CFR part 2. Subpart A applies when any person who may apply for a construction permit under 10 CFR part 50 or for a combined license under 10 CFR part 52 seeks an early site permit from the Commission separately from an application for a construction permit or a combined license for a facility.

§52.15 Filing of applications.

(a) Any person who may apply for a construction permit under 10 CFR part 50, or for a combined license under 10 CFR part 52, may file with the Director of Nuclear Reactor Regulation an application for an early site permit. An application for an early site permit may be filed notwithstanding the fact that an application for a construction permit or a combined license has not been filed in connection with the site or sites for which a permit is sought.
(b) The application must comply with the filing requirements of 10 CFR 50.30 (a), (b), and (f) as they would apply to an application for a construction permit. The following portions of §50.4, which is referenced by §50.30(a)(1), are applicable: paragraphs (a), (b) (1) - (3), (c), (d), and (e).

§52.17 Contents of applications.

(a)(1) The application must contain the information required by §50.33 (a) through (d), the information required by §50.34 (a)(12) and (b)(10), and to the extent approval of emergency plans is sought under paragraph (b)(2)(ii) of this section, the information required by §50.33 (g) and (j), and §50.34 (b)(6)(v) of this chapter. The application must also contain a description and safety assessment of the site on which the facility is to be located. The assessment must contain an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in §50.34(a)(1) of this chapter. Site characteristics must comply with part 100 of this chapter. In addition, the application should describe the following:
(i) The number, type, and thermal power level of the facilities for which the site may be used;
(ii) The boundaries of the site;
(iii) The proposed general location of each facility on the site;

(iv) The anticipated maximum levels of radiological and thermal effluents each facility will produce;
(v) The type of cooling systems, intakes, and outflows that may be associated with each facility;
(vi) The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site;
(vii) The location and description of any nearby industrial, military, or transportation facilities and routes; and
(viii) The existing and projected future population profile of the area surrounding the site.
(2) A complete environmental report as required by 10 CFR 51.45 and 51.50 must be included in the application, provided, however, that such environmental report must focus on the environmental effects of construction and operation of a reactor, or reactors, which have characteristics that fall within the postulated site parameters, and provided further that the report need not include an assessment of the benefits (for example, need for power) of the proposed action, but must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed.
(b) (1) The application must identify physical characteristics unique to the proposed site, such as egress limitations from the area surrounding the site, that could pose a significant impediment to the development of emergency plans.
(2) The application may also either:
(i) Propose major features of the emergency plans, such as the exact sizes of the emergency planning zones, that can be reviewed and approved by NRC in consultation with FEMA in the absence of complete and integrated emergency plans; or
(ii) Propose complete and integrated emergency plans for review and approval by the NRC, in consultation with the Federal Emergency Management Agency, in accord with the applicable provisions of 10 CFR 50.47.
(3) Under paragraphs (b)(1) and (2)(i) of this section, the application must include a description of contacts and arrangements made with local, state, and federal governmental agencies with emergency planning responsibilities. Under the option set forth in paragraph (b)(2)(ii) of this section, the applicant shall make good faith efforts to obtain from the same governmental agencies certifications that: (i) The proposed emergency plans are practicable; (ii) These agencies are committed to participating in any further development of the plans, including any required field demonstrations, and (iii) that these agencies are committed to executing their responsibilities under the plans in the event of an emergency. The application must contain any certifications that have been obtained. If these certifications cannot be obtained, the application must contain information, including a utility plan, sufficient to show that the proposed plans nonetheless provide reasonable assurance that adequate protective measures can and will be taken, in the event of a radiological emergency at the site.
(c) If the applicant wishes to be able to perform, after grant of the early site permit, the activities at the site allowed by 10 CFR 50.10(e)(1) without first obtaining the separate authorization required by that section, the applicant shall propose, in the early site permit, a plan for redress of the site in the event that the activities are performed and the site permit expires before it is referenced in an application for a construction permit or a combined license issued under subpart C of this part. The application must demonstrate that there is reasonable assurance that redress carried out under the plan will achieve an

environmentally stable and aesthetically acceptable site suitable for whatever non-nuclear use may conform with local zoning laws.
[54 FR 15386, Spt. 18, 1989, as amended at 61 FR 65175, Dec. 11, 1996]

§52.18 Standards for review of applications.

Applications filed under this subpart will be reviewed according to the applicable standards set out in 10 CFR part 50 and its appendices and part 100 as they apply to applications for construction permits for nuclear power plants. In particular, the Commission shall prepare an environmental impact statement during review of the application, in accordance with the applicable provisions of 10 CFR part 51, provided, however, that the draft and final environmental impact statements prepared by the Commission focus on the environmental effects of construction and operation of a reactor, or reactors, which have characteristics that fall within the postulated site parameters, and provided further that the statements need not include an assessment of the benefits (for example, need for power) of the proposed action, but must include an evaluation of alternative sites to determine whether there is any obviously superior alternative to the site proposed. The Commission shall determine, after consultation with the Federal Emergency Management Agency, whether the information required of the applicant by §52.17(b)(1) shows that there is no significant impediment to the development of emergency plans, whether any major features of emergency plans submitted by the applicant under §52.17(b)(2)(i) are acceptable, and whether any emergency plans submitted by the applicant under §52.17(b)(2)(ii) provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency.

§52.19 Permit and renewal fees.

The fees charged for the review of an application for the initial issuance or renewal of an early site permit are set forth in 10 CFR 170.21 and shall be paid in accordance with 10 CFR 170.12.
[56 FR 31499, July 10, 1991]

§52.21 Hearings.

An early site permit is a partial construction permit and is therefore subject to all procedural requirements in 10 CFR part 2 which are applicable to construction permits, including the requirements for docketing in §§2.101(a)(1) - (4), and the requirements for issuance of a notice of hearing in §§2.104(a), (b)(1)(iv) and (v), (b)(2) to the extent it runs parallel to (b)(1)(iv) and (v), and (b)(3), provided that the designated sections may not be construed to require that the environmental report or draft or final environmental impact statement include an assessment of the benefits of the proposed action. In the hearing, the presiding officer shall also determine whether, taking into consideration the site criteria contained in 10 CFR part 100, a reactor, or reactors, having characteristics that fall within the parameters for the site can be constructed and operated without undue risk to the health and safety of the public. All hearings conducted on applications for early site permits filed under this part are governed by the procedures contained in subpart G of part 2.

§52.23 Referral to the ACRS.

The Commission shall refer a copy of the application to the Advisory Committee on Reactor Safeguards (ACRS). The ACRS shall report on those portions of the application which concern safety.

§52.24 Issuance of early site permit.

After conducting a hearing under §52.21 of this subpart and receiving the report to be submitted by the Advisory Committee on Reactor Safeguards under §52.23 of this subpart, and upon determining that an application for an early site permit meets the applicable standards and requirements of the Atomic Energy Act and the Commission's regulations, and that notifications, if any, to other agencies or bodies have been duly made, the Commission shall issue an early site permit, in the form and containing the conditions and limitations, as the Commission deems appropriate and necessary.

§52.25 Extent of activities permitted.

(a) If an early site permit contains a site redress plan, the holder of the permit, or the applicant for a construction permit or combined license who references the permit, may perform the activities at the site allowed by 10 CFR 50.10(e)(1) without first obtaining the separate authorization required by that section, provided that the final environmental impact statement prepared for the permit has concluded that the activities will not result in any significant adverse environmental impact which cannot be redressed.
(b) If the activities permitted by paragraph (a) of this section are performed at any site for which an early site permit has been granted, and the site is not referenced in an application for a construction permit or a combined license issued under subpart C of this part while the permit remains valid, then the early site permit must remain in effect solely for the purpose of site redress, and the holder of the permit shall redress the site in accordance with the terms of the site redress plan required by §52.17(c). If, before redress is complete, a use not envisaged in the redress plan is found for the site or parts thereof, the holder of the permit shall carry out the redress plan to the greatest extent possible consistent with the alternate use.

§52.27 Duration of permit.

(a) Except as provided in paragraph (b) of this section, an early site permit issued under this subpart may be valid for not less than ten nor more than twenty years from the date of issuance.
(b)(1) An early site permit continues to be valid beyond the date of expiration in any proceeding on a construction permit application or a combined license application which references the early site permit and is docketed either before the date of expiration of the early site permit, or, if a timely application for renewal of the permit has been filed, before the Commission has determined whether to renew the permit.
(2) An early site permit also continues to be valid beyond the date of expiration in any proceeding on an operating license application which is based on a construction permit which references the early site permit, and in any hearing held under §52.103 of this part before operation begins under a combined license which references the early site permit.
(c) An applicant for a construction permit or combined license may, at its own risk, reference in its application a site for which an early site permit application has been docketed but not granted.

§52.29 Application for renewal.

(a) Not less than twelve nor more than thirty-six months prior to the end of the initial twenty-year period, or any later renewal period, the permit holder may apply for a renewal

of the permit. An application for renewal must contain all information necessary to bring up to date the information and data contained in the previous application.
(b) Any person whose interests may be affected by renewal of the permit may request a hearing on the application for renewal. The request for a hearing must comply with 10 CFR 2.714. If a hearing is granted, notice of the hearing will be published in accordance with 10 CFR 2.703.
(c) An early site permit, either original or renewed, for which a timely application for renewal has been filed, remains in effect until the Commission has determined whether to renew the permit. If the permit is not renewed, it continues to be valid in certain proceedings in accordance with the provisions of §52.27(b).
(d) The Commission shall refer a copy of the application for renewal to the Advisory Committee on Reactor Safeguards (ACRS). The ACRS shall report on those portions of the application which concern safety and shall apply the criteria set forth in §52.31.

§52.31 Criteria for renewal.

(a) The Commission shall grant the renewal if the Commission determines that the site complies with the Atomic Energy Act and the Commission's regulations and orders applicable and in effect at the time the site permit was originally issued, and any new requirements the Commission may wish to impose after a determination that there is a substantial increase in overall protection of the public health and safety or the common defense and security to be derived from the new requirements and that the direct and indirect costs of implementation of those requirements are justified in view of this increased protection.
(b) A denial of renewal on this basis does not bar the permit holder or another applicant from filing a new application for the site which proposes changes to the site or the way in which it is used which correct the deficiencies cited in the denial of the renewal.

§52.33 Duration of renewal.

Each renewal of an early site permit may be for not less than ten nor more than twenty years.

§52.35 Use of site for other purposes.

A site for which an early site permit has been issued under this subpart may be used for purposes other than those described in the permit, including the location of other types of energy facilities. The permit holder shall inform the Director of Nuclear Reactor Regulation of any significant uses for the site which have not been approved in the early site permit. The information about the activities must be given to the Director in advance of any actual construction or site modification for the activities. The information provided could be the basis for imposing new requirements on the permit, in accordance with the provisions of §52.39. If the permit holder informs the Director that the holder no longer intends to use the site for a nuclear power plant, the Director shall terminate the permit.

§52.37 Reporting of defects and noncompliance; revocation, suspension, modification of permits for cause.

For purposes of part 21 and 10 CFR 50.100, an early site permit is a construction permit.

§52.39 Finality of early site permit determinations.

(a)(1) Notwithstanding any provision in 10 CFR 50.109, while an early site permit is in effect under §§52.27 or 52.33 the Commission may not impose new requirements, including new emergency planning requirements, on the early site permit or the site for which it was issued, unless the Commission determines that a modification is necessary either to bring the permit or the site into compliance with the Commission's regulations and orders applicable and in effect at the time the permit was issued, or to assure adequate protection of the public health and safety or the common defense and security.

(2) In making the findings required for issuance of a construction permit, operating license, or combined license, or the findings required by §52.103 of this part, if the application for the construction permit, operating license, or combined license references an early site permit, the Commission shall treat as resolved those matters resolved in the proceeding on the application for issuance or renewal of the early site permit, unless a contention is admitted that a reactor does not fit within one or more of the site parameters included in the site permit, or a petition is filed which alleges either that the site is not in compliance with the terms of the early site permit, or that the terms and conditions of the early site permit should be modified.

(i) A contention that a reactor does not fit within one or more of the site parameters included in the site permit may be litigated in the same manner as other issues material to the proceeding.

(ii) A petition which alleges that the site is not in compliance with the terms of the early site permit must include, or clearly reference, official NRC documents, documents prepared by or for the permit holder, or evidence admissible in a proceeding under subpart G of part 2, which show, prima facie, that the acceptance criteria have not been met. The permit holder and NRC staff may file answers to the petition within the time specified in 10 CFR 2.730 for answers to motions by parties and staff. If the Commission, in its judgment, decides, on the basis of the petitions and any answers thereto, that the petition meets the requirements of this paragraph, that the issues are not exempt from adjudication under 5 U.S.C. 554(a)(3), that genuine issues of material fact are raised, and that settlement or other informal resolution of the issues is not possible, then the genuine issues of material fact raised by the petition must be resolved in accordance with the provisions in 554, 556, and 557 which are applicable to determining application for initial licenses.

(iii) A petition which alleges that the terms and conditions of the early site permit should be modified will be processed in accord with 10 CFR 2.206. Before construction commences, the Commission shall consider the petition and determine whether any immediate action is required. If the petition is granted, then an appropriate order will be issued. Construction under the construction permit or combined license will not be affected by the granting of the petition unless the order is made immediately effective.

(iv) Prior to construction, the Commission shall find that the terms of the early site permit have been met.

(b) An applicant for a construction permit, operating license, or combined license who has filed an application referencing an early site permit issued under this subpart may include in the application a request for a variance from one or more elements of the permit. In determining whether to grant the variance, the Commission shall apply the same technically relevant criteria as were applicable to the application for the original or renewed site permit. Issuance of the variance must be subject to litigation during the

construction permit, operating license, or combined license proceeding in the same manner as other issues material to those proceedings.

Appendix Q to Part 52--Pre-Application Early Review of Site Suitability Issues

This appendix sets out procedures for the filing, Staff review, and referral to the Advisory Committee on Reactor Safeguards (ACRS) of requests for early review of one or more site suitability issues relating to the construction and operation of certain utilization facilities separately from and prior to the submittal of applications for construction permits for the facilities. The appendix also sets out procedures for the preparation and issuance of Staff Site Reports and for their incorporation by reference in applications for the construction and operation of certain utilization facilities. The utilization facilities are those which are subject to §51.20(b) of this chapter and are of the type specified in §50.21(b) (2) or (3) or §50.22 of this chapter or are testing facilities. This appendix does not apply to proceedings conducted pursuant to subpart F or part 2 of this chapter.

1. Any person may submit information regarding one or more site suitability issues to the Commission's Staff for its review separately from and prior to an application for a construction permit for a facility. Such a submittal shall be accompanied by any fee required by part 170 of this chapter and shall consist of the portion of the information required of applicants for construction permits by §§50.33 (a) - (c) and (e) of this chapter, and, insofar as it relates to the issue(s) of site suitability for which early review is sought, by §§50.34(a)(1) and 50.30(f) of this chapter, except that information with respect to operation of the facility at the projected initial power level need not be supplied.

2. The submittal for early review of site suitability issue(s) must be made in the same manner and in the same number of copies as provided in §§50.4 and 50.30 of this chapter for license applications. The submittal must include sufficient information concerning range of postulated facility design and operation parameters to enable the Staff to perform the requested review of site suitability issues. The submittal must contain suggested conclusions on the issues of site suitability submitted for review and must be accompanied by a statement of the bases or the reasons for those conclusions. The submittal must also list, to the extent possible, any long-range objectives for ultimate development of the site, state whether any site selection process was used in preparing the submittal, describe any site selection process used, and explain what consideration, if any, was given to alternative sites.

3. The staff shall publish a note of docketing of the submittal in the Federal Register, and shall send a copy of the notice of docketing to the Governor or other appropriate official of the State in which the site is located. This notice shall identify the location of the site, briefly describe the site suitability issue(s) under review, and invite comments from Federal, State, and local agencies and interested persons within 120 days of publication or such other time as may be specified, for consideration by the staff in connection with the initiation or outcome of the review and, if appropriate by the ACRS, in connection with the outcome of their review. The person requesting review shall serve a copy of the submittal on the Governor or other appropriate official of the State in which the site is located, and on the chief executive of the municipality in which the site is located or, if the site is not located in a municipality, on the chief executive of the county. The portion of the submittal containing information requested of applicants for construction permits by §§50.33 (a) - (c) and (e) and 50.34(a)(1) of this chapter will be referred to the ACRS for a review and report.

There will be no referral to the ACRS unless early review of the site safety issues under §50.34(a)(1) is requested.

4. Upon completion of review by the NRC staff and, if appropriate by the ACRS, of a submittal under this appendix, the NRC staff shall prepare a Staff Site Report which shall identify the location of 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. Upon issuance of an NRC Staff Site Report, the NRC staff shall publish a notice of the availability of the report in the Federal Register and shall make available a copy of the report at the NRC Web site, *http://www.nrc.gov*. The NRC staff shall also send a copy of the report to the Governor or other appropriate official of the State in which the site is located, and to the chief executive of the municipality in which the site is located or, if the site is not located in a municipality, to the chief executive of the county.]

5. Any Staff Site Report prepared and issued in accordance with this appendix may be incorporated by reference, as appropriate, in an application for a construction permit for a utilization facility which is subject to §51.20(b) of this chapter and is of the type specific in §50.21(b) (2) or (3) or §50.22 of this chapter or is a testing facility. The conclusions of the Staff Site Report will be reexamined by the staff where five years or more have elapsed between the issuance of the Staff Site Report and its incorporation by reference in a construction permit application.

6. Issuance of a Staff Site Report shall not constitute a commitment to issue a permit or license, to permit on-site work under §50.10(e) of this chapter, or in any way affect the authority of the Commission, Atomic Safety and Licensing Appeal Panel, Atomic Safety and Licensing Board Panel, and other presiding officers in any proceeding under subpart F and/or G of part 2 of this chapter.

7. The staff will not conduct more than one review of site suitability issues with regard to a particular site prior to the full construction permit review required by subpart A of part 51 of this chapter. The staff may decline to prepare and issue a Staff Site Report in response to a submittal under this appendix where it appears that, (a) in cases where no review of the relative merits of the submitted site and alternative sites under subpart A of part 51 of this chapter is requested, there is a reasonable likelihood that further staff review would identify one or more preferable alternative sites and the staff review of one or more site suitability issues would lead to an irreversible and irretrievable commitment of resources prior to the submittal of the analysis of alternative sites in the Environmental Report that would prejudice the later review and decision on alternative sites under subpart F and/or G of part 2 and subpart A of part 51 of this chapter; or (b) in cases where, in the judgment of the staff, early review of any site suitability issue or issues would not be in the public interest, considering (1) the degree of likelihood that any early findings on those issues would retain their validity in later reviews, (2) the objections, if any, of cognizant state or local government agencies to the conduct of an early review on those issues, and (3) the possible effect on the public interest of having an early, if not necessarily conclusive, resolution of those issues.

Environmental Report

§51.45 Environmental report.

(a) *General*. As required by §§51.50, 51.53, 51.54, 51.60, 51.61, 51.62 or §51.68, as appropriate, each applicant or petitioner for rulemaking shall submit with its application or petition for rulemaking one signed original of a separate document entitled "Applicant's" or "Petitioner's Environmental Report," as appropriate, and the number of copies specified in §§51.55, 51.66 or §51.69. An applicant or petitioner for rulemaking may submit a supplement to an environmental report at any time.

(b) *Environmental considerations*. The environmental report shall contain a description of the proposed action, a statement of its purposes, a description of the environment affected, and discuss the following considerations:

(1) The impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance;

(2) Any adverse environmental effects which cannot be avoided should the proposal be implemented;

(3) Alternatives to the proposed action. The discussion of alternatives shall be sufficiently complete to aid the Commission in developing and exploring, pursuant to section 102(2)(E) of NEPA, "appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form;

(4) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and

(5) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

(c) *Analysis*. The environmental report shall include an analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects. Except for environmental reports prepared at the license renewal stage pursuant to §51.53(c), the analysis in the environmental report should also include consideration of the economic, technical, and other benefits and costs of the proposed action and of alternatives. Environmental reports prepared at the license renewal stage pursuant to §51.53(c) need not discuss the economic or technical benefits and costs of either the proposed action or alternatives except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, environmental reports prepared pursuant to §51.53(c) need not discuss other issues not related to the environmental effects of the proposed action and alternatives. The analyses for environmental reports shall, to the fullest extent practicable, quantify the various factors considered. To the extent that there are important qualitative considerations or factors that cannot be quantified, those considerations or factors shall be discussed in qualitative terms. The environmental report should contain sufficient data to aid the Commission in its development of an independent analysis.

(d) *Status of compliance*. The environmental report shall list all Federal permits, licenses, approvals and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The

environmental report shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements which have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. The discussion of alternatives in the report shall include a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements.

(e) *Adverse information.* The information submitted pursuant to paragraphs (b) through (d) of this section should not be confined to information supporting the proposed action but should also include adverse information.

[49 FR 9381, Mar. 12, 1984, as amended at 61 FR 28486, June 5, 1996; 61 FR 66542, Dec. 18, 1996]

§51.50 Environmental report -- construction permit stage.

Each applicant for a permit to construct a production or utilization facility covered by §51.20 shall submit with its application the number of copies, as specified in §51.55, of a separate document, entitled "Applicant's Environmental Report -- Construction Permit Stage," which shall contain the information specified in §§51.45, 51.51 and 51.52. Each environmental report shall identify procedures for reporting and keeping records of environmental data, and any conditions and monitoring requirements for protecting the non-aquatic environment, proposed for possible inclusion in the license as environmental conditions in accordance with §50.36b of this chapter.

Emergency Plans

§50.47 Emergency plans.

(a)(1) Except as provided in paragraph (d) of this section, no initial operating license for a nuclear power reactor will be issued unless a finding is made by the NRC that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. No finding under this section is necessary for issuance of a renewed nuclear power reactor operating license.

(2) The NRC will base its finding on a review of the Federal Emergency Management Agency (FEMA) findings and determinations as to whether State and local emergency plans are adequate and whether there is reasonable assurance that they can be implemented, and on the NRC assessment as to whether the applicant's onsite emergency plans are adequate and whether there is reasonable assurance that they can be implemented. A FEMA finding will primarily be based on a review of the plans. Any other information already available to FEMA may be considered in assessing whether there is reasonable assurance that the plans can be implemented. In any NRC licensing proceeding, a FEMA finding will constitute a rebuttable presumption on questions of adequacy and implementation capability.

(b) The onsite and, except as provided in paragraph (d) of this section, offsite emergency response plans for nuclear power reactors must meet the following standards:

(1) Primary responsibilities for emergency response by the nuclear facility licensee and by State and local organizations within the Emergency Planning Zones have been assigned, the emergency responsibilities of the various supporting organizations have been specifically established, and each principal response organization has staff to respond and to augment its initial response on a continuous basis.

(2) On-shift facility licensee responsibilities for emergency response are unambiguously defined, adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, timely augmentation of response capabilities is available and the interfaces among various onsite response activities and offsite support and response activities are specified.

(3) Arrangements for requesting and effectively using assistance resources have been made, arrangements to accommodate State and local staff at the licensee's near-site Emergency Operations Facility have been made, and other organizations capable of augmenting the planned response have been identified.

(4) A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.

(5) Procedures have been established for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations; the content of initial and followup messages to response organizations and the public has been established; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established.

(6) Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public.

(7) Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local

broadcast station and remaining indoors), the principal points of contact with the news media for dissemination of information during an emergency (including the physical location or locations) are established in advance, and procedures for coordinated dissemination of information to the public are established.
(8) Adequate emergency facilities and equipment to support the emergency response are provided and maintained.
(9) Adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use.
(10) A range of protective actions has been developed for the plume exposure pathway EPZ for emergency workers and the public. In developing this range of actions, consideration has been given to evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI), as appropriate. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place, and protective actions for the ingestion exposure pathway EPZ appropriate to the locale have been developed.
(11) Means for controlling radiological exposures, in an emergency, are established for emergency workers. The means for controlling radiological exposures shall include exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Action Guides.
(12) Arrangements are made for medical services for contaminated injured individuals.
(13) General plans for recovery and reentry are developed.
(14) Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.
(15) Radiological emergency response training is provided to those who may be called on to assist in an emergency.
(16) Responsibilities for plan development and review and for distribution of emergency plans are established, and planners are properly trained.
(c)(1) Failure to meet the applicable standards set forth in paragraph (b) of this section may result in the Commission declining to issue an operating license; however, the applicant will have an opportunity to demonstrate to the satisfaction of the Commission that deficiencies in the plans are not significant for the plant in question, that adequate interim compensating actions have been or will be taken promptly, or that there are other compelling reasons to permit plant operations. Where an applicant for an operating license asserts that its inability to demonstrate compliance with the requirements of paragraph (b) of this section results wholly or substantially from the decision of state and/or local governments not to participate further in emergency planning, an operating license may be issued if the applicant demonstrates to the Commission's satisfaction that:
(i) The applicant's inability to comply with the requirements of paragraph (b) of this section is wholly or substantially the result of the non-participation of state and/or local governments.
(ii) The applicant has made a sustained, good faith effort to secure and retain the participation of the pertinent state and/or local governmental authorities, including the furnishing of copies of its emergency plan.
(iii) The applicant's emergency plan provides reasonable assurance that public health and safety is not endangered by operation of the facility concerned. To make that finding, the applicant must demonstrate that, as outlined below, adequate protective measures can and

will be taken in the event of an emergency. A utility plan will be evaluated against the same planning standards applicable to a state or local plan, as listed in paragraph (b) of this section, with due allowance made both for --

(A) Those elements for which state and/or local non-participation makes compliance infeasible and

(B) The utility's measures designed to compensate for any deficiencies resulting from state and/or local non-participation.

In making its determination on the adequacy of a utility plan, the NRC will recognize the reality that in an actual emergency, state and local government officials will exercise their best efforts to protect the health and safety of the public. The NRC will determine the adequacy of that expected response, in combination with the utility's compensating measures, on a case-by-case basis, subject to the following guidance. In addressing the circumstance where applicant's inability to comply with the requirements of paragraph (b) of this section is wholly or substantially the result of non-participation of state and/or local governments, it may be presumed that in the event of an actual radiological emergency state and local officials would generally follow the utility plan. However, this presumption may be rebutted by, for example, a good faith and timely proffer of an adequate and feasible state and/or local radiological emergency plan that would in fact be relied upon in a radiological emergency.

(2) Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. The size of the EPZs also may be determined on a case-by-case basis for gas-cooled nuclear reactors and for reactors with an authorized power level less than 250 MW thermal. The plans for the ingestion pathway shall focus on such actions as are appropriate to protect the food ingestion pathway.

(d) Notwithstanding the requirements of paragraphs (a) and (b) of this section, and except as specified by this paragraph, no NRC or FEMA review, findings, or determinations concerning the state of offsite emergency preparedness or the adequacy of and capability to implement State and local or utility offsite emergency plans are required prior to issuance of an operating license authorizing only fuel loading or low power testing and training (up to 5 percent of the rated power). Insofar as emergency planning and preparedness requirements are concerned, a license authorizing fuel loading and/or low power testing and training may be issued after a finding is made by the NRC that the state of onsite emergency preparedness provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. The NRC will base this finding on its assessment of the applicant's onsite emergency plans against the pertinent standards in paragraph (b) of this section and appendix E. Review of applicant's emergency plans will include the following standards with offsite aspects:

(1) Arrangements for requesting and effectively using offsite assistance on site have been made, arrangements to accommodate State and local staff at the licensee's near-site Emergency Operations Facility have been made, and other organizations capable of augmenting the planned onsite response have been identified.

(2) Procedures have been established for licensee communications with State and local response organizations, including initial notification of the declaration of emergency and periodic provision of plant and response status reports.
(3) Provisions exist for prompt communications among principal response organizations to offsite emergency personnel who would be responding onsite.
(4) Adequate emergency facilities and equipment to support the emergency response onsite are provided and maintained.
(5) Adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use onsite.
(6) Arrangements are made for medical services for contaminated and injured onsite individuals.
(7) Radiological emergency response training has been made available to those offsite who may be called to assist in an emergency onsite.

Appendix E to Part 50 -- Emergency Planning and Preparedness for Production and Utilization Facilities

Table of Contents

I. Introduction

Each applicant for a construction permit is required by §50.34(a) to include in the preliminary safety analysis report a discussion of preliminary plans for coping with emergencies. Each applicant for an operating license is required by §50.34(b) to include in the final safety analysis report plans for coping with emergencies.

This appendix establishes minimum requirements for emergency plans for use in attaining an acceptable state of emergency preparedness. These plans shall be described generally in the preliminary safety analysis report and submitted as part of the final safety analysis report.

The potential radiological hazards to the public associated with the operation of research and test reactors and fuel facilities licensed under 10 CFR Parts 50 and 70 involve considerations different than those associated with nuclear power reactors. Consequently, the size of Emergency Planning Zones(1) (EPZs) for facilities other than power reactors and the degree to which compliance with the requirements of this section and sections II, III, IV, and V as necessary will be determined on a case-by-case basis.(2)

Notwithstanding the above paragraphs, in the case of an operating license authorizing only fuel loading and/or low power operations up to 5% of rated power, no NRC or FEMA review, findings, or determinations concerning the state of offsite emergency preparedness or the adequacy of and the capability to implement State and local offsite emergency plans, as defined in this Appendix, are required prior to the issuance of such a license.

II. The Preliminary Safety Analysis Report

The Preliminary Safety Analysis Report shall contain sufficient information to ensure the compatibility of proposed emergency plans for both onsite areas and the EPZs, with facility design features, site layout, and site location with respect to such considerations as access routes, surrounding population distributions, land use, and local jurisdictional boundaries for the EPZs in the case of nuclear power reactors as well as the means by which the standards of §50.47(b) will be met.

As a minimum, the following items shall be described:

A. Onsite and offsite organizations for coping with emergencies and the means for notification, in the event of an emergency, of persons assigned to the emergency organizations.

B. Contacts and arrangements made and documented with local, State, and Federal governmental agencies with responsibility for coping with emergencies, including identification of the principal agencies.

C. Protective measures to be taken within the site boundary and within each EPZ to protect health and safety in the event of an accident; procedures by which these measures are to be carried out (e.g., in the case of an evacuation, who authorizes the evacuation, how the public is to be notified and instructed, how the evacuation is to be carried out); and the expected response of offsite agencies in the event of an emergency.

D. Features of the facility to be provided for onsite emergency first aid and decontamination and for emergency transportation of onsite individuals to offsite treatment facilities.

E. Provisions to be made for emergency treatment at offsite facilities of individuals injured as a result of licensed activities.

F. Provisions for a training program for employees of the licensee, including those who are assigned specific authority and responsibility in the event of an emergency, and for other persons who are not employees of the licensee but whose assistance may be needed in the event of a radiological emergency.

G. A preliminary analysis that projects the time and means to be employed in the notification of State and local governments and the public in the event of an emergency. A nuclear power plant applicant shall perform a preliminary analysis of the time required to evacuate various sectors and distances within the plume exposure pathway EPZ for

transient and permanent populations, noting major impediments to the evacuation or taking of protective actions.

H. A preliminary analysis reflecting the need to include facilities, systems, and methods for identifying the degree of seriousness and potential scope of radiological consequences of emergency situations within and outside the site boundary, including capabilities for dose projection using real-time meteorological information and for dispatch of radiological monitoring teams within the EPZs; and a preliminary analysis reflecting the role of the onsite technical support center and of the near-site emergency operations facility in assessing information, recommending protective action, and disseminating information to the public.

III. The Final Safety Analysis Report

The Final Safety Analysis Report shall contain the plans for coping with emergencies. The plans shall be an expression of the overall concept of operation; they shall describe the essential elements of advance planning that have been considered and the provisions that have been made to cope with emergency situations. The plans shall incorporate information about the emergency response roles of supporting organizations and offsite agencies. That information shall be sufficient to provide assurance of coordination among the supporting groups and with the licensee.

The plans submitted must include a description of the elements set out in Section IV for the Emergency Planning Zones (EPZs) to an extent sufficient to demonstrate that the plans provide reasonable assurance that adequate protective measures can and will be taken in the event of an emergency.

IV. Content of Emergency Plans

The applicant's emergency plans shall contain, but not necessarily be limited to, information needed to demonstrate compliance with the elements set forth below, i.e., organization for coping with radiation emergencies, assessment action, activation of emergency organization, notification procedures, emergency facilities and equipment, training, maintaining emergency preparedness, and recovery. In addition, the emergency response plans submitted by an applicant for a nuclear power reactor operating license shall contain information needed to demonstrate compliance with the standards described in §50.47(b), and they will be evaluated against those standards. The nuclear power reactor operating license applicant shall also provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

A. Organization

The organization for coping with radiological emergencies shall be described, including definition of authorities, responsibilities, and duties of individuals assigned to the licensee's emergency organization and the means for notification of such individuals in the event of an emergency. Specifically, the following shall be included:

1. A description of the normal plant operating organization.

2. A description of the onsite emergency response organization with a detailed discussion of:

a. Authorities, responsibilities, and duties of the individual(s) who will take charge during an emergency;

b. Plant staff emergency assignments;

c. Authorities, responsibilities, and duties on an onsite emergency coordinator who shall be in charge of the exchange of information with offsite authorities responsible for coordinating and implementing offsite emergency measures.

3. A description, by position and function to be performed, of the licensee's headquarters personnel who will be sent to the plant site to augment the onsite emergency organization.

4. Identification, by position and function to be performed, of persons within the licensee organization who will be responsible for making offsite dose projections, and a description of how these projections will be made and the results transmitted to State and local authorities, NRC, and other appropriate governmental entities.

5. Identification, by position and function to be performed, of other employees of the licensee with special qualifications for coping with emergency conditions that may arise. Other persons with special qualifications, such as consultants, who are not employees of the licensee and who may be called upon for assistance for emergencies shall also be identified. The special qualifications of these persons shall be described.

6. A description of the local offsite services to be provided in support of the licensee's emergency organization.

7. Identification of, and assistance expected from, appropriate State, local, and Federal agencies with responsibilities for coping with emergencies.

8. Identification of the State and/or local officials responsible for planning for, ordering, and controlling appropriate protective actions, including evacuations when necessary.

B. Assessment Actions

The means to be used for determining the magnitude of and for continually assessing the impact of the release of radioactive materials shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within and outside the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite and offsite monitoring. These emergency action levels

shall be discussed and agreed on by the applicant and State and local governmental authorities and approved by NRC. They shall also be reviewed with the State and local governmental authorities on an annual basis.

C. Activation of Emergency Organization

The entire spectrum of emergency conditions that involve the alerting or activating of progressively larger segments of the total emergency organization shall be described. The communication steps to be taken to alert or activate emergency personnel under each class of emergency shall be described. Emergency action levels (based not only on onsite and offsite radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the Emergency Core Cooling System) for notification of offsite agencies shall be described. The existence, but not the details, of a message authentication scheme shall be noted for such agencies. The emergency classes defined shall include: (1) notification of unusual events, (2) alert, (3) site area emergency, and (4) general emergency. These classes are further discussed in NUREG - 0654; FEMA - REP - 1.

D. Notification Procedures

1. Administrative and physical means for notifying local, State, and Federal officials and agencies and agreements reached with these officials and agencies for the prompt notification of the public and for public evacuation or other protective measures, should they become necessary, shall be described. This description shall include identification of the appropriate officials, by title and agency, of the State and local government agencies within the EPZs.(1)

2. Provisions shall be described for yearly dissemination to the public within the plume exposure pathway EPZ of basic emergency planning information, such as the methods and times required for public notification and the protective actions planned if an accident occurs, general information as to the nature and effects of radiation, and a listing of local broadcast stations that will be used for dissemination of information during an emergency. Signs or other measures shall also be used to disseminate to any transient population within the plume exposure pathway EPZ appropriate information that would be helpful if an accident occurs.

3. A licensee shall have the capability to notify responsible State and local governmental agencies within 15 minutes after declaring an emergency. The licensee shall demonstrate that the State/local officials have the capability to make a public notification decision promptly on being informed by the licensee of an emergency condition. By February 1, 1982, each nuclear power reactor licensee shall demonstrate that administrative and physical means have been established for alerting and providing prompt instructions to the public within the plume exposure pathway EPZ. The four-month period in 10 CFR 50.54(s)(2) for the correction of emergency plan deficiencies shall not apply to the initial installation of this public notification system that is required by February 1, 1982. The four-month period will apply to correction of deficiencies identified during the initial installation and testing of the prompt public notification systems as well as those

deficiencies discovered thereafter. The design objective of the prompt public notification system shall be to have the capability to essentially complete the initial notification of the public within the plume exposure pathway EPZ within about 15 minutes. The use of this notification capability will range from immediate notification of the public (within 15 minutes of the time that State and local officials are notified that a situation exists requiring urgent action) to the more likely events where there is substantial time available for the State and local governmental officials to make a judgment whether or not to activate the public notification system. Where there is a decision to activate the notification system, the State and local officials will determine whether to activate the entire notification system simultaneously or in a graduated or staged manner. The responsibility for activating such a public notification system shall remain with the appropriate governmental authorities.

E. Emergency Facilities and Equipment

Adequate provisions shall be made and described for emergency facilities and equipment, including:

1. Equipment at the site for personnel monitoring;

2. Equipment for determining the magnitude of and for continuously assessing the impact of the release of radioactive materials to the environment;

3. Facilities and supplies at the site for decontamination of onsite individuals;

4. Facilities and medical supplies at the site for appropriate emergency first aid treatment;

5. Arrangements for the services of physicians and other medical personnel qualified to handle radiation emergencies on-site;

6. Arrangements for transportation of contaminated injured individuals from the site to specifically identified treatment, facilities outside the site boundary;

7. Arrangements for treatment of individuals injured in support of licensed activities on the site at treatment facilities outside the site boundary;

8. A licensee onsite technical support center and a licensee near-site emergency operations facility from which effective direction can be given and effective control can be exercised during an emergency;

9. At least one onsite and one offsite communications system; each system shall have a backup power source.

All communication plans shall have arrangements for emergencies, including titles and alternates for those in charge at both ends of the communication links and the primary and backup means of communication. Where consistent with the function of the governmental agency, these arrangements will include:

a. Provision for communications with contiguous State/local governments within the plume exposure pathway EPZ. Such communications shall be tested monthly.

b. Provision for communications with Federal emergency response organizations. Such communications systems shall be
tested annually.

c. Provision for communications among the nuclear power reactor control room, the onsite technical support center, and the near-site emergency operations facility; and among the nuclear facility, the principal State and local emergency operations centers, and the field assessment teams. Such communications systems shall be tested annually.

d. Provisions for communications by the licensee with NRC Headquarters and the appropriate NRC Regional Office Operations Center from the nuclear power reactor control room, the onsite technical support center, and the near-site emergency operations facility. Such communications shall be tested monthly.

F. Training.

1. The program to provide for: (a) The training of employees and exercising, by periodic drills, of radiation emergency plans to ensure that employees of the licensee are familiar with their specific emergency response duties, and (b) The participation in the training and drills by other persons whose assistance may be needed in the event of a radiation emergency shall be described. This shall include a description of specialized initial training and periodic retraining programs to be provided to each of the following categories of emergency personnel:

i. Directors and/or coordinators of the plant emergency organization;

ii. Personnel responsible for accident assessment, including control room shift personnel;

iii Radiological monitoring teams;

iv. Fire control teams (fire brigades);

v. Repair and damage control teams;

vi. First aid and rescue teams;

vii. Medical support personnel;

viii. Licensee's headquarters support personnel;

ix. Security personnel.

In addition, a radiological orientation training program shall be made available to local services personnel; e.g., local emergency services/Civil Defense, local law enforcement personnel, local news media persons.

2. The plan shall describe provisions for the conduct of emergency preparedness exercises as follows: Exercises shall test
the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, test the public notification system, and ensure that emergency organization personnel are familiar with their duties.(3)

a. A full participation(4) exercise which tests as much of the licensee, State and local emergency plans as is reasonably achievable without mandatory public participation shall be conducted for each site at which a power reactor is located. This exercise shall be conducted within two years before the issuance of the first operating license for full power (one authorizing operation above 5% of rated power) of the first reactor and shall include participation by each State and local government within the plume exposure pathway EPZ and each state within the ingestion exposure pathway EPZ. If the full participation exercise is conducted more than one year prior to issuance of an operating licensee for full power, an exercise which tests the licensee's onsite emergency plans shall be conducted within one year before issuance of an operating license for full power. This exercise need not have State or local government participation.

b. Each licensee at each site shall conduct an exercise of its onsite emergency plan every 2 years. The exercise may be included in the full participation biennial exercise required by paragraph 2.c. of this section. In addition, the licensee shall take actions necessary to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response capabilities. The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, protective action decisionmaking, and plant system repair and corrective actions. During these drills, activation of all of the licensee's emergency response facilities (Technical Support Center (TSC), Operations Support Center (OSC), and the Emergency Operations Facility (EOF)) would not be necessary, licensees would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff would have the opportunity to resolve problems (success paths) rather than have controllers intervene, and the drills could focus on onsite training objectives.

c. Offsite plans for each site shall be exercised biennially with full participation by each offsite authority having a role under the plan. Where the offsite authority has a role under a radiological response plan for more than one site, it shall fully participate in one exercise every two years and shall, at least, partially participate(5) in other offsite plan exercises in this period.

d. A State should fully participate in the ingestion pathway portion of exercises at least once every six years. In States with more than one site, the State should rotate this participation from site to site.

e. Licensees shall enable any State or local Government located within the plume exposure pathway EPZ to participate in the licensee's drills when requested by such State or local Government.

f. Remedial exercises will be required if the emergency plan is not satisfactorily tested during the biennial exercise, such that NRC, in consultation with FEMA, cannot find reasonable assurance that adequate protective measures can be taken in the event of a radiological emergency. The extent of State and local participation in remedial exercises must be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.

g. All training, including exercises, shall provide for formal critiques in order to identify weak or deficient areas that need correction. Any weaknesses or deficiencies that are identified shall be corrected.

h. The participation of State and local governments in an emergency exercise is not required to the extent that the applicant has identified those governments as refusing to participate further in emergency planning activities, pursuant to 10 CFR 50.47(c)(1). In such cases, an exercise shall be held with the applicant or licensee and such governmental entities as elect to participate in the emergency planning process.

G. Maintaining Emergency Preparedness

Provisions to be employed to ensure that the emergency plan, its implementing procedures, and emergency equipment and supplies are maintained up to date shall be described.

H. Recovery

Criteria to be used to determine when, following an accident, reentry of the facility would be appropriate or when operation could be resumed shall be described.

V. Implementing Procedures

No less than 180 days prior to the scheduled issuance of an operating license for a nuclear power reactor or a license to possess nuclear material the applicant's detailed implementing procedures for its emergency plan shall be submitted to the Commission as specified in §50.4. Licensees who are authorized to operate a nuclear power facility shall submit any changes to the emergency plan or procedures to the Commission, as specified in §50.4, within 30 days of such changes.

VI. Emergency Response Data System

1. The Emergency Response Data System (ERDS) is a direct near real-time electronic data link between the licensee's onsite computer system and the NRC Operations Center that provides for the automated transmission of a limited data set of selected parameters. The

ERDS supplements the existing voice transmission over the Emergency Notification System
(ENS) by providing the NRC Operations Center with timely and accurate updates of a limited set of parameters from the licensee's installed onsite computer system in the event of an emergency. When selected plant data are not available on the licensee's onsite computer system, retrofitting of data points is not required. The licensee shall test the ERDS periodically to verify system availability and operability. The frequency of ERDS testing will be quarterly unless otherwise set by NRC based on demonstrated system performance.

2. Except for Big Rock Point and all nuclear power facilities that are shut down permanently or indefinitely, onsite hardware shall be provided at each unit by the licensee to interface with the NRC receiving system. Software, which will be made available by the NRC, will assemble the data to be transmitted and transmit data from each unit via an output port on the appropriate data system. The hardware and software must have the following characteristics:

a. Data points, if resident in the in-plant computer systems, must be transmitted for four selected types of plant conditions: Reactor core and coolant system conditions; reactor containment conditions; radioactivity release rates; and plant meteorological tower data. A separate data feed is required for each reactor unit. While it is recognized that ERDS is not a safety system, it is conceivable that a licensee's ERDS interface could communicate with a safety system. In this case, appropriate isolation devices would be required at these interfaces.(6) The data points, identified in the following parameters will be transmitted:

(i) For pressurized water reactors (PWRs), the selected plant parameters are: (1) Primary coolant system: pressure, temperatures (hot leg, cold leg, and core exit thermocouples), subcooling margin, pressurizer level, reactor coolant charging/makeup flow, reactor vessel level, reactor coolant flow, and reactor power; (2) Secondary coolant system: Steam generator levels and pressures, main feedwater flows, and auxiliary and emergency feedwater flows; (3) Safety injection: High- and low-pressure safety injection flows, safety injection flows (Westinghouse), and borated water storage tank level; (4) Containment: pressure, temperatures, hydrogen concentration, and sump levels; (5) Radiation monitoring system: Reactor coolant radioactivity, containment radiation level, condenser air removal radiation level, effluent radiation monitors, and process radiation monitor levels; and (6) Meteorological data: wind speed, wind direction, and atmospheric stability.

(ii) For boiling water reactors (BWRs), the selected parameters are: (1) Reactor coolant system: Reactor pressure, reactor vessel level, feedwater flow, and reactor power; (2) Safety injection: Reactor core isolation cooling flow, high-pressure coolant injection/high-pressure core spray flow, core spray flow, low-pressure coolant injection flow, and condensate storage tank level; (3) Containment: drywell pressure, drywell temperatures, drywell sump levels, hydrogen and oxygen concentrations, suppression pool temperature, and suppression pool level; (4) Radiation monitoring system: Reactor coolant radioactivity level, primary containment radiation level, condenser off-gas radiation level, effluent radiation monitor, and process radiation levels; and (5) Meteorological data: Wind speed, wind direction, and atmospheric stability.

b. The system must be capable of transmitting all available ERDS parameters at time intervals of not less than 15 secondsor more than 60 seconds. Exceptions to this requirement will be considered on a case by case basis.

c. All link control and data transmission must be established in a format compatible with the NRC receiving system(7) asconfigured at the time of licensee implementation.

3. Maintaining Emergency Response Data System:

a. Any hardware and software changes that affect the transmitted data points identified in the ERDS Data Point Library(8)(site specific data base residing on the ERDS computer) must be submitted to the NRC within 30 days after the changes are completed.

b. Hardware and software changes, with the exception of data point modifications, that could affect the transmission format and computer communication protocol to the ERDS must be provided to the NRC as soon as practicable and at least 30 days prior to the modification.

c. In the event of a failure of the NRC supplied onsite modem, a replacement unit will be furnished by the NRC for licensee installation.

4. Implementing the Emergency Response Data System Program:

a. Each licensee shall develop and submit an ERDS implementation program plan to the NRC by October 28, 1991. To ensure compatibility with the guidance provided for the ERDS, the ERDS implementation program plan,(9) must include,but not be limited to, information on the licensee's computer system configuration (i.e., hardware and software), interface, and procedures.

b. Licensees must comply with appendix E to part 50, section V.

c. Licensees that have submitted the required information under the voluntary ERDS implementation program will not be required to resubmit this information. The licensee shall meet the implementation schedule of appendix E to Part 50, Section VI.4d.

d. Each licensee shall complete implementation of the ERDS by February 13, 1993, or before initial escalation to full power, whichever comes later. Licensees with currently operational ERDS interfaces approved under the voluntary ERDS implementation program(10) will not be required to submit another implementation plan and will be considered to have met the requirements for ERDS under appendix E to part 50, section VI.1 and 2 of this part.

[45 FR 55410, Aug. 19, 1980; 46 FR 28839, May 29, 1981, as amended at 46 FR 63032, Dec. 30, 1981; 47 FR 30236, July 13, 1982; 47 FR 57671, Dec. 28, 1982; 49 FR 27736, July 6,

1984; 51 FR 40310, Nov. 6, 1986; 52 FR 16829, May 6, 1987; 52 FR 42086, Nov. 3, 1987; 56 FR 40185, Aug. 13, 1991; 59 FR 14090, Mar. 25, 1994; 61 FR 30132, June 14, 1996]

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1 EPZs for power reactors are discussed in NUREG - 0396; EPA 520/1 - 78 - 016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," December 1978. The size of the EPZs for a nuclear power plant shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. The size of the EPZs also may be determined on a case-by-case basis for gas-cooled nuclear reactors and for reactors with an authorized power level less than 250 MW thermal. Generally, the plume exposure pathway EPZ for nuclear power plants with an authorized power level greater than 250 MW thermal shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius.

2 Regulatory Guide 2.6 will be used as guidance for the acceptability of research and test reactor emergency response plans.

3 Use of site specific simulators or computers is acceptable for any exercise.

4 "Full participation" when used in conjunction with emergency preparedness exercises for a particular site means appropriate offsite local and State authorities and licensee personnel physically and actively take part in testing their integrated capability to adequately assess and respond to an accident at a commercial nuclear power plant. "Full participation" includes testing major observable portions of the onsite and offsite emergency plans and mobilization of state, local and licensee personnel and other resources in sufficient numbers to verify the capability to respond to the accident scenario.

5 "Partial participation" when used in conjunction with emergency preparedness exercises for a particular site means appropriate offsite authorities shall actively take part in the exercise sufficient to test direction and control functions; i.e., (a) protective action decision making related to emergency action levels, and (b) communication capabilities among affected State and local authorities and the licensee.

6 See 10 CFR 50.55a(h) Protection Systems.

7 Guidance is provided in NUREG - 1394, Revision 1.

8 See NUREG - 1394, Revision 1, appendix C, Data Point Library.

9 See NUREG - 1394, Revision 1, section 3.

10 See NUREG - 1394, Revision 1.

Site Redress

§50.10 License required.

(a) Except as provided in §50.11, no person within the United States shall transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, or use any production or utilization facility except as authorized by a license issued by the Commission.
(b) No person shall begin the construction of a production or utilization facility on a site on which the facility is to be operated until a construction permit has been issued. As used in this paragraph, the term "construction" shall be deemed to include pouring the foundation for, or the installation of, any portion of the permanent facility on the site, but does not include:
(1) Site exploration, site excavation, preparation of the site for construction of the facility, including the driving of piles, and construction of roadways, railroad spurs, and transmission lines;
(2) Procurement or manufacture of components of the facility;
(3) Construction of non-nuclear facilities (such as turbogenerators and turbine buildings) and temporary buildings (such as construction equipment storage sheds) for use in connection with the construction of the facility; and
(4) With respect to production or utilization facilities, other than testing facilities, required to be licensed pursuant to section 104a or section 104c of the Act, the construction of buildings which will be used for activities other than operation of a facility and which may also be used to house a facility. (For example, the construction of a college laboratory building with space for installation of a training reactor is not affected by this paragraph. This paragraph does not apply to production or utilization facilities subject to paragraph (c) of this section.
(c) Notwithstanding the provisions of paragraph (b) of this section, and subject to paragraphs (d) and (e) of this section, no person shall effect commencement of construction of a production or utilization facility subject to the provisions of §51.20(b) of this chapter on a site on which the facility is to be operated until a construction permit has been issued. As used in this paragraph, the term "commencement of construction" means any clearing of land, excavation or other substantial action that would adversely affect the environment of a site, but does not mean:
(1) Changes desirable for the temporary use of the land for public recreational uses, necessary borings to determine foundation conditions or other preconstruction monitoring to establish background information related to the suitability of the site or to the protection of environmental values;
(2) Procurement or manufacture of components of the facility; and
(3) With respect to production or utilization facilities, other than testing facilities, required to be licensed pursuant to section 104a or section 104c of the Act, the construction of buildings which will be used for activities other than operation of a facility and which may also be used to house a facility. (For example, the construction of a college laboratory building with space for installation of a training reactor is not affected by this paragraph.)
(d)(1) Each person subject to the provisions of paragraph (c) of this section, who is, on March 21, 1972, conducting activities permitted pursuant to paragraph (b) of this section in effect prior to March 21, 1972, may furnish to the Commission within 30 days after March 21, 1972 or such later date as may be approved by the Commission upon good cause shown,

a written statement of any reasons, with supporting factual submission, why, with reference to the factors stated in paragraph (d)(2) of this section, the activities should be continued, pending the issuance of a construction permit, notwithstanding the provisions of paragraph (c) of this section. If such written statement has been submitted, within the time specified, such activities may continue to be conducted pending Commission action pursuant to paragraph (d)(2) of this section.

(2) Upon submission of a statement of reasons pursuant to paragraph (d)(1) of this section the Commission may authorize the continued conduct of activities permitted by paragraph (b) of this section in effect prior to March 21, 1972, upon consideration and balancing of the following factors:

(i) Whether continuation of the activities will give rise to a significant adverse impact on the environment and the nature and extent of such impact, if any;

(ii) Whether redress of any adverse environmental impact from continuation of the activities can reasonably be effected should such redress be necessary;

(iii) Whether continuation of the activities would foreclose subsequent adoption of alternatives; and

(iv) The effect of delay in conducting such activities on the public interest, including the power needs to be served by the proposed facility, the availability of alternative sources, if any, to meet those needs on a timely basis, and delay costs to the applicant and to consumers.

(3) Activities permitted to be continued pursuant to this paragraph (d) shall be conducted in such a manner as will minimize or reduce their environmental impact.

(e)(1) The Director of Nuclear Reactor Regulation may authorize an applicant for a construction permit for a utilization facility which is subject to §51.20(b) of this chapter, and is of the type specified in §50.21(b) (2) or (3) or §50.22 or is a testing facility to conduct the following activities: (i) Preparation of the site for construction of the facility (including such activities as clearing, grading, construction of temporary access roads and borrow areas); (ii) installation of temporary construction support facilities (including such items as warehouse and shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and construction support buildings); (iii) excavation for facility structures; (iv) construction of service facilities (including such facilities as roadways, paving, railroad spurs, fencing, exterior utility and lighting systems, transmission lines, and sanitary sewerage treatment facilities); and (v) the construction of structures, systems and components which do not prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. No such authorization shall be granted unless the staff has completed a final environmental impact statement on the issuance of the construction permit as required by subpart A of part 51 of this chapter.

(2) Such an authorization shall be granted only after the presiding officer in the proceeding on the construction permit application (i) has made all the findings required by §§51.104(b) and 51.105 of this chapter to be made prior to issuance of the construction permit for the facility, and (ii) has determined that, based upon the available information and review to date, there is reasonable assurance that the proposed site is a suitable location for a reactor of the general size and type proposed from the standpoint of radiological health and safety considerations under the Act and rules and regulations promulgated by the Commission pursuant thereto.

(3)(i) The Director of Nuclear Reactor Regulation may authorize an applicant for a construction permit for a utilization facility which is subject to §51.20(b) of this chapter,

and is of the type specified in §50.21(b) (2) or (3) or §50.22 or is a testing facility to conduct, in addition to the activities described in paragraph (e)(1) of this section, the installation of structural foundations, including any necessary subsurface preparation, for structures, systems and components which prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public.

(ii) Such an authorization, which may be combined with the authorization described in paragraph (e)(1) of this section, or may be granted at a later time, shall be granted only after the presiding officer in the proceeding on the construction permit application has, in addition to making the findings and determinations required by paragraph (e)(2) of this section, determined that there are no unresolved safety issues relating to the additional activities that may be authorized pursuant to this paragraph that would constitute good cause for withholding authorization.

(4) Any activities undertaken pursuant to an authorization granted under this paragraph shall be entirely at the risk of the applicant and, except as to matters determined under paragraphs (e)(2) and (e)(3)(ii), the grant of the authorization shall have no bearing on the issuance of a construction permit with respect to the requirements of the Act, and rules, regulations, or orders promulgated pursuant thereto.

[21 FR 355, Jan. 19, 1956, as amended at 25 FR 8712, Sept. 9, 1960; 33 FR 2381, Jan. 31, 1968; 35 FR 11460, July 7, 1970; 37 FR 5748, Mar. 21, 1972; 39 FR 14508, Apr. 24, 1974; 39 FR 26279, July 18, 1974; 39 FR 33202, Sept. 16, 1974; 43 FR 6924, Feb. 17, 1978; 49 FR 9403, Mar. 12, 1984]

References on Contents of Applications

§50.33 Contents of applications; general information.

Each application shall state:
(a) Name of applicant;
(b) Address of applicant;
(c) Description of business or occupation of applicant;
(d)(1) If applicant is an individual, state citizenship.
(2) If applicant is a partnership, state name, citizenship and address of each partner and the principal location where the partnership does business.
(3) If applicant is a corporation or an unincorporated association, state:
(i) The state where it is incorporated or organized and the principal location where it does business;
(ii) The names, addresses and citizenship of its directors and of its principal officers;
(iii) Whether it is owned, controlled, or dominated by an alien, a foreign corporation, or foreign government, and if so, give details.
(4) If the applicant is acting as agent or representative of another person in filing the application, identify the principal and furnish information required under this paragraph with respect to such principal.
(e) The class of license applied for, the use to which the facility will be put, the period of time for which the license is sought, and a list of other licenses, except operator's licenses, issued or applied for in connection with the proposed facility.
(f) Except for an electric utility applicant for a license to operate a utilization facility of the type described in §50.21(b) or §50.22, information sufficient to demonstrate to the Commission the financial qualification of the applicant to carry out, in accordance with regulations in this chapter, the activities for which the permit or license is sought. As applicable, the following should be provided:
(1) If the application is for a construction permit, the applicant shall submit information that demonstrates that the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated construction costs and related fuel cycle costs. The applicant shall submit estimates of the total construction costs of the facility and related fuel cycle costs, and shall indicate the source(s) of funds to cover these costs.
(2) If the application is for an operating license, the applicant shall submit information that demonstrates the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated operation costs for the period of the license. The applicant shall submit estimates for total annual operating costs for each of the first five years of operation of the facility. The applicant shall also indicate the source(s) of funds to cover these costs. An application to renew or extend the term of an operating license must include the same financial information as is required in an application for an initial license.
(3) Each application for a construction permit or an operating license submitted by a newly-formed entity organized for the primary purpose of constructing or operating a facility must also include information showing:
(i) The legal and financial relationships it has or proposes to have with its stockholders or owners;
(ii) Its financial ability to meet any contractual obligation to the entity which they have incurred or proposed to incur; and

(iii) Any other information considered necessary by the Commission to enable it to determine the applicant's financial qualification.

(4) The Commission may request an established entity or newly-formed entity to submit additional or more detailed information respecting its financial arrangements and status of funds if the Commission considers this information appropriate. This may include information regarding a licensee's ability to continue the conduct of the activities authorized by the license and to decommission the facility.

(g) If the application is for an operating license for a nuclear power reactor, the applicant shall submit radiological emergency response plans of State and local governmental entities in the United States that are wholly or partially within the plume exposure pathway Emergency Planning Zone (EPZ)[3], as well as the plans of State governments wholly or partially within the ingestion pathway EPZ.[4] Generally, the plume exposure pathway EPZ for nuclear power reactors shall consist of an area about 10 miles (16 km) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to the local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. The size of the EPZs also may be determined on a case-by-case basis for gas-cooled reactors and for reactors with an authorized power level less than 250 MW thermal. The plans for the ingestion pathway shall focus on such actions as are appropriate to protect the food ingestion pathway.

(h) If the applicant proposes to construct or alter a production or utilization facility, the application shall state the earliest and latest dates for completion of the construction or alteration.

(i) If the proposed activity is the generation and distribution of electric energy under a class 103 license, a list of the names and addresses of such regulatory agencies as may have jurisdiction over the rates and services incident to the proposed activity, and a list of trade and news publications which circulate in the area where the proposed activity will be conducted and which are considered appropriate to give reasonable notice of the application to those municipalities, private utilities, public bodies, and cooperatives, which might have a potential interest in the facility.

(j) If the application contains Restricted Data or other defense information, it shall be prepared in such manner that all Restricted Data and other defense information are separated from the unclassified information.

(k) (1) For an application for an operating license for a production or utilization facility, information in the form of a report, as described in §50.75 of this part, indicating how reasonable assurance will be provided that funds will be available to decommission the facility.

(2) On or before July 26, 1990, each holder of an operating license for a production or utilization facility in effect on July 27, 1990, shall submit information in the form of a report as described in §50.75 of this part, indicating how reasonable assurance will be provided that funds will be available to decommission the facility.

[21 FR 355, Jan. 19, 1956, as amended at 35 FR 19660, Dec. 29, 1970; 38 FR 3956, Feb. 9, 1973; 45 FR 55408, Aug. 19, 1980; 49 FR 35752, Sept. 12, 1984; 53 FR 24049, June 27, 1988]

[3] Emergency Planning Zones (EPZs) are discussed in NUREG - 0396, EPA 520/1 - 78 - 016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light-Water Nuclear Power Plants," December 1978.

[4] If the State and local emergency response plans have been previously provided to the NRC for inclusion in the facility docket, the applicant need only provide the appropriate reference to meet this requirement.

§50.34 Contents of applications; technical information.

(a) *Preliminary safety analysis report.* Each application for a construction permit shall include a preliminary safety analysis report. The minimum information[5] to be included shall consist of the following:

(1) Stationary power reactor applicants for a construction permit pursuant to this part, or a design certification or combined license pursuant to part 52 of this chapter who apply on or after January 10, 1997, shall comply with paragraph (a)(1)(ii) of this section. All other applicants for a construction permit pursuant to this part or a design certification or combined license pursuant to part 52 of this chapter, shall comply with paragraph (a)(1)(i) of this section.

(i) A description and safety assessment of the site on which the facility is to be located, with appropriate attention to features affecting facility design. Special attention should be directed to the site evaluation factors identified in part 100 of this chapter. The assessment must contain an analysis and evaluation of the major structures, systems and components of the facility which bear significantly on the acceptability of the site under the site evaluation factors identified in part 100 of this chapter, assuming that the facility will be operated at the ultimate power level which is contemplated by the applicant. With respect to operation at the projected initial power level, the applicant is required to submit information prescribed in paragraphs (a)(2) through (a)(8) of this section, as well as the information required by this paragraph, in support of the application for a construction permit, or a design approval.

(ii) A description and safety assessment of the site and a safety assessment of the facility. It is expected that reactors will reflect through their design, construction and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. The following power reactor design characteristics and proposed operation will be taken into consideration by the Commission:

(A) Intended use of the reactor including the proposed maximum power level and the nature and inventory of contained radioactive materials;

(B) The extent to which generally accepted engineering standards are applied to the design of the reactor;

(C) The extent to which the reactor incorporates unique, unusual or enhanced safety features having a significant bearing on the probability or consequences of accidental release of radioactive materials;

(D) The safety features that are to be engineered into the facility and those barriers that must be breached as a result of an accident before a release of radioactive material to the environment can occur. Special attention must be directed to plant design features intended to mitigate the radiological consequences of accidents. In performing this assessment, an applicant shall assume a fission product release[6] from the core into the containment assuming that the facility is operated at the ultimate power level contemplated. The

applicant shall perform an evaluation and analysis of the postulated fission product release, using the expected demonstrable containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents, together with applicable site characteristics, including site meteorology, to evaluate the offsite radiological consequences. Site characteristics must comply with part 100 of this chapter. The evaluation must determine that:

(1) An individual located at any point on the boundary of the exclusion area for any 2 hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 25 rem[7] total effective dose equivalent (TEDE).

(2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE);

(E) With respect to operation at the projected initial power level, the applicant is required to submit information prescribed in paragraphs (a)(2) through (a)(8) of this section, as well as the information required by this paragraph (a)(1)(i), in support of the application for a construction permit, or a design approval.

(2) A summary description and discussion of the facility, with special attention to design and operating characteristics, unusual or novel design features, and principal safety considerations.

(3) The preliminary design of the facility including:

(i) The principal design criteria for the facility.[8] Appendix A, General Design Criteria for Nuclear Power Plants, establishes minimum requirements for the principal design criteria for water-cooled nuclear power plants similar in design and location to plants for which construction permits have previously been issued by the Commission and provides guidance to applicants for construction permits in establishing principal design criteria for other types of nuclear power units;

(ii) The design bases and the relation of the design bases to the principal design criteria;

(iii) Information relative to materials of construction, general arrangement, and approximate dimensions, sufficient to provide reasonable assurance that the final design will conform to the design bases with adequate margin for safety.

(4) A preliminary analysis and evaluation of the design and performance of structures, systems, and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility and including determination of (i) the margins of safety during normal operations and transient conditions anticipated during the life of the facility, and (ii) the adequacy of structures, systems, and components provided for the prevention of accidents and the mitigation of the consequences of accidents. Analysis and evaluation of ECCS cooling performance following postulated loss-of-coolant accidents shall be performed in accordance with the requirements of §50.46 of this part for facilities for which construction permits may be issued after December 28, 1974.

(5) An identification and justification for the selection of those variables, conditions, or other items which are determined as the result of preliminary safety analysis and evaluation to be probable subjects of technical specifications for the facility, with special attention given to those items which may significantly influence the final design: *Provided, however*, That this requirement is not applicable to an application for a construction permit filed prior to January 16, 1969.

(6) A preliminary plan for the applicant's organization, training of personnel, and conduct of operations.
(7) A description of the quality assurance program to be applied to the design, fabrication, construction, and testing of the structures, systems, and components of the facility. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," sets forth the requirements for quality assurance programs for nuclear power plants and fuel reprocessing plants. The description of the quality assurance program for a nuclear power plant or a fuel reprocessing plant shall include a discussion of how the applicable requirements of appendix B will be satisfied.
(8) An identification of those structures, systems, or components of the facility, if any, which require research and development to confirm the adequacy of their design; and identification and description of the research and development program which will be conducted to resolve any safety questions associated with such structures, systems or components; and a schedule of the research and development program showing that such safety questions will be resolved at or before the latest date stated in the application for completion of construction of the facility.
(9) The technical qualifications of the applicant to engage in the proposed activities in accordance with the regulations in this chapter.
(10) A discussion of the applicant's preliminary plans for coping with emergencies. Appendix E sets forth items which shall be included in these plans.
(11) On or after February 5, 1979, applicants who apply for construction permits for nuclear powerplants to be built on multiunit sites shall identify potential hazards to the structures, systems and components important to safety of operating nuclear facilities from construction activities. A discussion shall also be included of any managerial and administrative controls that will be used during construction to assure the safety of the operating unit.
(12) On or after January 10, 1997, stationary power reactor applicants who apply for a construction permit pursuant to this part, or a design certification or combined license pursuant to part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria in Appendix S to this part.
(b) *Final safety analysis report*. Each application for a license to operate a facility shall include a final safety analysis report. The final safety analysis report shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole, and shall include the following:
(1) All current information, such as the results of environmental and meteorological monitoring programs, which has been developed since issuance of the construction permit, relating to site evaluation factors identified in part 100 of this chapter.
(2) A description and analysis of the structures, systems, and components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations.
(i) For nuclear reactors, such items as the reactor core, reactor coolant system, instrumentation and control systems, electrical systems, containment system, other

engineered safety features, auxiliary and emergency systems, power conversion systems, radioactive waste handling systems, and fuel handling systems shall be discussed insofar as they are pertinent.
(ii) For facilities other than nuclear reactors, such items as the chemical, physical, metallurgical, or nuclear process to be performed, instrumentation and control systems, ventilation and filter systems, electrical systems, auxiliary and emergency systems, and radioactive waste handling systems shall be discussed insofar as they are pertinent.
(3) The kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in part 20 of this chapter.
(4) A final analysis and evaluation of the design and performance of structures, systems, and components with the objective stated in paragraph (a)(4) of this section and taking into account any pertinent information developed since the submittal of the preliminary safety analysis report. Analysis and evaluation of ECCS cooling performance following postulated loss-of-coolant accidents shall be performed in accordance with the requirements of §50.46 for facilities for which a license to operate may be issued after December 28, 1974.
(5) A description and evaluation of the results of the applicant's programs, including research and development, if any, to demonstrate that any safety questions identified at the construction permit stage have been resolved.
(6) The following information concerning facility operation:
(i) The applicant's organizational structure, allocations or responsibilities and authorities, and personnel qualifications requirements.
(ii) Managerial and administrative controls to be used to assure safe operation. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," sets forth the requirements for such controls for nuclear power plants and fuel reprocessing plants. The information on the controls to be used for a nuclear power plant or a fuel reprocessing plant shall include a discussion of how the applicable requirements of appendix B will be satisfied.
(iii) Plans for preoperational testing and initial operations.
(iv) Plans for conduct of normal operations, including maintenance, surveillance, and periodic testing of structures, systems, and components.
(v) Plans for coping with emergencies, which shall include the items specified in appendix E.
(vi) Proposed technical specifications prepared in accordance with the requirements of §50.36.
(vii) On or after February 5, 1979, applicants who apply for operating licenses for nuclear powerplants to be operated on multiunit sites shall include an evaluation of the potential hazards to the structures, systems, and components important to safety of operating units resulting from construction activities, as well as a description of the managerial and administrative controls to be used to provide assurance that the limiting conditions for operation are not exceeded as a result of construction activities at the multiunit sites.
(7) The technical qualifications of the applicant to engage in the proposed activities in accordance with the regulations in this chapter.
(8) A description and plans for implementation of an operator requalification program. The operator requalification program must as a minimum, meet the requirements for those programs contained in §55.59 of part 55 of this chapter.

(9) A description of protection provided against pressurized thermal shock events, including projected values of the reference temperature for reactor vessel beltline materials as defined in §50.61 (b)(1) and (b)(2).
(10) On or after January 10, 1997, stationary power reactor applicants who apply for an operating license pursuant to this part, or a design certification or combined license pursuant to part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria of Appendix S to this part. However, for those operating license applicants and holders whose construction permit was issued prior to January 10, 1997, the earthquake engineering criteria in Section VI of Appendix A to part 100 of this chapter continues to apply.
(11) On or after January 10, 1997, stationary power reactor applicants who apply for an operating license pursuant to this part, or a combined license pursuant to part 52 of this chapter, shall provide a description and safety assessment of the site and of the facility as in §50.34(a)(1)(ii) of this part. However, for either an operating license applicant or holder whose construction permit was issued prior to January 10, 1997, the reactor site criteria in part 100 of this chapter and the seismic and geologic siting criteria in Appendix A to part 100 of this chapter continues to apply.
(c) Each application for a license to operate a production or utilization facility must include a physical security plan. The plan must describe how the applicant will meet the requirements of part 73 (and part 11 of this chapter, if applicable, including the identification and description of jobs as required by §11.11(a), at the proposed facility). The plan must list tests, inspections, audits, and other means to be used to demonstrate compliance with the requirements of 10 CFR Parts 11 and 73, if applicable.
(d) *Safeguards contingency plan.* Each application for a license to operate a production or utilization facility that will be subject to §§73.50, 73.55, or §73.60 of this chapter must include a licensee safeguards contingency plan in accordance with the criteria set forth in appendix C to 10 CFR part 73. The safeguards contingency plan shall include plans for dealing with threats, thefts, and radiological sabotage, as defined in part 73 of this chapter, relating to the special nuclear material and nuclear facilities licensed under this chapter and in the applicant's possession and control. Each application for such a license shall include the first four categories of information contained in the applicant's safeguards contingency plan. (The first four categories of information as set forth in appendix C to 10 CFR part 73 are Background, Generic Planning Base, Licensee Planning Base, and Responsibility Matrix. The fifth category of information, Procedures, does not have to be submitted for approval.)[9]
(e) Each applicant for a license to operate a production or utilization facility, who prepares a physical security plan, a safeguards contingency plan, or a guard qualification and training plan, shall protect the plans and other related Safeguards Information against unauthorized disclosure in accordance with the requirements of §73.21 of this chapter, as appropriate.
(f) *Additional TMI-related requirements.* In addition to the requirements of paragraph (a) of this section, each applicant for a light-water-reactor construction permit or manufacturing license whose application was pending as of February 16, 1982 shall meet the requirements in paragraphs (f) (1) through (3) of this section. This rule applies only to the pending applications by Duke Power Company (Perkins Nuclear Station Units 1, 2 and 3), Houston Lighting & Power Company (Allens Creek Nuclear Generating Station, Unit 1), Portland General Electric Company (Pebble Springs Nuclear Plant, Units 1 and 2), Public Service

Company of Oklahoma (Black Fox Station, Units 1 and 2), Puget Sound Power & Light Company (Skagit/Hanford Nuclear Power Project, Units 1 and 2), and Offshore Power Systems (License to Manufacture Floating Nuclear Plants). The number of units that will be specified in the manufacturing license, if issued, will be that number whose start of manufacture, as defined in the license application, can practically begin within a ten-year period commencing on the date of issuance of the manufacturing license, but in no event will that number be in excess of ten. The manufacturing license will require the plant design to be updated no later than five years after its approval. Paragraphs (f)(1)(xii), (2)(ix), and (3)(v) of this section, pertaining to hydrogen control measures, must be met by all applicants covered by this rule. However, the Commission may decide to impose additional requirements and the issue of whether compliance with these provisions, together with 10 CFR 50.44 and Criterion 50 of appendix A to 10 CFR part 50, is sufficient for issuance of the manufacturing license may be considered in the manufacturing license proceeding.

(1) To satisfy the following requirements, the application shall provide sufficient information to describe the nature of the studies, how they are to be conducted, estimated submittal dates, and a program to ensure that the results of such studies are factored into the final design of the facility. All studies shall be completed no later than two years following issuance of the construction permit or manufacturing license.[10]

(i) Perform a plant/site specific probabilistic risk assessment, the aim of which is to seek such improvements in the reliability of core and containment heat removal systems as are significant and practical and do not impact excessively on the plant. (II.B.8)

(ii) Perform an evaluation of the proposed auxiliary feedwater system (AFWS), to include (applicable to PWR's only) (II.E.1.1):

(A) A simplified AFWS reliability analysis using event-tree and fault-tree logic techniques.

(B) A design review of AFWS.

(C) An evaluation of AFWS flow design bases and criteria.

(iii) Perform an evaluation of the potential for and impact of reactor coolant pump seal damage following small-break LOCA with loss of offsite power. If damage cannot be precluded, provide an analysis of the limiting small-break loss-of-coolant accident with subsequent reactor coolant pump seal damage. (II.K.2.16 and II.K.3.25)

(iv) Perform an analysis of the probability of a small-break loss-of-coolant accident (LOCA) caused by a stuck-open power-operated relief valve (PORV). If this probability is a significant contributor to the probability of small-break LOCA's from all causes, provide a description and evaluation of the effect on small-break LOCA probability of an automatic PORV isolation system that would operate when the reactor coolant system pressure falls after the PORV has opened. (Applicable to PWR's only). (II.K.3.2)

(v) Perform an evaluation of the safety effectiveness of providing for separation of high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) system initiation levels so that the RCIC system initiates at a higher water level than the HPCI system, and of providing that both systems restart on low water level. (For plants with high pressure core spray systems in lieu of high pressure coolant injection systems, substitute the words, "high pressure core spray" for "high pressure coolant injection" and "HPCS" for "HPCI") (Applicable to BWR's only). (II.K.3.13)

(vi) Perform a study to identify practicable system modifications that would reduce challenges and failures of relief valves, without compromising the performance of the valves or other systems. (Applicable to BWR's only). (II.K.3.16)

(vii) Perform a feasibility and risk assessment study to determine the optimum automatic depressurization system (ADS) design modifications that would eliminate the need for manual activation to ensure adequate core cooling. (Applicable to BWR's only). (II.K.3.18)
(viii) Perform a study of the effect on all core-cooling modes under accident conditions of designing the core spray and low pressure coolant injection systems to ensure that the systems will automatically restart on loss of water level, after having been manually stopped, if an initiation signal is still present. (Applicable to BWR's only). (II.K.3.21)
(ix) Perform a study to determine the need for additional space cooling to ensure reliable long-term operation of the reactor core isolation cooling (RCIC) and high-pressure coolant injection (HPCI) systems, following a complete loss of offsite power to the plant for at least two (2) hours. (For plants with high pressure core spray systems in lieu of high pressure coolant injection systems, substitute the words, "high pressure core spray" for "high pressure coolant injection" and "HPCS" for "HPCI") (Applicable to BWR's only). (II.K.3.24)
(x) Perform a study to ensure that the Automatic Depressurization System, valves, accumulators, and associated equipment and instrumentation will be capable of performing their intended functions during and following an accident situation, taking no credit for non-safety related equipment or instrumentation, and accounting for normal expected air (or nitrogen) leakage through valves. (Applicable to BWR's only). (II.K.3.28)
(xi) Provide an evaluation of depressurization methods, other than by full actuation of the automatic depressurization system, that would reduce the possibility of exceeding vessel integrity limits during rapid cooldown. (Applicable to BWR's only) (II.K.3.45)
(xii) Perform an evaluation of alternative hydrogen control systems that would satisfy the requirements of paragraph (f)(2)(ix) of this section. As a minimum include consideration of a hydrogen ignition and post-accident inerting system. The evaluation shall include:
(A) A comparison of costs and benefits of the alternative systems considered.
(B) For the selected system, analyses and test data to verify compliance with the requirements of (f)(2)(ix) of this section.
(C) For the selected system, preliminary design descriptions of equipment, function, and layout.
(2) To satisfy the following requirements, the application shall provide sufficient information to demonstrate that the required actions will be satisfactorily completed by the operating license stage. This information is of the type customarily required to satisfy 10 CFR 50.35(a)(2) or to address unresolved generic safety issues.
(i) Provide simulator capability that correctly models the control room and includes the capability to simulate small-break LOCA's. (Applicable to construction permit applicants only) (I.A.4.2.)
(ii) Establish a program, to begin during construction and follow into operation, for integrating and expanding current efforts to improve plant procedures. The scope of the program shall include emergency procedures, reliability analyses, human factors engineering, crisis management, operator training, and coordination with INPO and other industry efforts. (Applicable to construction permit applicants only) (I.C.9)
(iii) Provide, for Commission review, a control room design that reflects state-of-the-art human factor principles prior to committing to fabrication or revision of fabricated control room panels and layouts. (I.D.1)
(iv) Provide a plant safety parameter display console that will display to operators a minimum set of parameters defining the safety status of the plant, capable of displaying a

full range of important plant parameters and data trends on demand, and capable of indicating when process limits are being approached or exceeded. (I.D.2)
(v) Provide for automatic indication of the bypassed and operable status of safety systems. (I.D.3)
(vi) Provide the capability of high point venting of noncondensible gases from the reactor coolant system, and other systems that may be required to maintain adequate core cooling. Systems to achieve this capability shall be capable of being operated from the control room and their operation shall not lead to an unacceptable increase in the probability of loss-of-coolant accident or an unacceptable challenge to containment integrity. (II.B.1)
(vii) Perform radiation and shielding design reviews of spaces around systems that may, as a result of an accident, contain accident source term1A\11\ radioactive materials, and design as necessary to permit adequate access to important areas and to protect safety equipment from the radiation environment. (II.B.2)
(viii) Provide a capability to promptly obtain and analyze samples from the reactor coolant system and containment that may contain accident source term1A\11\ radioactive materials without radiation exposures to any individual exceeding 5 rems to the whole body or 50 rems to the extremities. Materials to be analyzed and quantified include certain radionuclides that are indicators of the degree of core damage (e.g., noble gases, radioiodines and cesiums, and nonvolatile isotopes), hydrogen in the containment atmosphere, dissolved gases, chloride, and boron concentrations. (II.B.3)
(ix) Provide a system for hydrogen control that can safely accommodate hydrogen generated by the equivalent of a 100% fuel-clad metal water reaction. Preliminary design information on the tentatively preferred system option of those being evaluated in paragraph (f)(1)(xii) of this section is sufficient at the construction permit stage. The hydrogen control system and associated systems shall provide, with reasonable assurance, that: (II.B.8)
(A) Uniformly distributed hydrogen concentrations in the containment do not exceed 10% during and following an accident that releases an equivalent amount of hydrogen as would be generated from a 100% fuel clad metal-water reaction, or that the post-accident atmosphere will not support hydrogen combustion.
(B) Combustible concentrations of hydrogen will not collect in areas where unintended combustion or detonation could cause loss of containment integrity or loss of appropriate mitigating features.
(C) Equipment necessary for achieving and maintaining safe shutdown of the plant and maintaining containment integrity will perform its safety function during and after being exposed to the environmental conditions attendant with the release of hydrogen generated by the equivalent of a 100% fuel-clad metal water reaction including the environmental conditions created by activation of the hydrogen control system.
(D) If the method chosen for hydrogen control is a post-accident inerting system, inadvertent actuation of the system can be safely accommodated during plant operation.
(x) Provide a test program and associated model development and conduct tests to qualify reactor coolant system relief and safety valves and, for PWR's, PORV block valves, for all fluid conditions expected under operating conditions, transients and accidents. Consideration of anticipated transients without scram (ATWS) conditions shall be included in the test program. Actual testing under ATWS conditions need not be carried out until subsequent phases of the test program are developed. (II.D.1)
(xi) Provide direct indication of relief and safety valve position (open or closed) in the control room. (II.D.3)

(xii) Provide automatic and manual auxiliary feedwater (AFW) system initiation, and provide auxiliary feedwater system flow indication in the control room. (Applicable to PWR's only) (II.E.1.2)
(xiii) Provide pressurizer heater power supply and associated motive and control power interfaces sufficient to establish and maintain natural circulation in hot standby conditions with only onsite power available. (Applicable to PWR's only) (II.E.3.1)
(xiv) Provide containment isolation systems that: (II.E.4.2)
(A) Ensure all non-essential systems are isolated automatically by the containment isolation system,
(B) For each non-essential penetration (except instrument lines) have two isolation barriers in series,
(C) Do not result in reopening of the containment isolation valves on resetting of the isolation signal,
(D) Utilize a containment set point pressure for initiating containment isolation as low as is compatible with normal operation,
(E) Include automatic closing on a high radiation signal for all systems that provide a path to the environs.
(xv) Provide a capability for containment purging/venting designed to minimize the purging time consistent with ALARA principles for occupational exposure. Provide and demonstrate high assurance that the purge system will reliably isolate under accident conditions. (II.E.4.4)
(xvi) Establish a design criterion for the allowable number of actuation cycles of the emergency core cooling system and reactor protection system consistent with the expected occurrence rates of severe overcooling events (considering both anticipated transients and accidents). (Applicable to B&W designs only). (II.E.5.1)
(xvii) Provide instrumentation to measure, record and readout in the control room: (A) containment pressure, (B) containment water level, (C) containment hydrogen concentration, (D) containment radiation intensity (high level), and (E) noble gas effluents at all potential, accident release points. Provide for continuous sampling of radioactive iodines and particulates in gaseous effluents from all potential accident release points, and for onsite capability to analyze and measure these samples. (II.F.1)
(xviii) Provide instruments that provide in the control room an unambiguous indication of inadequate core cooling, such as primary coolant saturation meters in PWR's, and a suitable combination of signals from indicators of coolant level in the reactor vessel and in-core thermocouples in PWR's and BWR's. (II.F.2)
(xix) Provide instrumentation adequate for monitoring plant conditions following an accident that includes core damage. (II.F.3)
(xx) Provide power supplies for pressurizer relief valves, block valves, and level indicators such that: (A) Level indicators are powered from vital buses; (B) motive and control power connections to the emergency power sources are through devices qualified in accordance with requirements applicable to systems important to safety and (C) electric power is provided from emergency power sources. (Applicable to PWR's only). (II.G.1)
(xxi) Design auxiliary heat removal systems such that necessary automatic and manual actions can be taken to ensure proper functioning when the main feedwater system is not operable. (Applicable to BWR's only). (II.K.1.22)

(xxii) Perform a failure modes and effects analysis of the integrated control system (ICS) to include consideration of failures and effects of input and output signals to the ICS. (Applicable to B&W-designed plants only). (II.K.2.9)
(xxiii) Provide, as part of the reactor protection system, an anticipatory reactor trip that would be actuated on loss of main feedwater and on turbine trip. (Applicable to B&W-designed plants only). (II.K.2.10)
(xxiv) Provide the capability to record reactor vessel water level in one location on recorders that meet normal post-accident recording requirements. (Applicable to BWR's only). (II.K.3.23)
(xxv) Provide an onsite Technical Support Center, an onsite Operational Support Center, and, for construction permit applications only, a nearsite Emergency Operations Facility. (III.A.1.2).
(xxvi) Provide for leakage control and detection in the design of systems outside containment that contain (or might contain) accident source term1A\11\ radioactive materials following an accident. Applicants shall submit a leakage control program, including an initial test program, a schedule for re-testing these systems, and the actions to be taken for minimizing leakage from such systems. The goal is to minimize potential exposures to workers and public, and to provide reasonable assurance that excessive leakage will not prevent the use of systems needed in an emergency. (III.D.1.1)
(xxvii) Provide for monitoring of inplant radiation and airborne radioactivity as appropriate for a broad range of routine and accident conditions. (III.D.3.3)
(xxviii) Evaluate potential pathways for radioactivity and radiation that may lead to control room habitability problems under accident conditions resulting in an accident source term [11] release, and make necessary design provisions to preclude such problems. (III.D.3.4)
(3) To satisfy the following requirements, the application shall provide sufficient information to demonstrate that the requirement has been met. This information is of the type customarily required to satisfy paragraph (a)(1) of this section or to address the applicant's technical qualifications and management structure and competence.
(i) Provide administrative procedures for evaluating operating, design and construction experience and for ensuring that applicable important industry experiences will be provided in a timely manner to those designing and constructing the plant. (I.C.5)
(ii) Ensure that the quality assurance (QA) list required by Criterion II, app. B, 10 CFR part 50 includes all structures, systems, and components important to safety. (I.F.1)
(iii) Establish a quality assurance (QA) program based on consideration of: (A) Ensuring independence of the organization performing checking functions from the organization responsible for performing the functions; (B) performing quality assurance/quality control functions at construction sites to the maximum feasible extent; (C) including QA personnel in the documented review of and concurrence in quality related procedures associated with design, construction and installation; (D) establishing criteria for determining QA programmatic requirements; (E) establishing qualification requirements for QA and QC personnel; (F) sizing the QA staff commensurate with its duties and responsibilities; (G) establishing procedures for maintenance of "as-built" documentation; and (H) providing a QA role in design and analysis activities. (I.F.2)
(iv) Provide one or more dedicated containment penetrations, equivalent in size to a single 3-foot diameter opening, in order not to preclude future installation of systems to prevent containment failure, such as a filtered vented containment system. (II.B.8)

(v) Provide preliminary design information at a level of detail consistent with that normally required at the construction permit stage of review sufficient to demonstrate that: (II.B.8)
(A)(1) Containment integrity will be maintained (i.e., for steel containments by meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsubarticle NE - 3220, Service Level C Limits, except that evaluation of instability is not required, considering pressure and dead load alone. For concrete containments by meeting the requirements of the ASME Boiler Pressure Vessel Code, Section III, Division 2 Subsubarticle CC - 3720, Factored Load Category, considering pressure and dead load alone) during an accident that releases hydrogen generated from 100% fuel clad metal-water reaction accompanied by either hydrogen burning or the added pressure from post-accident inerting assuming carbon dioxide is the inerting agent. As a minimum, the specific code requirements set forth above appropriate for each type of containment will be met for a combination of dead load and an internal pressure of 45 psig. Modest deviations from these criteria will be considered by the staff, if good cause is shown by an applicant. Systems necessary to ensure containment integrity shall also be demonstrated to perform their function under these conditions.
(2) Subarticle NE - 3220, Division 1, and subarticle CC - 3720, Division 2, of section III of the July 1, 1980 ASME Boiler and Pressure Vessel Code, which are referenced in paragraphs (f)(3)(v)(A)(1) and (f)(3)(v)(B)(1) of this section, were approved for incorporation by reference by the Director of the Office of the Federal Register. A notice of any changes made to the material incorporated by reference will be published in the Federal Register. Copies of the ASME Boiler and Pressure Vessel Code may be purchased from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th St., New York, NY 10017. It is also available for inspection at the NRC Library, 11545 Rockville Pike, Rockville, Maryland 20852 - 2738.
(B)(1) Containment structure loadings produced by an inadvertent full actuation of a post-accident inerting hydrogen control system (assuming carbon dioxide), but not including seismic or design basis accident loadings will not produce stresses in steel containments in excess of the limits set forth in the ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsubarticle NE - 3220, Service Level A Limits, except that evaluation of instability is not required (for concrete containments the loadings specified above will not produce strains in the containment liner in excess of the limits set forth in the ASME Boiler and Pressure Vessel Code, Section III, Division 2, Subsubarticle CC - 3720, Service Load Category, (2) The containment has the capability to safely withstand pressure tests at 1.10 and 1.15 times (for steel and concrete containments, respectively) the pressure calculated to result from carbon dioxide inerting.
(vi) For plant designs with external hydrogen recombiners, provide redundant dedicated containment penetrations so that, assuming a single failure, the recombiner systems can be connected to the containment atmosphere. (II.E.4.1)
(vii) Provide a description of the management plan for design and construction activities, to include: (A) The organizational and management structure singularly responsible for direction of design and construction of the proposed plant; (B) technical resources director by the applicant; (C) details of the interaction of design and construction within the applicant's organization and the manner by which the applicant will ensure close integration of the architect engineer and the nuclear steam supply vendor; (D) proposed procedures for handling the transition to operation; (E) the degree of top level management oversight and technical control to be exercised by the applicant during design and

construction, including the preparation and implementation of procedures necessary to guide the effort. (II.J.3.1)

(g) Conformance with the Standard Review Plan (SRP). (1)(i) Applications for light water cooled nuclear power plant operating licenses docketed after May 17, 1982 shall include an evaluation of the facility against the Standard Review Plan (SRP) in effect on May 17, 1982 or the SRP revision in effect six months prior to the docket date of the application, whichever is later.

(ii) Applications for light water cooled nuclear power plant construction permits, manufacturing licenses, and preliminary or final design approvals for standard plants docketed after May 17, 1982 shall include an evaluation of the facility against the SRP in effect on May 17, 1982 or the SRP revision in effect six months prior to the docket date of the application, whichever is later.

(2) The evaluation required by this section shall include an identification and description of all differences in design features, analytical techniques, and procedural measures proposed for a facility and those corresponding features, techniques, and measures given in the SRP acceptance criteria. Where such a difference exists, the evaluation shall discuss how the alternative proposed provides an acceptable method of complying with those rules or regulations of Commission, or portions thereof, that underlie the corresponding SRP acceptance criteria.

(3) The SRP was issued to establish criteria that the NRC staff intends to use in evaluating whether an applicant/licensee meets the Commission's regulations. The SRP is not a substitute for the regulations, and compliance is not a requirement. Applicants shall identify differences from the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP criteria provide an acceptable method of complying with the Commission's regulations.

[33 FR 18612, Dec. 17, 1968]

Editorial Note: For additional Federal Register citations affecting §50.34, see the List of CFR Sections Affected in the Finding Aids section of this volume.

Effective Date Note: At 61 FR 65172, Dec. 11, 1996, in §50.34, footnotes 6, 7 and 8 were redesignated as footnotes 8, 9 and 10, paragraph (a)(1) was revised, and paragraphs (b)(10) and (11) were added, effective Jan. 10, 1997. For the convenience of the user, the superseded text is set forth as follows:

§50.34 Contents of applications; technical information.

(1) A description and safety assessment of the site on which the facility is to be located, with appropriate attention to features affecting facility design. Special attention should be directed to the site evaluation factors identified in part 100 of this chapter. Such assessment shall contain an analysis and evaluation of the major structures, systems and components of the facility which bear significantly on the acceptability of the site under the site evaluation factors identified in part 100 of this chapter, assuming that the facility will be operated at the ultimate power level which is contemplated by the applicant. With respect to operation at the projected initial power level, the applicant is required to submit information prescribed in paragraphs (a)(2) through (8) of this section, as well as the information required by this paragraph, in support of the application for a construction permit.

[5] The applicant may provide information required by this paragraph in the form of a discussion, with specific references, of similarities to and differences from, facilities of similar design for which applications have previously been filed with the Commission.
[6] The fission product release assumed for this evaluation should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release into the containment of appreciable quantities of fission products.
[7] A whole body dose of 25 rem has been stated to correspond numerically to the once in a lifetime accidental or emergency dose for radiation workers which, according to NCRP recommendations at the time could be disregarded in the determination of their radiation exposure status (see NBS Handbook 69 dated June 5, 1959). However, its use is not intended to imply that this number constitutes an acceptable limit for an emergency dose to the public under accident conditions. Rather, this dose value has been set forth in this section as a reference value, which can be used in the evaluation of plant design features with respect to postulated reactor accidents, in order to assure that such designs provide assurance of low risk of public exposure to radiation, in the event of such accidents.
[8] General design criteria for chemical processing facilities are being developed.
[9] A physical security plan that contains all the information required in both §73.55 and appendix C to part 73 satisfies the requirement for a contingency plan.
[10] Alphanumeric designations correspond to the related action plan items in NUREG 0718 and NUREG 0660, "NRC Action Plan Developed as a Result of the TMI - 2 Accident." They are provided herein for information only.
[11] The fission product release assumed for these calculations should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products.

Appendix S to Part 50 -- Earthquake Engineering Criteria for Nuclear Power Plants

General Information

This appendix applies to applicants for a design certification or combined license pursuant to part 52 of this chapter or a construction permit or operating license pursuant to part 50 of this chapter on or after January 10, 1997. However, for either an operating license applicant or holder whose construction permit was issued prior to January 10, 1997, the earthquake engineering criteria in Section VI of Appendix A to 10 CFR part 100 continues to apply.

I. Introduction

(a) Each applicant for a construction permit, operating license, design certification, or combined license is required by §50.34 (a)(12), (b)(10), and General Design Criterion 2 of

Appendix A to this part to design nuclear power plant structures, systems, and components important to safety to withstand the effects of natural phenomena, such as earthquakes, without loss of capability to perform their safety functions. Also, as specified in §50.54(ff), nuclear power plants that have implemented the earthquake engineering criteria described herein must shut down if the criteria in Paragraph IV(a)(3) of this appendix are exceeded.

(b) These criteria implement General Design Criterion 2 insofar as it requires structures, systems, and components important to safety to withstand the effects of earthquakes.

II. Scope

The evaluations described in this appendix are within the scope of investigations permitted by §50.10(c)(1).

III. Definitions

As used in these criteria:

Combined license means a combined construction permit and operating license with conditions for a nuclear power facility issued pursuant to Subpart C of Part 52 of this chapter.

Design Certification means a Commission approval, issued pursuant to Subpart B of Part 52 of this chapter, of a standard design for a nuclear power facility. A design so approved may be referred to as a "certified standard design."

The Operating Basis Earthquake Ground Motion (OBE) is the vibratory ground motion for which those features of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public will remain functional. The Operating Basis Earthquake Ground Motion is only associated with plant shutdown and inspection unless specifically selected by the applicant as a design input.

A response spectrum is a plot of the maximum responses (acceleration, velocity, or displacement) of idealized single-degree-of-freedom oscillators as a function of the natural frequencies of the oscillators for a given damping value. The response spectrum is calculated for a specified vibratory motion input at the oscillators' supports.

The Safe Shutdown Earthquake Ground Motion (SSE) is the vibratory ground motion for which certain structures, systems, and components must be designed to remain functional.

The structures, systems, and components required to withstand the effects of the Safe Shutdown Earthquake Ground Motion or surface deformation are those necessary to assure:

(1) The integrity of the reactor coolant pressure boundary;

(2) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(3) The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of §50.34(a)(1).

Surface deformation is distortion of geologic strata at or near the ground surface by the processes of folding or faulting as a result of various earth forces. Tectonic surface deformation is associated with earthquake processes.

IV. Application To Engineering Design

The following are pursuant to the seismic and geologic design basis requirements of §100.23 of this chapter:

(a) Vibratory Ground Motion.

(1) Safe Shutdown Earthquake Ground Motion.

(i) The Safe Shutdown Earthquake Ground Motion must be characterized by free-field ground motion response spectra at the free ground surface. In view of the limited data available on vibratory ground motions of strong earthquakes, it usually will be appropriate that the design response spectra be smoothed spectra. The horizontal component of the Safe Shutdown Earthquake Ground Motion in the free-field at the foundation level of the structures must be an appropriate response spectrum with a peak ground acceleration of at least 0.1g.

(ii) The nuclear power plant must be designed so that, if the Safe Shutdown Earthquake Ground Motion occurs, certain structures, systems, and components will remain functional and within applicable stress, strain, and deformation limits. In addition to seismic loads, applicable concurrent normal operating, functional, and accident-induced loads must be taken into account in the design of these safety-related structures, systems, and components. The design of the nuclear power plant must also take into account the possible effects of the Safe Shutdown Earthquake Ground Motion on the facility foundations by ground disruption, such as fissuring, lateral spreads, differential settlement, liquefaction, and landsliding, as required in §100.23 of this chapter.

(iii) The required safety functions of structures, systems, and components must be assured during and after the vibratory ground motion associated with the Safe Shutdown Earthquake Ground Motion through design, testing, or qualification methods.

(iv) The evaluation must take into account soil-structure interaction effects and the expected duration of vibratory motion. It is permissible to design for strain limits in excess of yield strain in some of these safety-related structures, systems, and components during the Safe Shutdown Earthquake Ground Motion and under the postulated concurrent loads, provided the necessary safety functions are maintained.

(2) Operating Basis Earthquake Ground Motion.

(i) The Operating Basis Earthquake Ground Motion must be characterized by response spectra. The value of the Operating Basis Earthquake Ground Motion must be set to one of the following choices:

(A) One-third or less of the Safe Shutdown Earthquake Ground Motion design response spectra. The requirements associated with this Operating Basis Earthquake Ground Motion in Paragraph (a)(2)(i)(B)(I) can be satisfied without the applicant performing explicit response or design analyses, or

(B) A value greater than one-third of the Safe Shutdown Earthquake Ground Motion design response spectra. Analysis and design must be performed to demonstrate that the requirements associated with this Operating Basis Earthquake Ground Motion in Paragraph (a)(2)(i)(B)(I) are satisfied. The design must take into account soil-structure interaction effects and the duration of vibratory ground motion.

(I) When subjected to the effects of the Operating Basis Earthquake Ground Motion in combination with normal operating loads, all structures, systems, and components of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public must remain functional and within applicable stress, strain, and deformation limits.

(3) Required Plant Shutdown. If vibratory ground motion exceeding that of the Operating Basis Earthquake Ground Motion or if significant plant damage occurs, the licensee must shut down the nuclear power plant. If systems, structures, or components necessary for the safe shutdown of the nuclear power plant are not available after the occurrence of the Operating Basis Earthquake Ground Motion, the licensee must consult with the Commission and must propose a plan for the timely, safe shutdown of the nuclear power plant. Prior to resuming operations, the licensee must demonstrate to the Commission that no functional damage has occurred to those features necessary for continued operation without undue risk to the health and safety of the public and the licensing basis is maintained.

(4) Required Seismic Instrumentation. Suitable instrumentation must be provided so that the seismic response of nuclear power plant features important to safety can be evaluated promptly after an earthquake.

(b) Surface Deformation. The potential for surface deformation must be taken into account in the design of the nuclear power plant by providing reasonable assurance that in the event of deformation, certain structures, systems, and components will remain functional. In addition to surface deformation induced loads, the design of safety features must take into account seismic loads and applicable concurrent functional and accident-induced loads. The design provisions for surface deformation must be based on its postulated occurrence in any direction and azimuth and under any part of the nuclear power plant, unless evidence indicates this assumption is not appropriate, and must take into account the estimated rate at which the surface deformation may occur.

(c) Seismically Induced Floods and Water Waves and Other Design Conditions. Seismically induced floods and water waves from either locally or distantly generated seismic activity and other design conditions determined pursuant to §100.23 of this chapter must be taken into account in the design of the nuclear power plant so as to prevent undue risk to the health and safety of the public.

[61 FR 65173, Dec. 11, 1996]

APPENDIX B

Acronyms and Terms

Acronyms and Terms

COL	Construction and operating license or combined license - combined construction permit and operating license for a nuclear facility issued pursuant to 10 CFR 52 Subpart C
DC	Design certification or standard design certification - A Commission approval per 10 CFR Part 52 Subpart B
Existing Site	Site that has received a previous formal approval from the NRC as a nuclear power plant site, including sites that are contiguous with operating nuclear power plant sites or have previously received a construction permit and/or operating license, whether or not the construction permit or operating license has expired
ESP	Early site permit - Commission approval per 10 CFR 52 Subpart A for a site or sites for one or more nuclear power facilities
Greenfield Site	Undeveloped site that was not used previously for any industrial purpose
Industrial Site	Site that has previously been the location of industrial facilities, either privately or publicly owned
Person	Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the NRC or DOE (except as provided under section 202 of the Energy reorganization Act of 1974), any State or any political subdivision of, or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity, and any legal successor, representative, agent or agency of the foregoing
PPE	Plant Parameters Envelope - A database of the salient plan-site interface features and their quantitative values for a plant design. Composite PPEs are used to describe a range of plant types and use the most limiting value for each parameter.
Standard Design	Design that is sufficiently complete and detailed to support certification under 10 CFR Part 52 Subpart B, which is useable for a multiple number of units or at a multiple number of sites without reopening or repeating the review

APPENDIX C

Plant Parameters Envelope

Table C-1 All - Composite Plant Parameters Envelope (PPE) for Early Site Permit Applications

PPE Section		All - Composite Value[1]	Usage[2]	Comments[3]
1.	Structures 1.1 Height		ER	Visual resources impacts
1.2	Precipitation (for Roof Design) 1.2.1 Maximum Rainfall Rate		SAR	
	1.2.2 Snow Load		SAR	
1.3	Safe Shutdown Earthquake (SSE) 1.3.1 Design Response Spectra		SAR	
	1.3.2 Peak Ground Acceleration		SAR	
	1.3.3 Time History		SAR	
1.4	Site Water Level (Allowable) 1.4.1 Maximum Flood (or Tsunami)		SAR	
	1.4.2 Maximum Ground Water		SAR	
1.5	Soil Properties Design Bases 1.5.1 Liquefaction		SAR	
	1.5.2 Minimum Bearing Capacity (Static)		SAR	
	1.5.3 Minimum Shear Wave Velocity		SAR	
1.6	Tornado (Design Bases) 1.6.1 Maximum Pressure Drop		SAR	
	1.6.2 Maximum Rotational Speed		SAR	
	1.6.3 Maximum Translational Speed		SAR	
	1.6.4 Maximum Wind Speed		SAR	
	1.6.5 Missile Spectra		SAR	
	1.6.6 Radius of Maximum Rotational Speed		SAR	
	1.6.7 Rate of Pressure Drop		SAR	

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
1.7 Wind 1.7.1 Basic Wind Speed		SAR	
1.7.2 Importance Factors		SAR	
2. Normal Plant Heat Sink 2.1 Ambient Air Requirements 2.1.1 Normal Shutdown Max Ambient Temp (1% Exceed)		SAR	
2.1.2 Normal Shutdown Max Wet Bulb Temp (1% Exceed)		SAR	
2.1.3 Normal Shutdown Min Ambient Temp (1% Exceed)		SAR	
2.1.4 Rx Thermal Power Max Ambient Temp (0% Exceed)		SAR	
2.1.5 Rx Thermal Power Max Wet Bulb Temp (0% Exceed)		SAR	
2.1.6 Rx Thermal Power Min Ambient Temp (0% Exceed)		SAR	
2.2 Blowdown Pond Acreage (24 hr blowdown)		ER	Construction impacts on ecological resources.
2.3 Maximum Inlet Temp Condenser/Heat Exchanger		SAR	
2.4 Mechanical Draft Cooling Towers		ER	See Note 4
2.4.1 Acreage		ER	Construction impacts on ecological resources.
2.4.2 Approach Temperature		SAR	
2.4.3 Blowdown Constituents and Concentrations	See Table C-2	ER	Operational impacts on water quality and ecological resources.
2.4.4 Blowdown Flow Rate		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown rate.
2.4.5 Blowdown Temperature		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown temperature.
2.4.6 Cycles of Concentration		ER	Operational impacts on water quality

PPE Section			All - Composite Value[1]	Usage[2]	Comments[3]
					and ecological resources.
	2.4.7	Evaporation Rate		ER	Operational impacts on water quality and local climatology.
	2.4.8	Height		ER	Visual resources impacts.
	2.4.9	Makeup Flow Rate		ER	Operational impacts on water resources/water supply. A water consumptive use permit must be obtained for this withdrawal rate.
	2.4.10	Noise		ER	Noise impacts
2.5	Natural Draft Cooling Towers				See Note 4
	2.5.1	Acreage		ER	Construction impacts on ecological resources.
	2.5.2	Approach Temperature		SAR	
	2.5.3	Blowdown Constituents and Concentrations	See Table C-2	ER	Operational impacts on water quality and ecological resources.
	2.5.4	Blowdown Flow Rate		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown rate.
	2.5.5	Blowdown Temperature		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown temperature.
	2.5.6	Cycles of Concentration		ER	Operational impacts on water quality and ecological resources.
	2.5.7	Evaporation Rate		ER	Operational impacts on water quality and local climatology.
	2.5.8	Height		ER	Visual impacts
	2.5.9	Makeup Flow Rate		ER	Operational impacts on water resources/water supply. A water consumptive use permit must be

PPE Section			All - Composite Value[1]	Usage[2]	Comments[3]
					obtained for this withdrawal rate.
	2.5.10	Noise		ER	Noise impacts
2.6	Once-Through Cooling				See Note 4
	2.6.1	Cooling Water Discharge Temperature		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown temperature.
	2.6.2	Cooling Water Flow Rate		ER	Operational impacts on water resources/water supply. A water consumptive use permit must be obtained for this withdrawal rate.
	2.6.3	Cooling Water Temperature Rise		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this temperature rise.
	2.6.4	Evaporation Rate		ER	Operational impacts on water quality and local climatology.
2.7	Ponds				See Note 4
	2.7.1	Acreage		SAR, ER	S - Site must be capable of accommodating a pond of the required storage volume. E - Construction impacts on ecological resources.
	2.7.2	Blowdown Constituents and Concentrations	See Table C-2	ER	Operational impacts on water quality and ecological resources.
	2.7.3	Blowdown Flow Rate		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown rate.
	2.7.4	Blowdown Temperature		ER	Operational impacts on water quality and ecological resources. A NPDES permit must be obtained for this blowdown temperature.

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
2.7.5 Cycles of Concentration		ER	Operational impacts on water quality and aquatic ecological resources.
2.7.6 Evaporation Rate		ER	Operational impacts on water quality and local climatology.
2.7.7 Heat Rejection Rate		SAR	
2.7.8 Makeup Flow Rate		ER	Operational impacts on water resources/water supply. A water consumptive use permit must be obtained for this withdrawal rate.
2.7.9 Stored Water Volume		SAR, ER	S – Site must be capable of accommodating a pond of the required storage volume. E – Construction impacts on ecological resources.
3. Ultimate Heat Sink			See Note 5
3.1 Ambient Air Requirements 3.1.1 Maximum Ambient Temp (0% Exceedance)		SAR	
3.1.2 Maximum Wet Bulb Temp (0% Exceedance)		SAR	
3.1.3 Minimum Ambient Temp (0% Exceedance)		SAR	
3.2 Maximum Inlet Temp to CCW Heat Exchanger		SAR	
3.3 Mech Draft Cooling Towers			
3.3.1 Acreage		ER	See Note 5
3.3.2 Approach Temperature		SAR	
3.3.3 Blowdown Constituents and Concentrations	See Table C-2	ER	See Note 5
3.3.4 Blowdown Flow Rate		ER	See Note 5
3.3.5 Blowdown Temperature		ER	See Note 5
3.3.6 Cycles of Concentration		ER	See Note 5

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
3.3.7 Evaporation Rate		ER	See Note 5
3.3.8 Height		ER	See Note 5
3.3.9 Makeup Flow Rate		ER	See Note 5
3.3.10 Noise		ER	See Note 5
3.4 Once-Through Cooling 3.4.1 Cooling Water Discharge Temperature		ER	See Note 5
3.4.2 Cooling Water Flow Rate		ER	See Note 5
3.4.3 Cooling Water Temperature Rise		ER	See Note 5
3.4.4 Minimum Essential Flow Rate		SAR, ER	See Note 5
3.5 Ponds			
3.5.1 Acreage		SAR	
3.5.2 Blowdown Constituents and Concentrations	See Table C-2	ER	See Note 5
3.5.3 Blowdown Flow Rate		ER	See Note 5
3.5.4 Blowdown Temperature		ER	See Note 5
3.5.5 Cycles of Concentration		ER	See Note 5
3.5.6 Evaporation Rate		ER	See Note 5
3.5.7 Makeup Flow Rate		ER	See Note 5
4. Containment Heat Removal System (Post-Accident) 4.1 Ambient Air Requirements 4.1.1 Maximum Ambient Air Temperature (0% Exceedance)		SAR	
4.1.2 Minimum Ambient Temperature (0% Exceedance)		SAR	
5. Potable Water/Sanitary Waste System 5.1 Discharge to Site Water Bodies 5.1.1 Flow Rate		ER	Operational impacts on water quality and aquatic ecological resources.
5.2 Raw Water Requirements		ER	Operational impacts on water quality

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
5.2.1 Maximum Use			and aquatic ecological resources.
5.2.2 Monthly Average Use		ER	Operational impacts on water quality and aquatic ecological resources.
6. Demineralized Water System 6.1 Discharge to Site Water Bodies 6.1.1 Flow Rate		ER	Operational impacts on water quality and aquatic ecological resources.
6.2 Raw Water Requirements 6.2.1 Maximum Use		ER	Operational impacts on water quality and aquatic ecological resources.
6.2.2 Monthly Average Use		ER	Operational impacts on water quality and aquatic ecological resources.
7. Fire Protection System 7.1 Raw Water Requirements 7.1.1 Maximum Use		ER	Operational impacts on water quality and aquatic ecological resources.
7.1.2 Monthly Average Use		ER	Operational impacts on water quality and aquatic ecological resources.
8. Miscellaneous Drain 8.1 Discharge to Site Water Bodies 8.1.1 Flow Rate		ER	Operational impacts on water quality and aquatic ecological resources.
9. Unit Vent/Airborne Effluent Release Point 9.1 Atmospheric Dispersion (CHI/Q) (Accident) 9.1.1 0.5 mi - 0-2 hr		SAR	
9.1.2 2 mi - 0-8 hr		SAR	
9.1.3 2 mi - 1-4 day		SAR	
9.1.4 2 mi - 4-30 day		SAR	
9.1.5 2 mi - 8-24 hr		SAR	
9.2 Atmospheric Dispersion (CHI/Q) (Annual Average)		SAR	

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
9.3 Dose Consequences 9.3.1 Normal		SAR, ER	Values listed for Section 9.3 are regulatory standards for effluent concentrations, doses from routine operations, and doses from postulated accidents. The applicant must demonstrate that the plant is capable of meeting these standards considering the plant design and, for the dose standards, dilution and dispersion conditions at the site.
9.3.2 Post-Accident		SAR, ER	
9.3.3 Severe Accidents		SAR, ER	
9.4 Release Point		SAR, ER	Release point characteristics (Sections 9.4.1 - 9.4.6) are used to calculate atmospheric dispersion factors used: S - In the Site SAR to demonstrate compliance with requirements listed in Section 9.3, and, E - In the ER to estimate impacts from routine and accident-scenario atmospheric releases.
9.4.1 Configuration (Horiz vs Vert)		SAR, ER	See Section 9.4
9.4.2 Elevation (Normal)		SAR, ER	See Section 9.4
9.4.3 Elevation (Post Accident)		SAR, ER	See Section 9.4
9.4.4 Minimum Distance to Site Boundary		SAR, ER	See Section 9.4
9.4.5 Temperature		SAR, ER	See Section 9.4
9.4.6 Volumetric Flow Rate		SAR, ER	See Section 9.4
9.5 Source Term			Source term data (Sections 9.5.1 - 9.5.3) are used to calculate dose consequences used: S - In the Site SAR to demonstrate compliance with requirements listed in Section 9.3, and,

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
			E - In the ER to estimate impacts from routine and accident-scenario atmospheric releases.
9.6.1 Gaseous (Normal)		SAR, ER	See Section 9.5
9.6.2 Gaseous (Post-Accident)		SAR, ER	See Section 9.5. Tables in Chapter 15 of Regulatory Guide 1.70 list the design and accident sequence parameters necessary to derive these source terms. Applicants must obtain calculated release values from the vendor/A-E for designs under consideration.
9.6.3 Tritium		SAR, ER	See Section 9.5
10. Liquid Radwaste System 10.1 Dose Consequences 10.1.1 Normal		SAR, ER	Values listed for Section 10.1 are regulatory standards for effluent concentrations, doses from routine operations, and doses from postulated accidents. The applicant must demonstrate that the plant is capable of meeting these standards considering the plant design and, for the dose standards, dilution and dispersion conditions at the site.
10.1.2 Post-Accident			
10.2 Release Point 10.2.1 Flow Rate		SAR, ER	Flow rate and dilution characteristics (Section 10.2) are used to calculate dilution factors used: S - In the Site SAR to demonstrate compliance with requirements listed in Section 10.1, and, E - In the ER to estimate impacts from liquid effluents.
10.3 Source Term 10.3.1 Liquid		SAR, ER	Liquid discharge data (Sections 10.3.1 - 10.3.2) are used to calculate dose consequences used: S - In the Site SAR to demonstrate compliance with requirements listed in Section 10.1, and,

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
			E - In the ER to estimate impacts from liquid effluents.
10.3.2 Tritium		SAR, ER	See Section 10.3.1
11. Solid Radwaste System 11.1 Acreage 11.1.1 Low Level Radwaste Storage		ER	Environmental effects of the uranium fuel cycle, including solid waste management, are set forth in Table S-3 of 10 CFR Part 51.20. Reference to this Table is made in the applicant's ER.
11.2 Solid Radwaste 11.2.1 Activity		ER	See Section 11
11.2.2 Principal Radionuclides	See Table C-3	ER	See Section 11
11.2.3 Volume		ER	See Section 11
12. Spent Fuel Storage 12.1 Spent Fuel Dry Storage 12.1.1 Acreage		ER	Construction impacts on ecological resources.
12.1.2 Minimum Distance to Nearest Residence		SAR	
12.1.3 Minimum Distance to Power Block		SAR	
13. Auxiliary Boiler System 13.1 Exhaust Elevation		ER	Operational impacts of non-radiological atmospheric emissions.
13.2 Flue Gas Effluents	See Table C-4	ER	Operational impacts of non-radiological atmospheric emissions.
13.3 Fuel 13.3.1 Type		ER	Operational impacts of non-radiological atmospheric emissions.
14. Heating, Ventilation and Air Conditioning System 14.1 Ambient Air Requirements 14.1.1 Non-safety hvac max ambient temp (1% Exceed)		SAR	
14.1.2 Non-safety hvac min ambient temp (1% Exceed)		SAR	

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
14.1.3 Safety hvac max ambient temp (0% Exceed)		SAR	
14.1.4 Safety hvac min ambient temp (0% Exceed)		SAR	
14.1.5 Vent System max ambient temp (5% Exceed)		SAR	
14.1.6 Vent System min ambient temp (5% Exceed)		SAR	
15. Onsite/Offsite Electrical Power System 15.1 Acreage 15.1.1 Switchyard		ER	Construction impacts on ecological resources.
16. Standby Power System 16.1 Diesel Exhaust Elevation		ER	Operational impacts of non-radiological atmospheric emissions.
16.2 Diesel Flue Gas Effluents	See Table C-5	ER	Operational impacts of non-radiological atmospheric emissions.
16.3 Diesel Noise		ER	Noise impacts
16.4 Gas-Turbine Exhaust Elevation		ER	Operational impacts of non-radiological atmospheric emissions.
16.5 Gas-Turbine Flue Gas Effluents	See Table C-6	ER	Operational impacts of non-radiological atmospheric emissions.
16.6 Gas-Turbine Fuel 16.6.1 Type		ER	Operational impacts of non-radiological atmospheric emissions.
16.7 Gas-Turbine Noise		ER	Noise impacts
17. Plant Characteristics 17.1 Access Routes 17.1.1 Heavy Haul Routes		ER	Construction impacts on ecological resources.
17.1.2 Spent Fuel Cask Weight		SAR	Transport requirements for component delivery.
17.2 Acreage			Total acreage footprint for site facilities is used to estimate construction impacts on ecological resources.
17.2.1 Office Facilities		ER	See Section 17.2

PPE Section	All - Composite Value[1]	Usage[2]	Comments[3]
17.2.2 Parking Lots		ER	See Section 17.2
17.2.3 Permanent Support Facilities		ER	See Section 17.2
17.2.4 Power Block		ER	See Section 17.2
17.2.5 Protected Area		ER	See Section 17.2
17.3 Megawatts Thermal		SAR	
17.4 Plant Design Life		ER	Socioeconomic impacts of plant construction and operation.
17.5 Plant Population 17.5.1 Operation		ER	Socioeconomic impacts of plant construction and operation.
17.5.2 Refueling		ER	Socioeconomic impacts of plant construction and operation.
18. Construction 18.1 Access Routes 18.1.1 Construction Module Dimensions		SAR	Transport requirements for component delivery.
18.1.2 Heaviest Construction Shipment		SAR	Transport requirements for component delivery.
18.2 Acreage 18.2.1 Laydown Area		ER	Construction impacts on ecological resources.
18.2.2 Temporary Construction Facilities		ER	Construction impacts on ecological resources.
18.3 Construction 18.3.1 Noise		ER	Noise impacts.
18.4 Plant Population 18.4.1 Construction		ER	Socioeconomic impacts of plant construction and operation.
18.5 Site Preparation Duration		ER	Socioeconomic impacts of plant construction and operation.

Notes:

1. PPE values should be based on plant designs being considered. The All - Composite PPE values provide an envelope (most restrictive values selected) for the ABWR, AP600, AP1000, System 80+, SWR 1000 and GT-MHR designs. A composite PPE should be used for the actual set of plant designs under consideration for the site.
2. SAR: Used in the Site SAR, ER: Used in the Environmental Report, No: Not utilized directly in an ESP application.
3. Sections in the "SAR" usage category require a demonstration that the site characteristic falls within the corresponding PPE section value (e.g., predicted peak ground acceleration < value for PPE Section 1.3.2). Sections in the "ER" usage category define the bases for analysis of the facility's environmental impact.
4. Applicants must identify main condenser cooling system alternatives (e.g., mechanical or natural draft cooling towers, cooling ponds, or once-through cooling). To maintain multiple options, the most restrictive value for each cooling system PPE section should be used in the ESP application (e.g., 550 feet cooling tower height selected if both mechanical and natural draft towers are being considered).
5. Impacts of the main condenser cooling system will usually bound impacts from operation of the Ultimate Heat Sink.

Table C-2 Blowdown Constituents and Concentrations[1]

Constituent	River Source	Concentration (ppm)[2]	
		Well/Treated Water	Envelope
Chlorine demand			
Free available chlorine			
Chromium			
Copper			
Iron			
Zinc			
Phosphate			
Sulfate			
Oil and grease			
Total dissolved solids			
Total suspended solids			
BOD, 5-day			

Notes:
(1) See PPE Sections 2.4.3, 2.5.3, 2.7.2, 3.3.3, and 3.5.2.
(2) Assumed cycles of concentration equals 4.

Table C-3 Principal Radionuclides in Solid Radwaste[1]

Radionuclide	Quantity (Ci/yr)
Fe-55	
Fe-59	
Co-60	
Mn-54	
Cr-51	
C0-58	
NI-63	
H-3	
C-14	
Nb-95	
Ag-110m	
Zr-95	
Ba-140	
Pu-241	
La-140	
Other	
Total (rounded to nearest hundred)	

Notes:
(1) See PPE Section 11.2.2

Table C-4 Yearly Emissions Auxiliary Boilers[1]

Pollutant Discharged[2]	Quantity (lbs)
Particulates	
Sulfur oxides	
Carbon monoxide	
Hydrocarbons	
Nitrogen oxides	

Notes:
(1) See PPE Section 13.2.
(2) Emissions are based on 4 hrs/month operation for each of the generators.

Table C-5 Yearly Emissions From Standby Diesel Generators[1]

Pollutant Discharged[2]	Quantity[2] (lbs)
Particulates	
Sulfur Oxides	
Carbon Monoxide	
Hydrocarbons	
Nitrogen oxides	

Notes:
(2) See PPE Section 16.2
(3) Emissions are based on 4 hrs/month operation for each of the generators.

Table C-6 Standby Power System Gas Turbine Flue Gas Effluents[1]

FUEL: Distillate 20F Ambient 9,890 BTU/KWH (LHV) 10,480 BTU/KWH (HHV) 96,960 LB/HR Fuel Consumption Rate	
Effluent	**Quantity[2] (lbs)**
NO_x (PPMVD @ 15% O_2	
NO_x as NO_2 (LB/HR)	
CO (PPMVD)	
CO (LB/HR)	
UHC (PPMVD)	
UHC (LB/HR)	
VOC (PPMVD)	
VOC (LB/HR)	
SO_2 (PPMVD)	
SO_2 (LB/HR)	
SO_3 (PPMVD)	
SO_3 (LB/HR)	
SULFUR MIST (LB/HR)	
PARTICULATES (LB/HR)	
Exhaust Analysis % Vol	
ARGON	
NITROGEN	
OXYGEN	
CARBON DIOXIDE	
WATER	

Notes:
(1) See PPE Section 16.5
(2) Emissions are based on 4 hrs/month operation for each of the generators.