NEI 10-01 [Revision 1]

Industry Guideline for Developing a Plant Parameter Envelope in Support of an Early Site Permit

May 2012

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Nuclear Energy Institute

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Nuclear Energy Institute, 1776 I Street N. W., Suite 400, Washington D.C. (202.739.8000)

ACKNOWLEDGEMENTS

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NOTICE

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EXECUTIVE SUMMARY

NEI 10-01 provides generic guidance for the development of a plant parameter envelope in support of an Early Site Permit (ESP). The purpose of this guidance is to provide a logical, consistent, and workable framework for developing a Plant Parameter Envelope (PPE) that supports finality on siting issues prior to selecting a specific reactor technology. This approach provides an equivalent level of finality to that achieved through an ESP based on a specific reactor design. Standardization of PPE development has significant benefits to both the applicants and the Nuclear Regulatory Commission (NRC) by assuring that common expectations on how to appropriately construct a PPE are in place and consistently met.

To facilitate the establishment of common expectations on the content and utility of a PPE, this document discusses the objectives of the PPE, the role that vendor and site information play in the construction of a PPE, and a roadmap for the development of a PPE. The central components of this roadmap are the Vendor Information Worksheet and sample PPE table, which are presented and described in detail. Also addressed are normal and accident source term and quality assurance topics unique to a PPE based ESP application.

Appendix A of the document provides context for the use of a PPE by providing a summary of general information relevant to and the regulatory basis for an ESP application. Appendix B provides a blank Vendor Information Worksheet for prospective applicants to use. Appendix C provides a sample PPE Table to serve as a guide for building plant specific PPE Tables based on the vendor information obtained.

This document reflects the discussions at a public meeting between industry and NRC on November 18, 2009 and during a March 10, 2010 technical session entitled *Siting Safety and Environmental Reviews – Looking Forward* at the 2010 NRC Regulatory Information Conference. Revision 1 of this document was also significantly informed by written comments received from NRC on February 3, 2011 (Adams Accession Number ML103010115). As discussed at these meetings, and throughout the subsequent dialogue regarding NRC's comments, a main objective of this guideline is to provide all stakeholders a common framework and understanding of the PPE based ESP concept.

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PLANT PARAMETER ENVELOPE PROCESS

1 INTRODUCTION

This guideline documents an approach that ESP applicants can apply to develop an ESP application based on a Plant Parameter Envelope (PPE) consistent with the requirements of Title 10 Code of Federal Regulations (CFR) Part 52, Subpart A. This guidance is developed based on this regulation as well as the lessons learned from the four early site permits that were approved by United States (U.S.) Nuclear Regulatory Commission (NRC) between 2007 and 2009 for proposed new reactors at the Clinton, Grand Gulf, and North Anna, and Vogtle sites. Three of these ESPs (Clinton, Grand Gulf and North Anna) are based on a PPE approach and one (Vogtle) is based on a specific reactor design.

1.1 BACKGROUND

The Early Site Permit (ESP) process, offered under Title 10 Code of Federal Regulations (CFR) Part 52, Subpart A, was promulgated by the NRC in 1989 to address industry concerns with the former licensing process under 10 CFR Part 50. Previously, the licensing process required large expenditures of time and money by applicants well before key site specific environmental, safety, and emergency planning issues could be resolved. As envisioned, the ESP process is meant to resolve these issues well in advance of when a decision is made to build a nuclear power facility and before substantial capital is invested in the construction of a new nuclear facility.

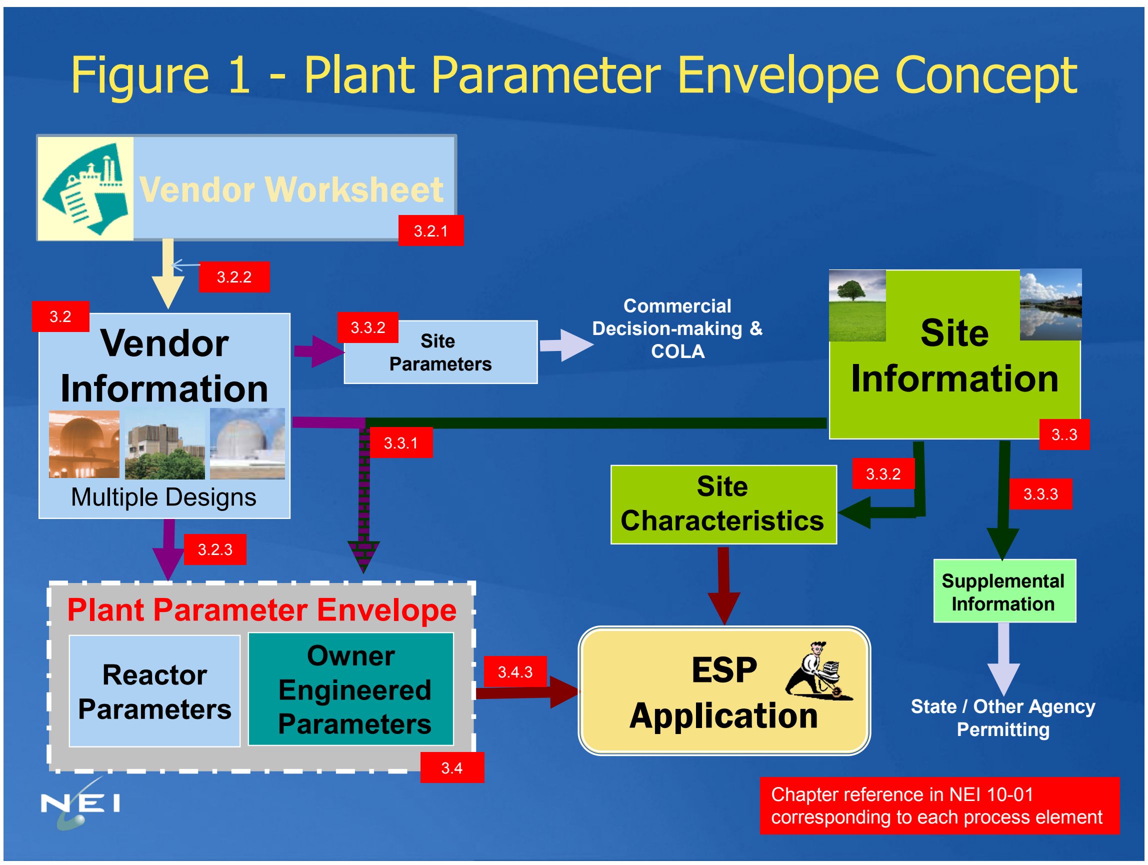
This document is focused on providing guidance specific to the development of a PPE for use in an ESP application and to provide a generic PPE table which prospective applicants can use as a starting point in the development of their application. The PPE approach allows for the ESP application, containing the information required by 10 CFR 52.17 (a), to be developed using a set of plant parameters that are expected to envelope the design of a reactor or reactors that might be later deployed at the site. NRC Review Standard RS-002 *Processing Applications for Early Site Permits* (SECY-03-0227) provides guidance for NRC staff review of an ESP application, including specific guidance, in Attachments 2 and 3 for the review of applications that include a PPE. More general information on the ESP process and its regulatory basis can be found in Appendix A of this document.

When the decision is made to proceed with the licensing and construction of a nuclear power plant, having a preapproved site can reduce the time to complete the project. When the ESP is referenced along with a certified design in a combined license (COL) application (COLA), the time required for construction and startup of a new plant can be shortened further. The NRC introduced the ESP and the COL concepts as part of a more effective licensing process (10 CFR Part 52) for new nuclear power plants. Congress affirmed and strengthened the new licensing process in the 1992 Energy Policy Act.

Historically, under the 10 CFR Part 50 process, the NRC reviewed proposed sites and designs in combination and approved the site/design combination simultaneously. Part 52 provides for the option to secure separate early approvals for proposed sites, designs or both. In particular, the Part 52 ESP process reflects the longstanding NRC objective to decouple siting from design and is central to the early resolution of safety and environmental issues, a principal policy objective of Part 52.

1.2 PURPOSE AND SCOPE

The purpose of this guidance is to provide a logical, consistent, and workable framework for developing a PPE that supports finality on siting issues prior to selecting a specific reactor technology. This approach provides an equivalent level of finality to that achieved through an ESP based on a specific reactor design. Standardization of PPE development has significant benefits to both the applicants and the NRC by assuring that common expectations on how to appropriately construct a PPE are in place and consistently met. Figure 1 below depicts a process flow chart for the construction of a PPE based ESP and is annotated to indicate where in this guidance document each element of the process is described.



Part 52 allows for approval of a site for future nuclear power plants as a separate licensing action well in advance of decisions on reactor technology and when to build. In those instances where the ESP applicant has not selected a particular technology, ESP applications may nonetheless use the PPE approach as a surrogate for actual facility information to support required safety and environmental reviews. Under the PPE approach, applications do not reference a specific reactor technology. As a result the ESP is applicable for a range of reactor designs, including NRC certified designs, designs for which NRC certification is currently in progress, and future designs.

Strong policy basis exists for the PPE approach. First, it provides applicants with essential flexibility to defer technology selection until the decision to build is made. Second, it provides the NRC with the information necessary for its review and issuance of an ESP. Third, the PPE approach facilitates the combined license process by clearly identifying the set of parameters on which the acceptability of a specific design for a particular site will be based. In a PPE based ESP application, reference to a "proposed" facility, site, or project is not meant to be restrictive to the reactors discussed, but rather encompasses any design bounded by the PPE.

This guidance was developed based on industry experience with large light water reactor technology; however, the concept should be scalable and adaptable to a wider range of reactor technologies.

2 DEFINITIONS

Combined License or Combined Operating License ("COL") are used interchangeably and mean a combined construction permit and operating license with conditions for a nuclear power facility, issued under 10 CFR Part 52.

Design Parameters are the postulated features of a reactor or reactors that could be built at a proposed site. Design parameters are specified in an early site permit.

Early Site Permit ("ESP") means an NRC approval issued under 10 CFR Part 52, for a site for one or more nuclear power facilities. An Early Site Permit addresses site suitability issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design.

Environmental Report (ER) contains the information that is required by the NRC in order to meet the requirements of the National Environmental Policy Act (NEPA) regarding assessment of the impact that the proposed project may have upon the environment.

Final Safety Analysis Report (FSAR) is a report required by 10 CFR 50.34(b) to be included in each application for a license to operate a nuclear facility, and shall include a description of the facility, the design bases and limits on its operation, and a safety analysis of the systems, structures, and components (SSC)s and of the facility as a whole.

Design Control Document (DCD). The generic version of this document contains information and generic technical specifications that are incorporated by reference into a design certification rule. The plant specific version of the document consists of generic DCD information modified and supplemented by the plant specific departures and exemptions from a referenced generic DCD. The plant specific DCD is an integral part of the COL applicant's FSAR and is maintained in accordance with Section X of the applicable design certification rule.

Limited Work Authorization (LWA) is authorization from the NRC to an applicant to conduct certain construction activities pursuant to 10 CFR 50.10(e)(1), for LWA-1, or 10 CFR 50.10(e)(3)(i), for LWA-2.

Owner/Engineered Parameters are the postulated features of a reactor or reactors that could be built at a proposed site that are derived from a combination of vendor and site information – e.g. become features of the reactor or reactors that are uniquely tailored to a given site.

Plant Parameter Envelope (PPE) is a set of reactor and owner engineered parameters listed in the Early Site Permit (ESP) that are expected to bound the characteristics of a reactor that might later be deployed at the ESP site. A PPE sets forth postulated values of parameters that provide details to support the NRC staff's review of an ESP application.

Reactor Parameters are the postulated features of a reactor or reactors that could be built at a proposed site (these are referred to as "design parameters" in 10 CFR Part 52.1(a)).

Site Characteristics are the actual physical, environmental and demographic features of a specific site. Site characteristics are specified in an early site permit or in a final safety analysis report for a combined license.

Site Information is the physical description of the postulated features of a site that is used, in combination with vendor information, to develop Owner/Engineered Parameters.

Site Parameters are specified by a reactor vendor, independent of a particular site and represent "postulated" physical, environmental, and demographic features of an assumed site that is utilized as a basis for the design analysis. Site parameters are provided as part of a standard design certification and allow the NRC to evaluate the safety and environmental impacts of the specific reactor design on a postulated or "typical" site.

Site Safety Analysis Report (SSAR) contains the technical information required by 10 CFR Part 52.17(a) (1) to be submitted by an applicant as a fundamental component of any ESP application.

Small Reactors are power reactors with output less than 300 MWe.

Supplemental Information for Environmental Permitting are the subset of physical, environmental and demographic features of a site that are not needed as input to an ESP application, but are required to be provided as inputs to various state, local, and other agency (not-NRC) permitting processes.

Vendor Information is the physical description of the parameters of a reactor as obtained from the reactor vendor that is used, in combination with site information, to develop Owner/Engineered Parameters.

3 GENERAL PROCESS DESCRIPTION AND GUIDANCE

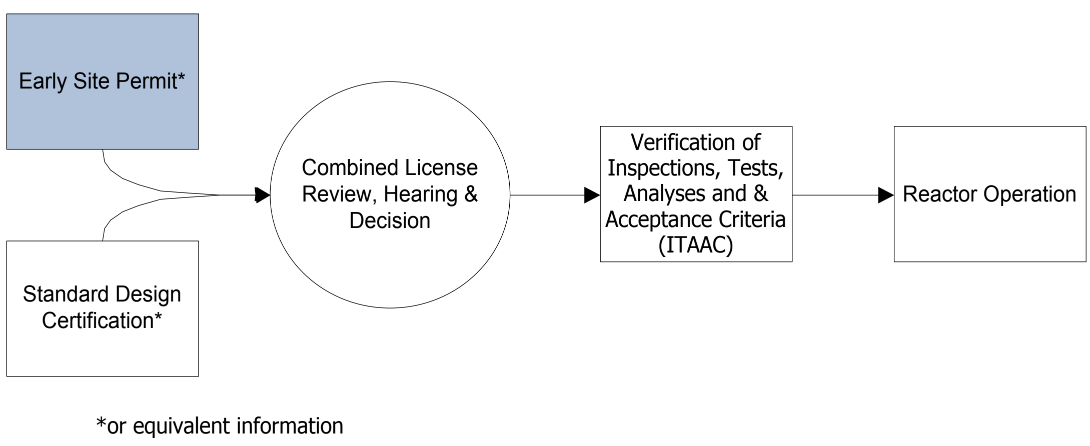
3.1 OBJECTIVES OF A PLANT PARAMETER ENVELOPE (PPE) BASED ESP

3.1.1 Consistency with 10 CFR Part 52 Process

Under the NRC's regulations in 10 CFR Part 52, the agency issues an early site permit (ESP) for approval of one or more sites separate from an application for a construction permit or combined license. Such permits are good for 10 to 20 years and can be renewed for an additional 10 to 20 years. The NRC review of an ESP application addresses site safety issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design.

Successful completion of the ESP process resolves many site related safety and environmental issues and determines if a site is suitable for possible future construction and operation of a nuclear power plant. 10 CFR Part 52 allows a prospective applicant to achieve finality on these issues early in the licensing process of a nuclear power facility. The provisions of Subpart A of 10 CFR 52 apply to an applicant seeking an ESP separate from an application for a construction permit or for a combined operating license for a facility.

Relationship Between Combined Licenses, Early Site Permits and Standard Design Certifications



The ESP application may specify a reactor design; however it is not required by the NRC regulations. If a reactor design is not specified in the ESP application, the application may provide a set of plant parameters that are expected to envelope the design of a reactor or reactors that might be later deployed at the site. The set of enveloping plant parameters is defined as the Plant Parameter Envelope (PPE).

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; or in the case of an ESP using a PPE approach these issues could be resolved before selection of a specific reactor technology is made. This process is ideal for proposed sites that the applicant may not plan to use in the near term.

3.1.2 Certainty of Foundation for COL

The 10 CFR Part 52 COL application process becomes more effective and efficient when the COL application references an ESP and a certified standard plant design because there is less new information for NRC to review. Environmental and safety issues resolved by prior regulatory actions (ESP process and/or Design Certification rulemaking) are not reconsidered during the COL application review, except under demonstrated "changed conditions." For example, the ER submitted with COL must evaluate information that meets the NEPA threshold of "new and significant" in comparison to the ER submitted and EIS issued at the ESP stage. Similarly, the ESP Site Safety Analysis Report (SSAR) gets incorporated into the COL application provided there is a demonstration that the SSAR bounds the technology specific COL application. A PPE based ESP provides an opportunity for the COL applicant to gain flexibility by deferring technology selection while maintaining finality on site safety and environmental issues.

An ESP provides the applicant with an opportunity to work with other stakeholders at an early point to identify and gain closure on site environmental issues that have challenged applicants in the past. Guidance on early interactions with these stakeholders is provided in NEI 01-07, *Industry Guideline for Effective Pre-Application Interactions with Agencies other than NRC during the Early Site Permit Process.*

Site environmental issues challenged previous applicants and could continue to challenge some COL applicants. Unique site issues may be identified in a number of ways. Ideally the detailed site investigations conducted by the applicant identify any site issues so they can be resolved in the application. Frequently however new issues may be identified by external stakeholders or by federal agencies cooperating with the NRC review of the application. This is an important risk commercial mitigation strategy as it can confirm the viability of the site prior to the expenditure of significant resources.

Resolution of these issues is needed for the NRC to approve the application and may involve:

- more site investigation,
- detailed modeling, and
- development and demonstration of detailed mitigation plans.

These additional activities can disrupt project schedules causing expensive delays.

The ESP allows for the early identification and closure of site issues, prior to a large financial commitment (e.g. purchase of long lead time components). The second benefit of the ESP is that it provides a vehicle for State and Local governments as well as other external stakeholders to get involved early in the process of siting a nuclear reactor. The applicant is able to gauge the level of support for the project in the local community.

The applicant has a number of options for content in the application, depending on the amount of closure desired versus the expense of engineering and preparation. Examples of areas where an applicant has the flexibility to provide additional detail to gain finality through a PPE based ESP include:

- Site facilities – Some conceptual design work enables the applicant to accurately describe the environmental impacts of construction and operation. This includes descriptions of permanent plant as well as temporary construction parking, offices, warehouses, shops

- Construction methods – Chapter 4 of the Environmental Report addresses the environmental impacts of construction. Details about construction issues such as soil management, excavation methods, shop needs, large component and material delivery methods are needed to adequately describe the environmental impacts.

- Transmission – A description of the number, length, voltage, and possible routing of any anticipated new transmission is needed to evaluate the environmental impact of constructing and operating new transmission lines.

- Intake and discharge – Some detail on intake flow rates as well as screen design and capture velocities is needed to determine aquatic species impingement and entrapment rates.

- Long-term low level radioactive waste (LLRW) storage – A discussion of the extent to which the site is adequate for the storage of LLRW. The volume of LLRW is described in 11.2.2. of the PPE and any LLRW building would be within the envelope of the disturbed area described in the PPE.

There are some areas where it may not be feasible to gain finality at the ESP stage – for example, the potential for radiological release to the environment. While this topic can be discussed in a general sense in the ESP, it can only be fully addressed when both site characteristics (site surface and ground water hydrology) and engineered design features (leak mitigation design features) are integrated. This more appropriately occurs at the COL stage (after a specific reactor technology has been selected).

An understanding of the NEPA process as well as permitting and local processes is needed to appropriately balance the benefit received from the ESP with resource expenditure expectations at this stage of the process.

3.1.3 Commercial Flexibility

The use of an ESP that is based on a PPE allows the deferral of the technology selection until the applicant submits the COL application to the NRC. This deferral of the technology decision is a key to maintaining commercial flexibility and lowering overall commercial risk. A two step licensing process that includes a technology neutral, site specific ESP followed by a technology specific COLA provides an optimum approach to balancing licensing and financial risks by enabling:

1. Early Resolution of Site Specific Issues
2. Deferral of Technology Selection
3. Technology Selection Concurrent with Commercial Agreement

The two step review process may result in a lengthened NRC review period and increased NRC review fees, however, the commercial and technical flexibility retained through this approach can offset these negatives through a significant reduction in commercial risk.

3.1.3.1 Early Resolution of Site-Specific Issues

The use of a PPE as a surrogate plant in the ESP licensing process allows the ESP application to be prepared independent from reactor technology selection. The NRC issuance of an ESP provides the permit holder with a degree of finality in the majority of siting issues associated with the construction and operation of a commercial nuclear power plant.

The NRC's design centered approach has favored the generic resolution of licensing issues associated with a given technology. This approach forecasts further efficiency gains for future applications referencing a mature technology. The opportunities for efficiency gains for siting issues are more limited. Therefore, the review of site-specific issues presents the greatest regulatory risk and schedule uncertainty. The ability to resolve siting issues independently and in advance of the technology selection can greatly reduce overall project commercial risk.

3.1.3.2 Deferral of Technology Selection

Technology selection and subsequent resolution of commercial issues can be challenging. Early selection of a reactor technology makes it difficult for the applicant to resolve commercial issues as part of the technology selection. Raw material costs are linked to global markets and are subject to price fluctuations outside the control of the contract parties. Contract negotiations are likely to end up with a final cost that is dependent on a number of indices to address variable costs such as raw materials, labor, and inflation. This condition eliminates cost certainty that is an important part of an applicant's decision to build a nuclear power plant.

Moving technology selection further back on the project schedule by performing it in parallel with resolution of siting issues minimizes price uncertainty by reducing the period between contract negotiation and the point, after regulatory approval, at which costs are actually incurred.

In the development of a PPE, the applicant typically draws data from a number of plant technologies under consideration to construct a bounding envelope. It is important to note, that when issuing the permit, the NRC approves the PPE rather than the specific technologies that the PPE was drawn from. As such, any plant technology that can be demonstrated to be bounded by the PPE is suitable for use in a COLA.

In cases where the technology is not bounded by the ESP PPE, the applicant must identify the impact and demonstrate that it is acceptable in the COLA. This provides the COL applicant a tremendous amount of flexibility in selecting a technology. By deferring the technology selection to the COLA, the applicant has the ability to reassess the designs initially considered; as well as consider new designs as they emerge and mature. This option provides flexibility to both ESP and design certification applicants to identify potential opportunities.

3.1.3.3 Technology Selection Concurrent with the Commercial Agreement

One of the major challenges in an engineering, procurement, and construction (EPC) contract negotiation is the identification, quantification, and assignment of commercial risk in the contract. This dynamic becomes less manageable as the contract duration is extended and the ability to reliably forecast future pricing (e.g., labor, commodities, etc.) erodes. The initial COL applications developed under 10 CFR 52 were submitted to the NRC in the 2007 and 2008 timeframe. These applications contained estimated commercial operation dates of 2016 and beyond. These efforts were consistent in that the technology was selected and the COLA was submitted prior to the agreement on terms and conditions for the EPC contract.

Some applicants ran into challenges in the contract negotiation process. There are many challenges in negotiating a contract; however, two important factors have their source in the licensing process. The first factor is that the length of the licensing process increases the commercial risk. Having a PPE on which an ESP application can be based reduces this risk by shortening the time between technology selection and the point at which the applicant plans significant cash payments for the technology. This results in less financial risk for all parties to the negotiation. The second factor is that the applicant's financial leverage is limited once the COLA is submitted.

Deferral of technology selection until the COL process allows the applicant to select the technology as part of the financial negotiation. This option is enabled because the timing for planning, scheduling, and procuring long lead time items approximates the lead time necessary to select a technology to support the COL application development. Thus, the EPC can be negotiated with a shortened planning horizon and in close proximity to the commitment of resources.

3.2 VENDOR INFORMATION

The development of the PPE is a multi-step process that requires some preliminary knowledge of the site and possible reactor technologies. This knowledge is needed to assess if some potential technologies have unique parameters that make it more challenging to build on the selected site. Frequent communication with the reactor vendors is recommended to understand those parameters. Gathering this information also helps to narrow the number of reactor technologies considered in the PPE and simplify the process.

3.2.1 Development of Vendor Information Worksheet

The Vendor Information Worksheet provided in Appendix B was developed from information in the previous ESP submittals and input from the reactor vendors.

The PPE used in the first three ESP submittals (Clinton, Grand Gulf, and North Anna) included parameters that were not essential to a conclusion that the site is suitable for a reactor. The initial PPE developed for those applications was developed before the NRC reviewed the applications and as a result, it was large and included parameters that were not needed in the NRC reviews. As such, the non-essential parameters were a source of confusion during those PPE ESP reviews.

In the preparation of the Vendor Information Worksheet in Appendix B, a review of the first three ESPs was conducted, including the NRC Safety Evaluation Reports and Environmental Impact Statements. The reviews identified which parameters were used to support the conclusion that the site is suitable for a reactor. As a result, the number of parameters in the Vendor Information Worksheet in Appendix B is reduced in comparison to what was in the first three PPE based ESPs.

A second review of the Vendor Information Worksheet was conducted with input from a number of reactor vendors. The Vendor Information Worksheet in Appendix B is the result of these reviews.

Once an ESP applicant has obtained and/or developed parameter values and entered them on the Vendor Information Worksheet, it is the applicant's responsibility to assure that these values are maintained current and that the impact of any changes on the ESP application is addressed.

3.2.2 Types of Parameters Included in the Vendor Information Worksheet

Parameters given in the Vendor Information Worksheet are divided into one of three categories; Reactor Parameters, Owner Engineered Parameters, or Site Parameters.

3.2.2.1 Reactor Parameters

Reactor Parameters are parameters that are generally given in the reactor vendors DCD. These parameters are independent of any site characteristics. Examples include:

- reactor thermal power
- fuel end of life burn-up
- normal operations radionuclide gaseous release rates(Ci/yr)

3.2.2.2 Owner-Engineered Parameters

Owner-engineered parameters are the parameters that depend in part on the reactor, but also on the site information. Some conceptual engineering work may be required to develop the appropriate value for the site under consideration. As described in Section 3.1.2, the level of detail provided and the number of parameters developed is dependent on the applicant. Some items are not required in an ESP and can be deferred to the COL application. For example, water studies are required to understand the capability of the cooling water supply to meet the needs of the plant as well as potable water. Annual water temperature ranges as well as particulate loading and salinity are needed to fully describe the parameters. The applicant may choose to defer this analysis. Examples of owner-engineered parameters include:

- cooling water consumption
- blowdown flow rate
- switchyard & transmission footprint

3.2.2.3 Site Parameters

Site Parameters are provided by the reactor vendors and describe the site environment for which the reactor is designed. Site parameters are not part of the ESP application, but rather are identified in the design certification for comparison with site characteristics as part of the COLA review.

In the ESP application, the applicant determines the site characteristics (see Section 3.4.1) for the proposed site which are then submitted to the NRC. The applicant should monitor the development of site characteristics and compare them to the site parameters from the vendors. If the parameter is not enveloped by the characteristic a variance may be required in the COLA.

3.2.3 Selecting Bounding Values from Vendor Information for Multiple Designs

The applicant sends the Vendor Information Worksheet to each of the reactor vendors under consideration. Vendor responses are compiled and the bounding value selected for each parameter. Selection of the bounding value requires the applicant to consider how the value is used. For example the bounding value for the reactor power is the maximum thermal power, while the bounding value for the snow load is the minimum of the snow load design values provided by the vendors.

3.3 SITE INFORMATION

The purpose of this section is to describe how site information is developed and the role that it plays in a PPE-based ESP. Specifically, this section addresses how site information translates into owner engineered parameters, site characteristics and supplemental information for environmental permitting.

3.3.1 Use of Site Information in Developing Owner-Engineered Parameters

Many of the parameters specified in the PPE are dependent both on input from the reactor vendors and on site information. For example, with respect to the cooling system, cooling tower drift is dependent on site meteorological information (such as temperature and humidity), whereas reactor heat rejection depends on the particular technology selected. Owner-engineered parameters are developed using site characteristics from the site investigations as well as reactor information from the Vendor Information Worksheets. Some conceptual design engineering is needed to develop the values. The applicant must determine the amount and extent of the conceptual engineering performed to support the ESP. Factors in the decision include the amount of closure on environmental issues that the applicant is hoping to achieve, the amount of information readily available, and the cost and time required to gather more data and complete the analysis.

3.3.2 Distinction between Site Characteristics and Site Parameters

Site characteristics are the actual physical, environmental and demographic features of a site. Site characteristics are specified in an ESP. A COL application referencing an ESP must contain sufficient information about the reactor technology to demonstrate that the design of the facility falls within the specified site characteristics.

Site parameters differ from site characteristics in that they are specified by a reactor vendor, independent of a particular site and represent “postulated” physical, environmental and demographic features of an assumed site. Site parameters are provided as part of a standard DCD and allow the NRC to evaluate the safety and environmental impacts of the specific reactor design on a postulated or “typical” site.

Term	Definition	Purpose	Site location	Reactor Technology
Site Characteristics	Actual physical, environmental and demographic features of a site.	Specified in the early site permit application or in a final safety analysis report for a combined license.	Specific	Postulated (if a PPE approach is utilized in the ESP)
Site Parameters	Postulated physical, environmental and demographic features of an assumed site.	Specified in a standard design approval, standard design certification or manufacturing license.	Postulated	Specific

As this comparison table shows, site characteristics reflect site specific information, developed by an applicant and included in an ESP. If the ESP is based on a PPE approach, then the reactor design is postulated by the applicant.

Examples of site characteristics include:

- ground motion
- wind speed
- demographics

3.3.3 Supplemental Information for Environmental Permitting

The NRC staff conducts environmental reviews to address construction and operation of nuclear power plants for ESPs and COLs in order to meet its obligations under NEPA. In the case of an ESP, the major federal action is the issuance of the permit which demonstrates that a site is suitable for the construction and operation of any reactor plant technology that is bounded by the envelope defined in the permit.

In addition to the NRC licensing process, an applicant is required to obtain a number of permits from the state and other agencies to support specific aspects of nuclear power plant construction and operations. The permitting actions conducted by the State and other agencies can be independent in terms of focus and timing from the NRC's process. These additional permits are typically focused on a specific impact from construction or operations and likewise more limiting regarding the activities that are authorized. Based on the lead times needed to support the NRC licensing process, the ESP application is typically submitted to the NRC well before applications are submitted to the State and other agencies for permitting.

The differences in purpose and timing make the information provided to the State and other agencies for permitting more limited in focus and more detailed in content than the information included in the ESP application. The term supplemental information is used to describe the information used for permitting that is not required for the ESP application. Figure 1 includes a path for site information used in permitting with the State or other agencies that includes information from the ESP application and supplemental information as required by the specific permitting process.

3.4 DEVELOPMENT OF A PPE

The PPE is a composite of reactor parameters and owner engineered parameters that bound the safety and environmental impact of plant construction and operation on the site. The PPE is used to define what is in effect a "surrogate plant" that can bound two or more technologies. This surrogate plant is used as an input for the analyses needed to support the development of the ESP application. When the applicant elects to move forward with a COLA, a reactor plant technology must be selected. The selection of one of the technologies used in the construction of the PPE or a future technology that is demonstrated to be bounded by the PPE maximizes the benefits of the ESP. This process provides reasonable assurance that siting issues will remain resolved when a reactor plant technology is selected and the ESP is incorporated into a combined license application.

3.4.1 Constructing the PPE from Selected Bounding Values

The PPE is constructed as a compilation of reactor parameters obtained from the Vendor Information Worksheet and owner engineered parameters which are derived from a combination of reactor vendor information and site data. Appendix B provides a sample of the Vendor Information Worksheet. Additionally, the Vendor Information Worksheet designates each parameter as either a reactor parameter or an owner engineered parameter.

Reactor parameters for each design are obtained from the Vendor Information Worksheet. When considering multiple reactor technologies, a bounding value must be selected on a parameter specific basis to represent the surrogate plant. In selecting the bounding values, the applicant should consider the need to build in design margin as part of the development of the surrogate plant. The maturity of the reactor technology, the sensitivity of the parameter to the regulatory decision, economic considerations, and site specific information should be considered in making these decisions.

The owner engineered parameters are typically obtained through a site specific analysis that considers information from the reactor vendor along with site specific information. The reactor vendors can often provide an early estimate for these parameters. However, these parameters need further refinement by the applicant to include site specific considerations. For example, the reactor vendor may estimate cooling tower performance for nominal and extreme cases and may recommend specific chemicals for corrosion and fouling control. However, actual cooling tower performance and chemical treatment needs will be based on local weather patterns and water quality.

3.4.2 Use of the PPE Table

The bounding values describing the surrogate plant are assembled in a PPE table that is used in the preparation of the ESP application. Establishing the parameters early in the project is critical because it becomes a tool for the project team to use. Establishing revision control on the PPE table enables the project team to ensure design calculations use consistent parameters. It also aids in the qualitative assessments of environmental impacts that are performed in the Environmental Report. Appendix C provides a sample PPE table. Consistent with the definition provided in RS-002 this table does not contain site parameters because site parameters are the postulated physical, environmental and demographic features of an assumed site that are specified in a standard design approval or standard design certification per 10 CFR Part 52.1 (a). An applicant may want to compile a set of bounding site parameters for comparison with its site characteristics for its own use in identifying potential COL application departures and exemptions from the standard design, but such information should not be included in the ESP application. The comparison of site characteristics and site parameters is performed in the COL application per 10 CFR 50.79. Options for presentation of the PPE in the ESP application are described below.

3.4.3 Incorporating the PPE into the ESP Application

The PPE is incorporated into the ESP application to support the NRC review. The incorporation process is complicated by a number of factors. First, the PPE supports the development of both the site safety analysis report (SSAR) and the environmental report (ER). While some parameters are only used to support either the SSAR or the ER, many parameters support both documents. Secondly, from a configuration control perspective it is undesirable to locate identical content in multiple locations within an ESP application. Thirdly, the NRC expects the information supporting the SSAR to be located in the SSAR or incorporated into the SSAR by reference to another part of the application. Finally, the SSAR will be incorporated into a future combined license if an applicant submits a COLA referencing an ESP/PPE that is approved by the NRC. The applicant has a number of options for locating the PPE in the ESP application:

1. Docket the PPE as an independent part of the application in which each parameter is designated for use in the SSAR, ER, or both documents. The SSAR and ER can incorporate the PPE by reference on a document specific basis.

2. The complete PPE can be incorporated into Chapter 1 or 2 of the SSAR. The SSAR continues to have relevance after the ESP is issued while the ER does not.

3. The PPE can be segregated between the SSAR and ER. Parameters needed in the SSAR should be located in Chapter 1 or 2 of the SSAR and the parameters supporting the ER should be located in Chapter 2 or 3 of the ER.

All three options are acceptable alternatives. There are a number of factors that influence the applicant's selection of a specific option. The ESP application is a complex document. From a configuration control perspective it is desirable to minimize the duplication of information within the application. The complexities of maintaining configuration control for the ESP application are increased when the need to update the SSAR and ER at different intervals during the review process is considered.

Option 1 may provide the most flexibility to the applicant in managing configuration control challenges as parts of the application are updated at varying frequencies. A central location of PPE information can facilitate the NRC staff's review and minimize the applicant's challenges in maintaining the document.

Option 2 provides the advantage of ease in developing the application in accordance with NRC requirements.

Option 3 provides improved efficiency by assuring that only the parameters required for the SSAR or ER are included in the documents and further subjects only those parameters in the SSAR to a regular requirement for updating. An SSAR listing of reactor and owner engineered parameters will facilitate the NRC's development of the corresponding appendices contained in the issued ESP.

The PPE included in the application should contain the following categories of information: PPE Section, Definition, Bounding Value / Units, Applicability (SSAR and/or ER), and Notes/Comments. Efficiencies can be gained in constructing the PPE in a manner similar to the Vendor Information Worksheet as shown in Appendix B. Care should be taken when considering multi-unit sites to differentiate between unit-specific and site-specific values.

4 DEVELOPMENT OF NORMAL AND ACCIDENT SOURCE TERMS FOR A PPE-BASED ESP

Design certifications currently under review by the NRC all use ground level release points with no elevated release points. Site orientation may not be known so it may not be possible to determine near field doses. In a PPE based ESP the applicant will determine gaseous effluent doses at the site boundary, Exclusion Area Boundary (EAB) and Low Population Zone (LPZ).

Normal Releases:

For the normal release analysis the applicant should assemble a list of the radionuclides released by each pathway (gaseous, liquid) for each reactor technology under consideration. Reactor vendors typically provide this information on an annual basis which include releases from intermittent or purge activities. For each radionuclide the release quantity from each reactor technology is compared and the highest value selected. The composite release table represents the bounding nuclide releases due to normal operations. The dose calculation is then performed using a computer code that analyzes all of the transport pathways to man as described in NUREG 0800 and NUREG 1555. Separate analyses are required for the gaseous and liquid pathways since they have different pathway characteristics and limits. For Greenfield sites that lack an Offsite Dose Calculation Manual a significant effort is required to define the plant parameters needed to perform these analyses.

Accident Releases:

Accident analyses model the time dependent transport of radionuclides out of the reactor core through several pathways, each with different time dependent removal mechanisms for radionuclides. Each reactor design has different release pathways, and each pathway has different release rates and different radionuclide removal mechanisms. Given the differences in the reactor designs, it is not possible to develop a bounding analysis for use in PPE based ESP.

In addition, the applicant using a PPE may not know the site layout and building configuration making it impossible to model near field atmospheric dispersion around buildings in order to determine doses in the main control room and other areas where habitability is required post accident. Detailed accident analyses are more appropriately performed in the COLA, when a technology is selected and the orientation of the plant onsite is known.

Based on the source term data requested from the vendors in Tables 8 and 9 of the vendor information worksheet, the applicant should perform an evaluation of offsite doses at the EAB and LPZ in order to demonstrate compliance with the 10CFR100 limits. For current generation nuclear power plants, these locations are far enough from the plant that building wake effects are insignificant. The reactor design certifications currently under review by the NRC all have a single X/Q value for each offsite location and time period and do NOT have an elevated release point. Therefore the calculation of offsite dose is performed by taking a simple ratio of the site characteristic X/Q divided by the vendor site parameter X/Q and applying it to the vendor dose. For example:

Site EAB dose = Vendor EAB dose * Site X/Q / Vendor X/Q

The vendor specific radionuclide emissions and vendor specific X/Q's should be presented in chapter 15 of the Safety Analysis Report.

Severe Accident Releases:

Applicants for an ESP are not required to address severe accident mitigation alternatives in the SSAR. If sufficient design information is not available at the ESP stage, then NRC review and findings will be deferred to the COL stage. However, the NRC expects the applicant to address severe accident impacts in its ER at the ESP stage.

ESP applications may reference approved severe accident mitigation design alternative (SAMDA) analyses for one or more certified standard designs. ESP applications that reference approved SAMDA analyses would also demonstrate either:

a. The site parameters assumed in the approved SAMDA analyses are conservative with respect to the characteristics of the proposed site, or

b. The characteristics of the proposed site will not result in severe accident impacts that are significantly greater than those evaluated in the referenced design certification(s).

In either case, the ESP applicant would request the NRC to determine, when granting the ESP, that severe accident issues are resolved for purposes of a COL proceeding based on a certified standard design and an ESP that references approved SAMDA analyses for that same certified design.

NUREG-1555, Section 7.2 provides guidance for ESP applications regarding consideration of severe accidents in the ER. Severe accidents are those involving multiple failures of equipment or function and, therefore, the likelihood of occurrence is lower for severe accidents than for design basis accidents, but the consequences of such accidents may be higher. The environmental consequences of severe accidents are estimated using acceptable methodology (such as the MACCS2 code package; Chanin and Young 1997). If the ESP application uses the PPE approach, then the severe accident analysis evaluation can be based on the generic certification analyses of a representative set of reactor designs. For example, a typical advanced BWR and a typical advanced PWR, or typical advanced passive and active ECCS designs, can be selected to represent the entire suite of advanced light water reactor technologies. This approach is appropriate because:

- A representative analysis is acceptable under the National Environmental Policy Act.
- The greatest risk associated with a new generation reactor design (for which data is available) is well below that of the already low risk associated with the existing fleet undergoing license renewal.

The severe accident analyses use the source term parameters (e.g., core inventory, release height at top of containment, release heat, nuclide release fractions and durations) applied in the generic PRAs. The analysis evaluates the impacts of a severe accident at the proposed site to demonstrate that the impacts are bounded by the generic certification analyses.

5 QUALITY ASSURANCE

The collection of reactor vendor plant parameter data to support development of the Vendor Information Worksheet is not a safety-related activity, and therefore, is not subject to 10 CFR Part 50 Appendix B Quality Assurance requirements. The Vendor Information Worksheet is not used in the design, fabrication, construction, testing, or operation of any safety-related structure, system, or component (SSC) at the ESP application stage. However, the information provided by the reactor vendors in the Vendor Information Worksheet (see Appendix B) will be used to establish the bounding surrogate plant parameters for the ESP Application SSAR and ER. Therefore, to assure confidence in the accuracy of the information, the reactor vendors should provide the requested reactor design parameter data developed to support the respective Design Control Document (DCD), developed in accordance with the reactor vendor's 10 CFR Part 50 Appendix B Quality Assurance program.

It is important to note that ESP activities associated with site safety must be controlled by Quality Assurance measures sufficient to provide reasonable assurance that future safety-related Systems Structures and Components (SSCs) of a nuclear power plant or plants that might be constructed on the site will perform adequately in service. For example, site characterization activities associated with data collection, analysis, and evaluation for soil composition, geology, hydrology, meteorology, and seismology determinations must be subject to Quality Assurance controls commensurate with the importance of the respective activities to design, and equivalent in substance to the controls described in Appendix B to 10 CFR Part 50. These safety-related activities support the future engineering, design, and accident analysis for a facility or facilities to be constructed on the proposed site. ESP applicants may use existing operating plant Quality Assurance program measures and controls, implemented to satisfy the requirements of 10 CFR Part 50 Appendix B, as supplemented by ESP project specific procedures or may develop a separate, 10 CFR Part 50 Appendix B compliant, new plant development Quality Assurance program.

SSAR Chapter 17 should describe the quality assurance applied to the safety-related activities supporting the SSAR. Additional quality assurance guidance and requirements relevant to the ESP application are provided or referenced in NEI 06-14, "Quality Assurance Program Description (QAPD)";.

6 SPECIFIC CONSIDERATIONS UNIQUE TO SMALL REACTORS

This guidance was developed based on industry experience with large light water reactor technology; however, the concept should be scalable and adaptable to a wider range of reactor technologies. Specifically, smaller reactors are being developed to provide energy companies and other users with additional options. Their small size less than 300 megawatts electric and modular construction will allow these new small reactors to be built in a controlled factory setting and installed module by module reducing construction time and financing costs.

Many small reactor designs are under development to meet specific U.S. and international market needs, and they are attracting considerable attention from the electric utility industry, state and local government officials, Congress, and the news media. The three major types are: light water reactors, high-temperature gas-cooled reactors, and liquid metal-cooled fast reactors.

Experience with the inclusion of light water and gas-cooled small reactors in PPE based ESPs indicates that this guidance can be readily adapted for most small reactor designs.

The sections below describe unique considerations that should be addressed when applying this guidance to a small reactor project.

6.1 APPLICABILITY OF VENDOR WORKSHEET TO SMALL REACTORS

The Vendor Information Worksheet (Appendix B) has been reviewed by a number of small reactor vendors and found to include a sufficient range of parameters to bound most small reactor designs. Of course, in some cases, a particular parameter might be designated as "not applicable". Conversely, there may be parameters that are unique to a given small reactor design that do not have precedents in large light water reactor experience. Sections 3.6, 7.2, and 18.8 of the Vendor Information Worksheet are intended to address some of these types of parameters.

One of the most important considerations for many small reactor projects is the need to multiply certain single unit parameter values by the number of units when multiple small reactors are intended to be deployed in a modular fashion. Small reactor designs may include some systems that are shared by multiple units and other systems that are individual to each reactor. For the thermal and electric power level requested by the ESP applicant, the small reactor vendor should provide the appropriate values that account for shared systems and multiple individual systems. Accordingly, when small reactors are to be deployed in a modular fashion, information should be requested from the vendor on a total desired power output basis.

6.2 CAPTURING BOTH LARGE AND SMALL REACTORS IN A SINGLE SUBMITTAL

The Plant Parameter Envelope (PPE) approach for an Early Site Permit (ESP) can be used when both large and small reactor designs are being considered for a selected site. In accordance with 10 CFR 52.17(a)(1)(i), the ESP application must specify the number, type, and thermal and electric power level of the facilities for which the ESP site may be used. Therefore, it is important to determine the overall number of modular reactors envisioned for the site. This will allow a more direct comparison of the small reactor design(s) to the large Light-Water Reactor (LWR) design(s), in terms of site-related design parameters and site characteristics, when capturing both types of designs into a single PPE.

In most cases, small reactor designs can be directly compared to large LWRs utilizing the Vendor Information Worksheet provided in Appendix B. Parameters such as site acreage for plant layout and power block acreage requirements, plant megawatts, cooling water requirements, raw water requirements, plant population (operation), and annual plant emissions should be based on the total number of reactors expected to be licensed for the selected site.

Construction impacts and socioeconomic impacts for construction and operation of small reactors can be expected to be bounded by the impacts associated with large LWRs, even though the overall construction schedules may reflect different timeframes.

Small reactor design parameters can be enveloping for the site. In the case of some small reactor designs that are installed below grade elevation for example, the PPE site-related design parameter for plant foundation embedment depth could potentially be the bounding design value. Additionally, bounding PPE site characteristic values for atmospheric dispersion factors could be based on a small reactor design installed below grade elevation because of the absence of some above ground building wake effects, which can provide added dispersion for accident release dose consequence analysis. Similarly, the specific radioisotopes that will need to be considered for some small reactors will be different requiring some radioisotopes to be added to release evaluations and reflected in Tables 3, 7, 8, 9, 10 and 11 of the Sample PPE Table in Appendix C.

Other site parameters to consider when including small reactors along with large LWRs in the PPE include Exclusion Area Boundary, Low Population Zone, and nearest population center distance, since these parameters may be uniquely defined for small reactors. Additionally, design parameters for some small reactor designs, such as source terms, release points, accident analysis dose consequences may be different compared to large LWR reactor designs. In order to evaluate these comparisons and prepare a PPE it will be important to understand the small reactor design and licensing basis.

6.3 SMALL REACTOR SOURCE TERM AND RADIOLOGICAL IMPACTS

Small reactor source terms and radiological impacts are expected to be different from the current generation of large light water reactors. However, it should still be practical to develop enveloping normal and accident radiological parameters for a PPE.

Small reactors may have a unique set of potential design basis accident scenarios. The type of bounding accidents may be different than a Loss of Coolant Accident (LOCA). The actual spectrum of design basis accident scenarios must be obtained from the individual reactor technology vendors since the specific scenarios may differ. However, these unique types of accident scenarios can still be addressed in a PPE using the existing regulatory framework.

For example, PPE Table 9 accident time intervals are based on several regulatory documents, specifically 10 CFR 50.67 and 10 CFR 100 as well as USNRC regulatory guides 1.4, 1.77, 1.183, and 1.195. 10 CFR 50.67 and 10 CFR 100 require that design basis radiological doses be calculated for 2 hours at the EAB and for the entire period of the plume passage at the LPZ with specific dose limits. The aforementioned regulatory guides specify atmospheric dispersion factors (also known as χ/Q) for each of the following time periods: 0-8 hours; 8-24 hours; 1-4 days; and 4-30 days. These regulatory guides also specify different public and control room operator breathing rates for 0-8 hours; 8-24 hours; and greater than 24 hours. The breathing rates, in conjunction with the χ/Q and source terms are used to calculate dose. All these CFR sections and regulatory guides would apply equally to a small reactor. There is an implied 30 day time period for calculating the LPZ dose based on the dispersion factors delineated in the regulatory guides. Therefore, the current time interval for source terms in PPE Table 9 is appropriate and applicable to small reactors without any modification.

APPENDIX A – GENERAL INFORMATION AND REGULATORY BASIS

A.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 have conducted various activities related to its implementation including the review and approval of four early site permits. In August of 2007, NRC published a revised 10 CFR Part 52, taking into account the experience gained over nearly two decades.

After issuing the original 1989 rule, NRC had always intended to update it after gaining some experience using the standard design certification process. NRC began to embark on this process with a proposed revision in 2003. However, in response to stakeholder input and additional experience gained, including the additional insights gained from NRC staff's review of the first three early site permit applications, NRC decided not to proceed with the 2003 proposal. Instead, a second revision was proposed in March 2006. This proposal was successfully promulgated into the current August 2007 rule.

The revised 10 CFR Part 52 rulemaking addressed several topics specific to the early site permit process. Key topics addressed included the following:

- ***The level of finality and certainty provided for by an approved early site permit application***. In this regard NRC decided not to require updating of early site permit information prior to submittal of a combined operating license application, but did make changes to allow early site permit holders the flexibility to make voluntary changes through the license amendment process. NRC also made specific changes to 10 CFR Part 52.39 to describe the different aspects of early site permit finality and describe how NRC treats matters resolved in the early site permit proceeding in subsequent proceedings on applications referencing the early site permit.
- ***The likelihood that future early site permit applicants might not know the specific type of reactor or reactors to be built at a given site***. The 2007 revised rule included changes to 10 CFR 52.17(a)(1) to remove requirements that would be difficult to address without a specific design and add requirements that better define expectations for what must be considered in an early site permit.
- ***Clarification of the definition of terms applicable to an early site permit***. Specifically, the terms site characteristics, site parameters, design characteristics, and design parameters were revised in the 2007 rulemaking. These terms are of fundamental importance to the construction of an early site permit using the plant parameter envelope approach described in the main body of this document.
- ***Clarification of the information that NRC must include in the early site permit when it is issued***. The 2007 revised rule made several changes to 10 CFR 52.24 to achieve consistency with parallel provisions in 10 CFR Part 50 and elsewhere in 10 CFR Part 52.
- ***Clarification of requirements for applicants to request a limited work authorization after receiving an early site permit***. The 2007 revised rule amended 10 CFR 52.17(c) to

require applicants intending to use an early site permit as the basis for a limited work authorization request to identify and describe the specific activities that the applicant intends to perform in the early site permit application

The revised rule was put to the test in the review and approval of a fourth early site permit (for the Vogtle site) in August of 2009. However, since the Vogtle early site permit was based on a specific design, the utility of the rule in preserving finality and certainty while at the same time allowing applicants to preserve flexibility by not choosing a specific design at the early site permit stage was not tested. It is the purpose of the main body of this document to provide guidance that will help applicants who have not chosen a specific design achieve that utility with their early site permit application. The remainder of the information in this Appendix is intended to provide more fundamental information useful to all prospective applicants – regardless of whether or not they have chosen a specific design

A.2 Early Site Permit Purpose and Scope

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

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 10 CFR Part 52.

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.

A.3 Qualifications of Applicants

Any person (as defined in 10 CFR Part 50.2) 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 or 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.

A.4 Regulatory Bases

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

The specific 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*
- Regulatory Guide 1.206
- NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.*
- NRR Review Standard RS-002 (SECY-03-0227) *Processing Applications for Early Site Permits*

The specific 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*
- NRR Review Standard RS-002 (SECY-03-0227) *Processing Applications for Early Site Permits*
- State Environmental Statues, as applicable.

The specific 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)*

The early site permitting process defined by these regulations and shown below in Figure A.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 (as required by 10 CFR 100.2 (g)), and it may also propose major features of emergency plans or provide complete integrated emergency plans for NRC review and approval (as provided for in 10 CFR 52.17 (b)(2)). The application must also contain information demonstrating that site characteristics are such that adequate security plans and measures can be developed (as required by 10 CFR 52.17(a)(1)(x) and 10 CFR 100.21(f).

Figure A.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.

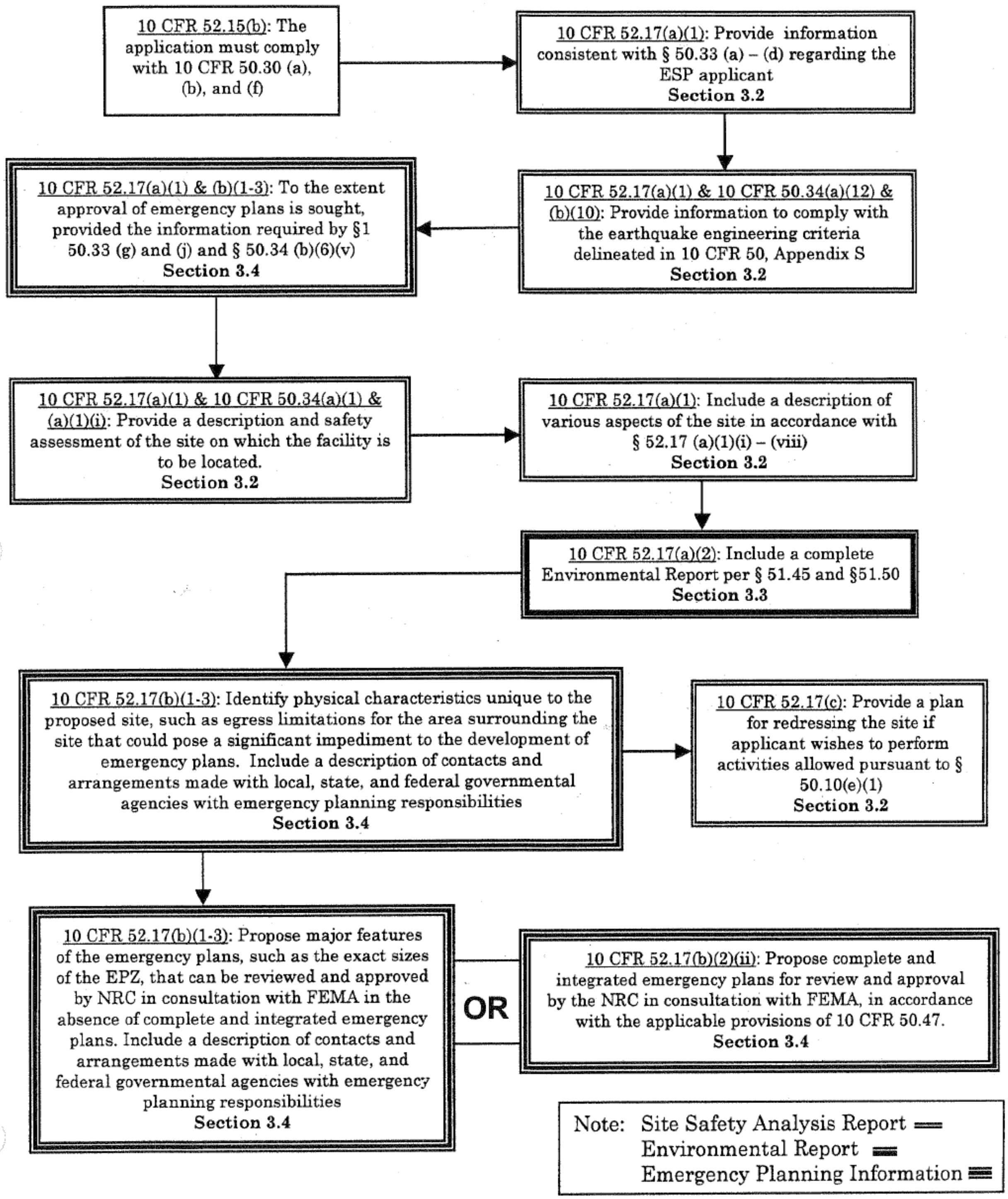
An ESP is valid for not less than 10 or more than 20 years from the date of issuance as the applicant may request. An ESP continues to be valid beyond its date of expiration in any proceeding on a construction permit or a COL application which references the ESP and is docketed before the date of expiration 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 neither less than 10 nor more than 20 years. A renewal application must be filed by the permit holder neither 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, and 52. An overview of these content requirements is shown in Figure A.2. The information presented in the ESP must be sufficient to demonstrate that the site meets the criteria of 10 CFR 100.21 (a) through (h). It must also consider the factors required by 10 CFR 100.20 (a) through (c) as well as the geologic and seismic siting criteria in 10 CFR 100.23.

FIGURE A.2

EARLY SITE PERMIT APPLICATION REQUIREMENTS



APPENDIX B – VENDOR INFORMATION WORKSHEET

TABLE 1 – VENDOR INFORMATION WORKSHEET BY PPE SECTION

TABLE 2 – BLOWDOWN CONSTITUENTS AND CONCENTRATIONS

TABLE 3 – PRINCIPAL RADIONUCLIDES IN SOLID RADWASTE

TABLE 4 – YEARLY EMISSIONS FROM AUXILLIARY BOILERS

TABLE 5 – YEARLY EMISSIONS FROM STANDBY DIESL GENERATORS

TABLE 6 – STANDBY POWER SYSTEM GAS TURBINE FLUE GAS EFFLUENTS

TABLE 7 – UNIT AVERAGE ANNUAL NORMAL GASEOUS RADIOACTIVE RELEASE

TABLE 8 – UNIT ACCIDENTAL GASEOUS RADIOACIVE RELEASE

TABLE 9 – UNIT LOCA ATMOSPHERIC RELEASE BY POST ACCIDENT INTERVAL

TABLE 10 – UNIT AVERAGE ANNUAL NORMAL LIQUID RADIOACTIVE RELEASE

TABLE 11 – UNIT ACCIDENTAL LIQUID RADIOACTIVE RELEASE

TABLE 12 – NOTES

Vendor Information Worksheet

Vendor Information Worksheet

TABLE 1 – VENDOR INFORMATION WORKSHEET BY PPE SECTION

PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
1. Structure						
1.1 Building Characteristics					X	X
1.1.1 Height (w/o Stack and Cooling Towers)	The height from finished grade to the top of the tallest power block structure, excluding cooling towers (excludes stairway towers, elevator, etc).			Rx	X	X
1.1.2 Foundation Embedment	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure.			Rx	X	
1.2 Precipitation (for Roof Design)						
1.2.1 Maximum Rainfall Rate	The probable maximum precipitation (PMP) value that can be accommodated by a plant design. Expressed as maximum precipitation for 1 hour in 1 square mile with a ratio for five minutes to the 1 hour PMP of 0.32 as found in National Weather Service Publication HMR No. 52.			Site	X	
1.2.2 Normal and Extreme Winter Precipitation Events	The loads on structure roofs that can be accommodated by a plant design (i.e. the weight of the 100 year period ground level snowpack and the weight of the 48 hour probable maximum winter precipitation (PMWP))					
1.3 Safe Shutdown Earthquake (SSE)						
1.3.1 Design Response Spectra	The assumed design response spectra used to establish a plant's seismic design.			Site	X	
1.3.2 Peak Ground Acceleration	The maximum earthquake ground acceleration for which a plant is designed; this is defined as the acceleration, which corresponds to the zero period in the response spectra taken in the free field at basemat elevation.			Site	X	
1.3.3 Time History	The plot of earthquake ground motion as a function of time used to establish a plant's seismic design.			Site	X	
1.3.4 Capable Tectonic Structures or Sources	The assumption made in a plant design about the presence of capable faults or earthquake sources in the vicinity of the plant site (e.g., no fault displacement potential within the investigative area).			Site	X	
1.4 Site Water Level (Allowable)						
1.4.1 Maximum Flood	Design assumption regarding the difference in elevation between finished plant grade and the water level due to the probable maximum flood.			Site	X	
1.4.2 Maximum Ground Water	Design assumption regarding the difference in elevation between finished plant grade and the maximum site ground water level used in the plant design.			Site	X	
1.5 Soil Properties Design Bases						
1.5.1 Liquefaction	Design assumption regarding the presence of potentially liquefying soils at a site (e.g., none at Site-Specific SSE).			Site	X	
1.5.2 Minimum Bearing Capacity (Static)	Design assumption regarding the capacity of the competent load-bearing layer required to support the loads exerted by plant structures used in the plant design.			Site	X	
1.5.3 Minimum Shear Wave Velocity	The assumed limiting propagation velocity of shear waves through the foundation materials used in the plant design.			Site	X	
1.5.6 Dynamic Bearing Capacity	Design assumption regarding the capacity of the foundation soil/rock to resist loads imposed by the structures in the event of an earthquake.			Site	X	
1.5.7 Min. Soil Angle of Internal Friction	Design assumption for the minimum value of the internal friction angle of foundation soils, fill soils, or excavation slopes that would provide a safe design of plant through soil structure interaction analyses including sliding along the base.			Site	X	
1.6 Tornado (Design Bases)						

[1] In the case of multiple reactors on the same site, some parameters may need to be scaled to reflect the number of units.
[2] Some parameters may not be applicable to either the ER or SSAR, but may be desirable for the applicant to collect for commercial decision making or as supplemental information

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2] SSAR	ER
1.6.1 Maximum Pressure Drop	The design assumption for the decrease in ambient pressure from normal atmospheric pressure due to the passage of the tornado.			Site	X	
1.6.2 Maximum Rotational Speed	The design assumption for the component of tornado wind speed due to the rotation within the tornado.			Site	X	
1.6.3 Maximum Translational Speed	The design assumption for the component of tornado wind speed due to the movement of the tornado over the ground.			Site	X	
1.6.4 Maximum Wind Speed	The design assumption for the sum of maximum rotational and maximum translational wind speed components.			Site	X	
1.6.5 Missile Spectra	The design assumptions regarding missiles that could be ejected either horizontally or vertically from a tornado. The spectra identify mass, dimensions and velocity of credible missiles.			Site	X	
1.6.6 Radius of Maximum Rotational Speed	The design assumption for distance from the center of the tornado at which the maximum rotational wind speed occurs.			Site	X	
1.6.7 Rate of Pressure Drop	The assumed design rate at which the pressure drops due to the passage of the tornado.			Site	X	
1.7 Wind (Non-Tornado)				Site		
1.7.1 3-Second Gust	The 3-second gust wind velocity associated with a 100-year return period (straight line) at 33 ft (10 m) above the ground level in the site area.			Site	X	
1.7.2 Importance Factors	Multiplication factors applied to basic wind speed to develop the plant design. Provide the definition of "multiplication factors" and the reference for the definition.			Site	X	
2. Ambient Air Requirements						
2.1.1 Operational Max Ambient Dry Bulb Temperature (1% Exceedance)	Assumption used for the maximum dry bulb ambient temperature in the design of plant safety and non-safety systems (e.g., 1% annual exceedance).			SITE	X	
2.1.2 Operational Wet Bulb Temperature (coincident))	Assumption used for the wet bulb temperature that is coincident with the dry bulb temperature value(s) provided in 2.1.1 above.			SITE	X	
2.1.3 Operational Max Wet Bulb Temperature (non - coincident)	Assumption used for the maximum wet bulb temperature in the design of plant safety and non-safety systems (e.g., 1% annual exceedance).			SITE	X	
2.1.4 Operational Min Ambient Dry Bulb Temperature (99% Exceedance)	Assumption used for the minimum dry bulb ambient temperature in the design of plant safety and non-safety systems (e.g., 99% annual exceedance).			SITE	X	
2.1.5 Rx Thermal Power Max Dry Bulb Ambient Temperature (0% Exceedance)	Assumption used for the historic maximum recorded ambient dry bulb temperature used in design of plant systems that must be capable of supporting full reactor power operation under the assumed temperature condition.			SITE	X	
2.1.6 Rx Thermal Power Max Wet Bulb Temperature (0% Exceedance)	Assumption used for the historic maximum recorded wet bulb temperature used in design of plant systems that must be capable of supporting full reactor power operation under the assumed temperature condition			SITE	X	
2.1.7 Rx Thermal Power Min Dry Bulb Ambient Temperature (0% Exceedance)	Assumption used for the historic minimum recorded ambient dry bulb temperature used in design of plant systems that must be capable of supporting full reactor power operation under the assumed temperature condition.			SITE	X	
3. **Normal Plant Heat Sink**						
3.1 Condenser				Eng		
3.1.1 Maximum Inlet Temp Condenser/ Heat Exchanger	Design assumption for the maximum acceptable circulating water temperature at the inlet to the condenser or cooling water system heat exchangers.			Eng		X
3.1.2 Condenser / Heat Exchanger Duty	Design value for the waste heat rejected to the circulating water system across the condensers.			Eng		X
3.1.3 Maximum Cooling Water Flow Rate Across Condenser	Design value for the maximum flow rate of the circulating water system through the condenser tubes.			Eng		X
3.1.4 Maximum Cooling Water Temperature Rise Across Condenser	Design value for the maximum temperature differential across the condenser.			Eng		X
3.2 Non-Safety Related Service Water Systems						
3.2.1 Maximum Inlet Temp to SW Heat Exchanger	The maximum temperature of non-safety related service water at the inlet of the service water heat exchanger.			Rx		X

Vendor Information Worksheet

PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
3.2.2 SW Heat Exchanger Duty	The heat transferred to the non-safety related service water system for rejection to the environment.			Rx		X
3.3 Mechanical Draft Cooling Towers				Eng		
3.3.1 Acreage	The land required for cooling towers, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.			Eng		X
3.3.2 Approach Temperature	The difference between the cold water temperature and the ambient wet bulb temperature.			Eng		X
3.3.3 Blowdown Constituents and Concentrations	The maximum expected concentrations for anticipated constituents in the cooling water systems blowdown to the receiving water body.			Eng		X
3.3.4 Blowdown Flow Rate	The normal (and maximum) flow rate of the blowdown stream from the cooling water systems to the receiving water body for closed system designs			Eng		X
3.3.5 Blowdown Temperature	The maximum expected blowdown temperature at the point of discharge to the receiving water body.			Eng		X
3.3.6 Cycles of Concentration	The ratio of total dissolved solids in the cooling water blowdown streams to the total dissolved solids in the make-up water streams.			Eng		X
3.3.7 Evaporation Rate	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.			Eng		X
3.3.8 Height	The vertical height above finished grade of mechanical draft cooling towers associated with the cooling water systems.			Eng		X
3.3.9 Makeup Flow Rate	The expected (and maximum) rate of removal of water from a natural source to replace water losses from closed cooling water system.			Eng		X
3.3.10 Noise	The maximum expected sound level produced by operation of cooling towers, measured at 1000 feet from the noise source.			Eng		X
3.3.11 Cooling Tower Temperature Range	The temperature difference between the cooling water entering and leaving the towers.			Eng		X
3.3.12Cooling Water Flow Rate	The total cooling water flow rate through the condenser/heat exchangers.			Eng		X
3.3.13 Heat Rejection Rate (Blowdown)	The expected heat rejection rate to a receiving water body,			Eng		X
3.3.14 Maximum Consumption of Raw Water	The expected maximum short-term consumptive use of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.3.15 Monthly Average Consumption of Raw Water	The expected normal operating consumption of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.3.16 Stored Water Volume	The quantity of water stored in cooling water system impoundments, basins, tanks and/or ponds.			Eng		X
3.3.17 Drift	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.			Eng		X
3.4 Natural Draft Cooling Towers				Eng		
3.4.1 Acreage	The land required for cooling towers, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.			Eng		X
3.4.2 Approach Temperature	The difference between the cold water temperature and the ambient wet bulb temperature.			Eng		X
3.4.3 Blowdown Constituents and Concentrations	The maximum expected concentrations for anticipated constituents in the cooling water systems blowdown to the receiving water body.			Eng		X
3.4.4 Blowdown Flow Rate	The normal (and maximum) flow rate of the blowdown stream from the cooling water systems to the receiving water body for closed system designs			Eng		X
3.4.5 Blowdown Temperature	The maximum expected blowdown temperature at the point of discharge to the receiving water body.			Eng		X
3.4.6 Cycles of Concentration	The ratio of total dissolved solids in the cooling water blowdown streams to the total dissolved solids in the make-up water streams.			Eng		X
3.4.7 Evaporation Rate	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.			Eng		X
3.4.8 Height	The vertical height above finished grade of natural draft cooling towers associated with the cooling water systems.			Eng		X

Vendor Information Worksheet

PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2] SSAR	Applicability[2] ER
3.4.9 Makeup Flow Rate	The expected (and maximum) rate of removal of water from a natural source to replace water losses from closed cooling water system.			Eng		X
3.4.10 Noise	The maximum expected sound level produced by operation of cooling towers, measured at 1000 feet from the noise source.			Eng		X
3.4.11 Cooling Tower Temperature Range	The temperature difference between the cooling water entering and leaving the towers.			Eng		X
3.4.12 Cooling Water Flow Rate	The total cooling water flow rate through the condenser/heat exchangers.			Eng		X
3.4.13 Heat Rejection Rate (Blowdown)	The expected heat rejection rate to a receiving water body,			Eng		X
3.4.14 Maximum Consumption of Raw Water	The expected maximum short-term consumptive use of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.4.15 Monthly Average Consumption of Raw Water	The expected normal operating consumption of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.4.16 Stored Water Volume	The quantity of water stored in cooling water system impoundments, basins, tanks and/or ponds.			Eng		X
3.4.17 Drift	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.			Eng		X
3.5 Ponds				Eng		
3.5.1 Acreage	The land required for ponds, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.			Eng		X
3.5.2 Blowdown Constituents and Concentrations	The maximum expected concentrations for anticipated constituents in the cooling water systems blowdown to the receiving water body.			Eng		X
3.5.3 Blowdown Flow Rate	The normal (and maximum) flow rate of the blowdown stream from the cooling water systems to the receiving water body for closed system designs.			Eng		X
3.5.4 Blowdown Temperature	The maximum expected blowdown temperature at the point of discharge to the receiving water body.			Eng		X
3.5.5 Cycles of Concentration	The ratio of total dissolved solids in the cooling water blowdown streams to the total dissolved solids in the make-up water streams.			Eng		X
3.5.6 Evaporation Rate	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.			Eng		X
3.5.7 Heat Rejection Rate (Blowdown)	The expected heat rejection rate to a receiving water body, expressed as flow rate in gallons per minute at a temperature in degrees Fahrenheit.			Eng		X
3.5.8 Makeup Flow Rate	The expected (and maximum) rate of removal of water from a natural source to replace water losses from closed cooling water system.			Eng		X
3.5.9 Stored Water Volume	The quantity of water stored in cooling water system impoundments, basins, tanks and/or ponds.			Eng		X
3.5.10 Cooling Pond Temperature Range	The temperature difference between the cooling water entering and leaving the ponds.			Eng		X
3.5.11 Cooling Water Flow Rate	The total cooling water flow rate through the condenser/heat exchangers.			Eng		X
3.5.12 Maximum Consumption of Raw Water	The expected maximum short-term consumptive use of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.5.13 Monthly Average Consumption of Raw Water	The expected normal operating consumption of water by the cooling water systems (evaporation and drift losses).			Eng		X
3.6 Air Cooled Condensers	As identified by the vendor			Eng		X
4. <u>Ultimate Heat Sink</u>						
4.1 CCW Heat Exchanger				Rx		
4.1.1 Maximum Inlet Temp to CCW Heat Exchanger	The maximum temperature of safety-related service water at the inlet of the UHS component cooling water heat exchanger.			Rx		X

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2] SSAR	ER
4.1.2 CCW (RCW) Heat Exchanger Duty	The heat transferred to the safety-related service water system for rejection to the environment in UHS heat removal devices.			Rx		X
4.2 UHS Cooling Towers				Eng		
4.2.1 Acreage	The land required for UHS cooling towers or ponds, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.			Eng	X	X
4.2.2 Approach Temperature	The difference between the cold water temperature and the ambient wet bulb temperature.			Eng		
4.2.3 Blowdown Constituents and Concentrations	The maximum expected concentrations for anticipated constituents in the UHS blowdown to the receiving water body.			Eng		X
4.2.4a Blowdown Flow Rate (Normal)	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during normal operation.			Eng		X
4.2.4b Blowdown Flow Rate (Accident)	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during accident conditions.			Eng		
4.2.5a Blowdown Temperature (Normal)	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during normal operation			Eng		X
4.2.5b Blowdown Temperature (Accident)	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during accident conditions			Eng		
4.2.6 Cycles of Concentration	The ratio of total dissolved solids in the UHS system blowdown streams to the total dissolved solids in the make-up water streams.			Eng		X
4.2.7a Evaporation Rate (Normal)	The maximum rate at which water is lost by evaporation from the UHS system during normal operations.			Eng		X
4.2.7b Evaporation Rate (Accident)	The maximum rate at which water is lost by evaporation from the UHS system during accident conditions.			Eng		
4.2.8a Cooling Tower Deck Height	The height of the cooling tower deck above grade.			Eng		
4.2.8b Exhaust Stack Height	The height of the exhaust stack above deck.			Eng		X
4.2.9a Makeup Flow Rate (Normal)	The maximum rate of removal of water from a natural source to replace water losses from the UHS system during normal operations.			Eng		X
4.2.9b Makeup Flow Rate Assumed (Accident)	The maximum rate of removal of water from a natural source assumed to replace water losses from the UHS system during accident conditions.			Eng		
4.2.10 Noise	The maximum expected sound level produced by operation of mechanical draft UHS cooling towers, measured at 1000 feet from the noise source.			Eng		X
4.2.11 Cooling Tower Temperature Range	The temperature difference between the cooling water entering and leaving the UHS system.			Eng		X
4.2.12 Cooling Water Flow Rate	The total cooling water flow rate through the UHS system.			Eng		X
4.2.13a Heat Rejection Rate (Normal)	The maximum expected heat rejection rate to the atmosphere during normal operations.			Eng		X
4.2.13b Heat Rejection Rate (Accident)	The maximum expected heat rejection rate to the atmosphere during accident conditions.			Eng		
4.2.14 Maximum Consumption of Raw Water	The expected maximum short-term consumptive use of water by the UHS system (evaporation and drift losses).			Eng		X
4.2.15 Monthly Average Consumption of Raw Water	The expected normal operating consumption of water by the UHS system (evaporation and drift losses).			Eng		X
4.2.16 Stored Water Volume	The quantity of water stored in UHS impoundments, basins, tanks and/or ponds.			Eng		X
4.2.17 Drift	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.			Eng		X
4.4 Ponds				Eng		
4.4.1 Acreage	The land required for UHS ponds, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.			Eng	X	X
4.4.2 Blowdown Constituents and Concentrations	The maximum expected concentrations for anticipated constituents in the UHS blowdown to the receiving water body.			Eng		X

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
4.4.3 Blowdown Flow Rate	The normal (and maximum) flow rate of the blowdown stream from the UHS system to the receiving water body for closed system designs.			Eng		X
4.4.4 Blowdown Temperature	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body.			Eng		X
4.4.5 Cycles of Concentration	The ratio of total dissolved solids in the UHS system blowdown streams to the total dissolved solids in the makeup water streams.			Eng		X
4.4.6 Evaporation Rate	The expected (and maximum) rate at which water is lost by evaporation from the UHS system.			Eng		X
4.4.7 Makeup Flow Rate	The expected (and maximum) rate of removal of water from a natural source to replace water losses from the UHS system.			Eng		X
4.4.8 Cooling Pond Temperature Range	The temperature difference between the cooling water entering and leaving the UHS.			Eng		X
4.4.9 Cooling Water Flow Rate	The total cooling water flow rate through the UHS system.			Eng		X
4.4.10 Heat Rejection Rate (Blowdown)	The expected heat rejection rate to a receiving water body, expressed as flow rate in gallons per minute at a temperature in degrees Fahrenheit.			Eng		X
4.4.11 Maximum Consumption of Raw Water	The expected maximum short-term consumptive use of water by the UHS system (evaporation and drift losses).			Eng		X
4.4.12 Monthly Average Consumption of Raw Water	The expected normal operating consumption of water by the UHS system (evaporation and drift losses).			Eng		X
4.4.13 Stored Water Volume	The quantity of water stored in UHS ponds.			Eng		X
5. Potable Water/Sanitary Waste System				Rx		
5.1 Discharge to Site Water Bodies				Rx		
5.1.1 Flow Rate (Potable/Sanitary Normal)	The expected (normal) effluent flow rate from the potable/sanitary water system to the receiving water body.			Rx		X
5.1.2 Flow Rate (Potable/Sanitary Maximum)	The maximum effluent flow rate from the potable/sanitary water system to the receiving water body.			Rx		X
5.2 Raw Water Requirements				Site		
5.2.1 Maximum Use	The maximum short-term rate of withdrawal from the water source for the potable and sanitary waste water systems.			Site		X
5.2.2 Monthly Average Use	The average rate of withdrawal from the water source for the potable and sanitary waste water systems.			Site		
6. Demineralized Water Processing System				Rx		
6.1 Discharge to Site Water Bodies				Rx		
6.1.1 Flow Rate	The expected (and maximum) effluent flow rate from the demineralized processing system to the receiving water body.			Rx		X
6.2 Raw Water Requirements				Site		
6.2.1 Maximum Use	The maximum short-term rate of withdrawal from the water source for the demineralized water system.			Site		X
6.2.2 Monthly Average Use	The average rate of withdrawal from the water source for the demineralized water system.			Site		X
7. Fire Protection System				Rx		
7.1 Raw Water Requirements				Site		X
7.1.1 Maximum Use	The maximum short-term rate of withdrawal from the water source for the fire protection water system (does not include large area fire requirements).			Site		X
7.1.2 Monthly Average Use	The average rate of withdrawal from the water source for the fire protection water system.			Site		
7.1.3 Stored Water Volume	The capacity of fire water storage impoundments, basins, or tanks.			Eng		

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
7.2 Items unique to non-water Fire Protection Systems	As identified by the vendor					
8. Miscellaneous Drain				Rx		
8.1 Discharge to Site Water Bodies				Rx		
8.1.1 Flow Rate (Normal)	The expected normal effluent flow rate from miscellaneous drains (other planned discharges excluding liquid radwaste and storm water) to the receiving water body. Provide a description of the drainage sources.			Rx		X
8.1.2 Flow Rate (Maximum)	The maximum effluent flow rate from miscellaneous drains (other planned discharges excluding liquid radwaste and storm water) to the receiving water body. Provide a description of the drainage sources.			Rx		X
9. Unit Vent/Airborne Effluent Release Point						
9.1 Atmospheric Dispersion (χ/Q) (Accident)	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases at a certain time during the accident.			Site		
9.1.1 0-2 hr @ EAB	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases in the limiting two hour interval.			Site	X	X
9.1.2 0-8 hr @ LPZ	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases in the first eight hours.			Site	X	X
9.1.3 8-24 hr @ LPZ	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases between hours 8 and 24 after the accident.			Site	X	X
9.1.4 1-4 day @ LPZ	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases between the first day and the fourth day after the accident			Site	X	X
9.1.5 4-30 day @ LPZ	The atmospheric dispersion coefficients used in the design safety analysis to estimate dose consequences of accident airborne releases between day four until the end of the first 30 days after the accident.			Site	X	X
9.2 Atmospheric Dispersion (χ/Q)(Annual Average)	The atmospheric dispersion coefficients used in the safety analysis for the dose consequences of normal airborne releases.			Site	X	X
9.3 Calculated Dose Consequences				Site		
9.3.1 Normal	The design radiological dose consequences due to airborne releases from normal operation of the plant.			Site	X	X
9.3.2 Post-Accident	The design radiological dose consequences due to airborne releases from postulated accidents.			Site	X	X
9.3.3 Severe Accidents	The design radiological dose consequences due to airborne releases from postulated severe accidents. Provide the release frequency (per reactor year) for each postulated severe accident and the associated population whole body dose in 24 hours.			Site		X
9.4 Release Point				Rx		
9.4.1 Configuration (Elevated or Ground Level Release)	The calculational release type for accident effluent dispersion (i.e., elevated or ground level).			Rx		
9.4.2 Elevation (Normal Operation)	For elevated release state the height above finished grade of the release point for routine operational releases.			Rx	X	X
9.4.3 Elevation (Post Accident)	For elevated release state the height above finished grade of the release point for accident sequence releases.			Rx	X	X
9.4.4 Minimum Distance to Site Boundary	The minimum lateral distance from the release point to the site boundary.			Site	X	X
9.4.5 Temperature	The temperature of the airborne effluent stream at the release point.			Rx	X	X
9.4.6 Volumetric Flow Rate	The volumetric flow rate of the airborne effluent stream at the release point.			Rx	X	X

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2] SSAR	ER
9.5 Source Term				Rx		
9.5.1 Gaseous (Normal)	The expected annual activity, by radionuclide, contained in routine plant airborne effluent streams, excluding tritium. Provide in Table 7.			Rx	X	X
9.5.2 Gaseous (Post-Accident)	The activity, by radionuclide, contained in post-accident airborne effluents. Provide in Tables 8 & 9.			Rx	X	X
9.5.3 Tritium (Normal)	The expected annual activity of tritium contained in routine plant airborne effluent streams. Provide in Table 7.			Rx	X	X
10. <u>Liquid Radwaste System</u>						
10.1 Dose Consequences				Site		
10.1.1 Normal	The estimated design radiological dose consequences due to liquid effluent releases from normal operation of the plant.			Site	X	X
10.1.2 Post-Accident	The estimated design radiological dose consequences due to liquid effluent releases from postulated accidents.			Site	X	X
10.2 Release Point				Site		
10.2.1 Flow Rate	The discharge (including minimum dilution flow, if any) flow rate of liquid potentially radioactive effluent streams from plant systems to the receiving water body.			Site	X	X
10.3 Source Term				Rx		
10.3.1 Liquid	The annual activity, by radionuclide, contained in routine plant liquid effluent streams, excluding tritium. Provide in Table 10.			Rx	X	X
10.3.2 Tritium	The annual activity of tritium contained in routine plant liquid effluent streams. Provide in Table 10.			Rx	X	X
10.3.3 Activity	The assumed activity, by radionuclide, contained in accidental liquid radwaste release. Provide in Table 11.			Rx	X	X
10.3.4 Volume	The assumed volume of accidental liquid radwaste release.			Rx	X	X
11. <u>Solid Radwaste System</u>						
11.1 Acreage				Eng		
11.1.1 Low Level Radwaste Storage	The land usage required to provide onsite storage of low level radioactive wastes.			Eng		X
11.2 Solid Radwaste				Rx		
11.2.1 Activity	The annual activity, by radionuclide, contained in solid radioactive wastes generated during routine plant operations. Provide in Table 3.			Rx		X
11.2.2 Principal Radionuclides	The principal radionuclides contained in solid radioactive wastes generated during routine plant operations. Provide in Table 3			Rx		X
11.2.3 Volume	The expected volume of solid radioactive wastes generated during routine plant operations.			Rx		X
12. <u>Spent Fuel Storage</u>						
12.1.1 Spent Fuel Pool Capacity	The number of spent fuel assemblies capable of being stored in the spent fuel pool.			Eng		
12.1.2 Fuel Bundles Discharged per Refuel Outage	The number of spent fuel assemblies discharged to the spent fuel pool for a typical refuel outage.			Eng		X
12.1.3 **Fuel Cycle Duration**	The design fuel cycle duration.			Eng		X
12.1.4 Fuel Bundles Discharged During Licensed Operation	The total number of spent fuel assemblies discharged during the 40 year operating license life of the plant.			Eng		X
13. <u>Auxiliary Boiler System</u>				Eng		
13.1 Exhaust Elevation	The height above finished plant grade at which the flue gas effluents are released to the environment.			Eng		X

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PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2] SSAR	ER
13.2 Flue Gas Effluents	The expected combustion products and anticipated quantities released to the environment due to operation of the auxiliary boilers. Provide in Table 4.			Eng		X
13.3 Fuel Type	The type of fuel oil required for proper operation of the auxiliary boilers. Provide in Table 4.			Eng		X
13.4 Heat Input Rate (BTU/hr)	The average heat input rate due to the periodic operation of the auxiliary boilers (fuel consumption rate).			Eng		
14. Standby Power System				Rx		
14.1 Diesel				Rx		
14.1.1 Diesel Capacity	The total generating capacity of diesel generating system.			Rx		
14.1.2 Diesel Exhaust Elevation	The elevation above finished grade of the release point for standby diesel exhaust releases.			Rx		X
14.1.3 Diesel Flue Gas Effluents	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby diesel generators. Provide in Table 5.			Eng		X
14.1.4 Diesel Noise	The maximum expected sound level produced by operation of diesel generators, measured at 1000 feet from the noise source.			Eng		
14.1.5 Diesel Fuel Type	The type of diesel fuel oil required for proper operation of the diesel generator.			Eng		X
14.2 Gas Turbine				Rx		
14.2.1 Gas Turbine Capacity (kw)	The total generating capacity of the gas turbine generating system.			Rx		
14.2.2 Gas-Turbine Exhaust Elevation	The elevation above finished grade of the release point for standby gas turbine exhaust releases.			Rx		X
14.2.3 Gas-Turbine Flue Gas Effluents	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby gas-turbine generators. Provide in Table 6.			Eng		X
14.2.4 Gas-Turbine Noise	The maximum expected sound level produced by operation of gas turbines, measured at 1000 feet from the noise source.			Eng		
14.2.5 Gas-Turbine Fuel Type	The type of fuel oil required for proper operation of the gas turbines.			Eng		X
15. Plant Layout Considerations				Eng		
15.1 Access Routes				Eng		
15.1.1 Heavy Haul Routes	The land usage required for permanent heavy haul routes to support normal operations and refueling.			Eng		X
15.1.2 Spent Fuel Shipping Weight	The weight of the heaviest expected shipment during normal plant operations and refueling.			Eng		
15.1.3 SMR Module Weight	The weight of the heaviest SMR component that is expected to be shipped to the site.					
15.2 Acreage to Support Plant Operations	The land area required to provide space for plant facilities.			Eng		
15.2.1 Office Facilities	The land area required to provide space for office facilities. Provide list of structures and associated acreage of each.			Eng		X
15.2.2 Parking Lots	The land area required to provide space for parking lots. Provide associated acreage of each.			Eng		X
15.2.3 Permanent Support Facilities	The land area required to provide space for permanent support facilities. Provide list of structures and associated acreage of each.			Eng		X
15.2.4 Power Block	The land area required to provide space for Power Block facilities. Provide list of structures and associated acreage of each. Power Block is defined as all structures, systems and components which perform a direct function in the production of, transport of, or storage of heat energy, electrical energy or radioactive wastes. Also included are structures, systems, and components that monitor, control, or protect the public health and safety.			Eng		X

Vendor Information Worksheet

PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
15.2.5 Protected Areas	The land area required to provide space for Protected Area facilities. Provide list of structures and associated acreage of each.			Eng		
15.2.6 Switchyard	The land usage required for the high voltage switchyard used to connect the plant to the transmission grid.			Eng		X
15.2.7 Other Areas	The land area required to provide space for plant facilities not provided in Parameters 15.2.1 - 15.2.5. Provide list of structures and associated acreage of each.			Eng		X
16. Plant Operations Considerations						
16.1 Megawatts Thermal	The thermal power generated by one unit (may be the total of several modules). Specify both core thermal power and RCP thermal power (if there are RCPs in the design).			Rx	X	X
16.2 Plant Design Life	The operational life for which the plant is designed.			Rx		X
16.3 Plant Population				Eng		
16.3.1 Operation	The estimated number of total permanent staff to support operations of the plant.			Eng		X
16.3.2 Refueling / Major Maintenance	The estimated additional number of temporary staff required to conduct refueling and major maintenance activities.			Eng		X
16.4 Station Capacity Factor	The percentage of time that a plant is capable of providing power to the grid.			Eng		X
16.5 Plant Operating Cycle	The normal plant operating cycle length.			Eng		X
16.6 Megawatts Electrical (at 100% power with 85F circulating water)	Best estimate of MWe generator output.			Eng		X
17. Construction				Eng		
17.1 Access Routes				Eng		
17.1.1 Construction Module Dimensions	The maximum expected length, width, and height of the largest construction modules or components and delivery vehicles to be transported to the site during construction.			Eng		X
17.1.2 Heaviest Construction Shipment	The maximum expected weight of the heaviest construction shipment to the site.			Eng		X
17.2 Acreage				Eng		
17.2.1 Laydown Areas	The land area required to provide space for construction support facilities. Provide a list of what buildings and/or areas and the associated acreage for each.			Eng		X
17.2.2 Temporary Construction Facilities	The land area required to provide space for temporary construction support facilities. Provide a list of what buildings and/or areas and the associated acreage for each.			Eng		X
17.2.3 Construction Parking Lot	The land area required to provide space for parking lots.			Eng		X
17.3 Construction				Eng		
17.3.1 Noise	The maximum expected sound level due to construction activities, measured at 50 feet from the noise source.			Eng		X
17.4 Plant Population				Eng		
17.4.1 Construction	Maximum number of people on-site during construction.			Eng		X
17.5 Site Preparation Duration	Length of time required to prepare the site for construction			Eng		X
18. Miscellaneous Items				Rx		
18.1 Maximum Fuel Enrichment	Concentration (weight percent fraction) of U-235 in the fuel uranium.			Rx		X
18.2 Maximum Average Assembly Burnup	Maximum assembly average burn-up at end of assembly life.			Rx		X
18.3 Peak fuel rod exposure at end of life	Peak fuel rod exposure at end of life			Rx		X

Vendor Information Worksheet

PPE Section	Definition	Technology Supplier Value[1]	Notes/ Comments	Parameter Type	Applicability[2]	
					SSAR	ER
18.4 Maximum Average Discharge Batch Burnup	Maximum average discharge batch burnup.			Rx		X
18.5 Maximum Thermal Power	Maximum core thermal power.			Rx		X
18.6 Fuel Reload	Mass of uranium in the reload batch.			Rx		X
18.7 Clad Material	Fuel rod clad material.			Rx		X
18.8 Unique reactor parameters	As identified by the vendor			Rx		X
18.9 Severe Accident PRA and release information	Nureg -1555 requires a severe accident analysis in ER section 7.2. The population dose and risk consequence analysis may be performed by the MAACS2 code					

Vendor Information Worksheet

TABLE 2 - BLOWDOWN CONSTITUENTS AND CONCENTRATIONS			
Constituent	**Concentration (ppm)[1]**		
	Surface Water Source	Well/ Treated Water	Envelope
Chlorine demand			
Free available chlorine			
Chromium			
Copper			
Iron			
Zinc			
Phosphate			
Sulfate			
Oil and grease			
Total dissolved solids			
Total suspended solids			
Biological Oxygen Demand (BOD), 5-day			
Notes:			
(1) Assumed cycles of concentration equals 4			

Vendor Information Worksheet

TABLE 3 – PRINCIPAL RADIONUCLIDES IN SOLID RADWASTE[(1)]

DATA FOR Radionuclide							**Composite**
	(Ci/yr)	**(Ci/yr)**	**(Ci/yr)**	**(Ci/yr)**	**(Ci/yr)**	**(Ci/yr)**	**(Ci/yr)**
Other							
Total							

Notes: (1) See PPE Section 11.2.; (2) NA = Not Applicable or negligible ($< 10^{-3}$ Ci);

Vendor Information Worksheet

TABLE 4 – YEARLY EMISSIONS FROM AUXILIARY BOILERS							
Pollutant Discharged per Unit[(1)]							**Bounding Value**
	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Particulates							
Sulfur oxides							
Carbon monoxide							
Hydrocarbons							
Nitrogen oxides							

Notes: 1) Emissions are based on 30 days of operation per year

TABLE 5 – YEARLY EMISSIONS FROM STANDBY DIESEL GENERATORS							
							Bounding Value
Number and size of Diesel Generators (kW)							
Pollutant Discharged [(1)]	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
Particulates							
Sulfur Oxides							
Carbon Monoxide							
Hydrocarbons							
Nitrogen oxides							

Notes: 1) Emissions are based on 4 hrs/month operation for each of the generators (one unit).
2) Identify whether further reduction can be achieved with addition of emission control equipment.

Vendor Information Worksheet

TABLE 6 – STANDBY POWER SYSTEM GAS TURBINE FLUE GAS EFFLUENTS						
FUEL: Distillate 20°F Ambient 9,890 BTU/KWH (LHV) 10,480 BTU/KWH (HHV) 96,960 LB/HR	Consumption Rate/Unit		Consumption Rate/Unit		Consumption Rate/Unit	
Effluent	**ppmvd**	**(lbs) [1]**	**Ppmvd**	**(lbs) [1]**	**ppmvd**	**(lbs) [1]**
NO_x (ppmvd @ 15% 0_2)						
NO_x as NO_2						
CO						
Underlying Hazardous Constituents (UHC)						
Volatile Organic Compounds (VOC)						
SO_2						
SO_3						
SULFUR MIST						
PARTICULATES						
Exhaust Analysis	**% Vol**		**% Vol**		**% Vol**	
ARGON						
NITROGEN						
OXYGEN						
CARBON DIOXIDE						

Notes: 1) Emissions are based on 4 hrs/month operation for each of the generators, ppmvd = parts per million, volumetric dry, lbs. = pounds, %Vol = percent volume.

Vendor Information Worksheet

TABLE 7 One Unit Average Annual Normal Gaseous Radioactive Release			
Radionuclide	Release 1 unit Ci/yr	Radionuclide	Release 1 unit Ci/yr
Kr-83m		Rb-88	
Kr-85m		Rb-89	
Kr-85		Sr-89	
Kr-87		Sr-90	
Kr-88		Y-90	
Kr-89		Sr-91	
Kr-90		Sr-92	
Xe-131m		Y-91	
Xe-133m		Y-92	
Xe-133		Y-93	
Xe-135m		Zr-95	
Xe-135		Nb-95	
Xe-137		Mo-99	
Xe-138		Tc-99m	
Xe-139		Ru-103	
I-129		Rh-103m	
I-131		Ru-106	
I-132		Rh-106	
I-133		Ag-110m	
I-134		Sb-124	
I-135		Te-129m	
H-3		Te-131m	
C-14		Te-132	
Na-24		Cs-134	
P-32		Cs-136	
Ar-41		Cs-137	
Cr-51		Cs-138	
Mn-54		Ba-140	
Mn-56		La-140	
Fe-55		Ce-141	
Fe-59		Ce-143	
Co-58		Ce-144	
Co-60		Pr-144	
Ni-63		W-187	
Cu-64		Np-239	
Zn-65			
Br-84			
		Total	

Note: Blank rows are provided to add isotopes that might be present in certain unique small reactor designs

Vendor Information Worksheet

TABLE 8 One Unit Accidental Gaseous Radioactive Release			
Radionuclide	**Release 1 unit Ci**	**Radionuclide**	**Release 1 unit Ci**
Noble Gases		**Noble Metals**	
Kr-85		Co-58	
Kr-85m		Co-60	
Kr-87		Mo-99	
Kr-88		Tc-99m	
Xe-133		Ru-103	
Xe-135		Ru-105	
Iodines		Ru-106	
I-129		Rh-105	
I-131		**Lanthanides**	
I-132		Y-90	
I-133		Y-91	
I-134		Y-92	
I-135		Y-93	
Alkali Metals		Zr-95	
Rb-86		Zr-97	
Cs-134		Nb-95	
Cs-136		La-140	
Cs-137		La-141	
Tellurium Group		La-142	
Sb-127		Pr-143	
Sb-129		Nd-147	
Te-127		Am-241	
Te-127m		Cm-242	
Te-129		Cm-244	
Te-129m		**Cerium Group**	
Te-131		Ce-141	
Te-132		Ce-143	
Strontium and Barium		Ce-144	
Sr-89		Np-239	
Sr-90		Pu-238	
Sr-91		Pu-239	
Sr-92		Pu-240	
Ba-139		Pu-241	
Ba-140			
		Total	

Note: Blank rows are provided to add isotopes that might be present in certain unique small reactor designs

Vendor Information Worksheet

TABLE 9

One Unit
LOCA (or other Bounding Design Basis Accident) Atmospheric Release by Post Accident Interval (Curies)[1]

Time Period					
Radionuclide	0 to 2 hour	0 to 8 hour	8 to 24 hour	24 to 96 hour	96 to 720 hours

Note: (1) Where applicable, for each time interval, vendor must provide plume release energy and height

Vendor Information Worksheet

Table 10 One Unit Average Annual Normal Liquid Radioactive Release			
Radionuclide	**Release Ci/yr**	**Radionuclide**	**Release Ci/yr**
I-129		Sr-92	
I-131		Y-92	
I-132		Y-93	
I-133		Zr-95	
I-134		Nb-95	
I-135		Mo-99	
H-3		Tc-99m	
C-14		Tc-99	
Na-24		Ru-103	
P-32		Rh-103m	
Cr-51		Ru-106	
Mn-54		Rh-106	
Mn-56		Ag-110m	
Co-56		Sb-124	
Co-57		Te-129m	
Co-58		Te-131m	
Co-60		Te-132	
Fe-55		Cs-134	
Fe-59		Cs-136	
Ni-63		Cs-137	
Cu-64		Cs-138	
Zn-65		Ba-140	
Br-84		La-140	
Rb-88		Ce-141	
Rb-89		Ce-143	
Sr-89		Ce-144	
Sr-90		Pr-143	
Y-90		W-187	
Sr-91		Np-239	
Y-91			

Note: Blank rows are provided to add isotopes that might be present in certain unique small reactor designs

Vendor Information Worksheet

Table 11 One Unit Accidental Liquid Radioactive Release			
Radionuclide	**Release Ci**	**Radionuclide**	**Release Ci**
I-129		Sr-92	
I-131		Y-92	
I-132		Y-93	
I-133		Zr-95	
I-134		Nb-95	
I-135		Mo-99	
H-3		Tc-99m	
C-14		Ru-103	
Na-24		Rh-103m	
P-32		Ru-106	
Cr-51		Rh-106	
Mn-54		Ag-110m	
Mn-56		Sb-124	
Co-56		Te-129m	
Co-57		Te-131m	
Co-58		Te-132	
Co-60		Cs-134	
Fe-55		Cs-136	
Fe-59		Cs-137	
Ni-63		Cs-138	
Cu-64		Ba-140	
Zn-65		La-140	
Rb-89		Ce-141	
Sr-89		Ce-144	
Sr-90		Pr-143	
Y-90		W-187	
Sr-91		Np-239	
Y-91			

Note: Blank rows are provided to add isotopes that might be present in certain unique small reactor designs

Vendor Information Worksheet

TABLE 12 - NOTES	
1	
2	
3	
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Vendor Information Worksheet

APPENDIX C — SAMPLE PPE TABLE

TABLE C-1 – PLANT PARAMETER ENVELOPE (BY SECTION)

TABLE C-2 – BLOWDOWN CONSTITUENTS AND CONCENTRATIONS

TABLE C-3 – SINGLE UITE PRINCIPAL RADIONUCLIDE IN SOLID RADWASTE

TABLE C-4 – EMISSIONS FROM AUXILIEARY BOILERS

TABLE C-5 – EMISSIONS FROM STANDBY DIESEL GENERATORS

TABLE C-6 – STANDBY POWER SYSTEM GA TURBINE FLUE GAS EFLUENTS

TABLE C-7 – SINGLE UNIT COMPOSIT AVEAGE ANNUAL NORMAL GASEOUS RELEASE

TABLE C-8 – ACCIDENTAL GASEOUS RADIOACTIVE RELEASE

TABLE C-9 – LOCA (OROTHER BOUNDING DBA) BY POST ACCIDENT INTERVAL

TABLE C-10 – SINGLE UNIT COMPOSITE AVERAGE ANNUAL NORMAL LIQUID RELEASE

TABLE C-11 – SINGLE UNIT COMPOSITE ACCIDENTAL LIQUID RADIOACTIVE RELEASE

Table C-1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
1	**Structure**		
1.1	**Building Characteristics**		
1.1.1	Height	### ft.	The height from finished grade to the top of the tallest power block structure, excluding cooling towers.
1.1.2	Foundation Embedment	## ft. to ## ft.	The depth from finished grade to the bottom of the basemat for the most deeply embedded power block structure.
3	**Normal Plant Heat Sink**		
3.1	**Condenser**		
3.1.1	Max Inlet Temp Condenser / Heat Exchanger	##° F	Design assumption for the maximum acceptable circulating water temperature at the inlet to the condenser or cooling water system heat exchangers
3.1.2	Condenser Heat Rejection / Heat Exchanger Duty	## Btu/hr	Design value for the waste heat rejected to the circulating water system across the condensers.
3.1.3	Maximum Cooling Water Flow Rate Across Condenser	## gpm	Design value for the maximum flow rate of the circulating water system through the condenser tubes.
3.1.4	Maximum Cooling Water Temperature Rise Across Condenser	##° F	Design value for the maximum temperature differential across the condenser.
3.3	**Mechanical Draft Cooling Towers - Circulating Water System**		**Sections 3.3, 3.4, and 3.5 may not be relevant for all applicants depending on the specific systems chosen. Other custom systems may be added.**
3.3.1	Acreage	## ac.	The land required for cooling towers, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.
3.3.2	Approach Temperature	##° F	The difference between the cold water temperature and the ambient wet bulb temperature.
3.3.3	Blowdown Constituents and Concentrations	Table C-2	The maximum expected concentrations for anticipated constituents in the cooling water system blowdown to the receiving water body.

Table C-1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3.3.4	Blowdown Flow Rate	## gpm	The normal (and Maximum)flow rate of the blowdown stream from the circulating water system to the receiving water body for closed system designs during normal operations.
3.3.5	Blowdown Temperature	##° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body.
3.3.6	Cycles of Concentration	##	The ratio of total dissolved solids in the circulating water system blowdown to the total dissolved solids in the make-up water streams.
3.3.7	Evaporation Rate	## gpm	The expected (and maximum) rate at which water is lost by evaporation from the cooling water systems.
3.3.8	Height	## ft.	The vertical height above finished grade of mechanical draft cooling towers associated with the cooling water systems.
3.3.9	Makeup Flow Rate	## gpm	The expected (and maximum) rate of removal of water from a natural source to replace water losses from a closed cooling water system.
3.4.10	Noise	### dBA at 1000 ft.	The maximum expected sound level produced by operation of cooling towers, measured at 1000 feet from the noise source.
3.3.11	Cooling Tower Temperature Range	##° F	The temperature difference between the cooling water entering and leaving the towers.
3.3.12	Cooling Water Flow Rate	#### gpm	The total cooling water flow rate through the condenser/heat exchangers.
3.3.13	Heat Rejection Rate (Blowdown)	### Btu/hr	The expected heat rejection rate to a receiving water body.
3.3.17	Drift	## gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
3.3.18	Exhaust Stack exit velocity	## fpm	The exit velocity of water vapor through the cooling tower exhaust stack.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3.3.19	Exhaust Stack exit diameter	# cells at ## ft. each	The diameter of the cooling tower exhaust stack.
3.4	**Natural Draft Cooling Towers - Circulating Water System**		**Sections 3.3, 3.4, and 3.5 may not be relevant for all applicants depending on the specific systems chosen. Other custom systems may be added.**
3.4.1	Acreage	## ac.	The land required for cooling towers, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.
3.4.2	Approach Temperature	##° F	The difference between the cold water temperature and the ambient wet bulb temperature.
3.4.3	Blowdown Constituents and Concentrations	Table C-1	The maximum expected concentrations for anticipated constituents in the circulating water system blowdown to the receiving water body.
3.4.4	Blowdown Flow Rate	## gpm	The normal (and maximum) flow rate of the blowdown stream from the circulating water system to the receiving water body for closed system designs.
3.4.5	Blowdown Temperature	##° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body.
3.4.6	Cycles of Concentration	##	The ratio of total dissolved solids in the cooling water system blowdown to the total dissolved solids in the make-up water streams.
3.4.7	Evaporation Rate	## gpm	The expected (and maximum) design rate at which water is lost by evaporation from the circulating water systems.
3.4.8	Exhaust Stack Height	# ft.	The vertical height above finished grade of cooling towers associated with the cooling water system.
3.4.9	Makeup Flow Rate	## gpm	The expected (and maximum) rate of removal of water from a natural source to replace water losses from a closed cooling water system.
3.4.10	Noise	## dBA at 1000 ft.	The maximum expected sound level produced by operation of cooling towers, measured at 1000 feet from the noise source.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3.4.11	Cooling Tower Temperature Range	##° F	The temperature difference between the cooling water entering and leaving the towers.
3.4.12	Cooling Water Flow Rate	## gpm	The total cooling water flow rate through the condenser/heat exchangers.
3.4.13	Heat Rejection Rate (Blowdown)	## Btu/hr	The expected heat rejection rate to a receiving water body.
3.4.17	Drift	# gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
3.4.18	Exhaust Stack exit velocity	## fpm	The exit velocity of water vapor through the cooling tower exhaust stack.
3.4.19	Exhaust Stack exit diameter	## ft.	The diameter of the cooling tower exhaust stack.
3.4.20	Exhaust Stack Height	# ft.	The vertical height above finished grade of cooling towers associated with the circulating water system.
3.5	**Ponds**		**Sections 3.3, 3.4, and 3.5 may not be relevant for all applicants depending on the specific systems chosen. Other custom systems may be added.**
3.5.1	Acreage	## ac.	The land required for cooling towers, including support facilities.
3.5.2	Blowdown Constituents and Concentrations	Table C-1	The maximum expected concentrations for anticipated constituents in the cooling water system blowdown to the receiving water body.
3.5.3	Blowdown Flow Rate	## gpm	The normal (and maximum) flow rate of the blowdown stream from the cooling water system to the receiving water body for closed system designs.
3.5.4	Blowdown Temperature	##° F	The maximum expected blowdown temperature at the point of discharge to the receiving water body during normal operations.
3.5.5	Cycles of Concentration	##	The ratio of total dissolved solids in the circulating water system blowdown to the total dissolved solids in the make-up water streams.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
3.5.6	Evaporation Rate	## gpm	The expected (and maximum) rate at which water is lost by evaporation from the cooling water system.
3.5.7	Makeup Flow Rate	## gpm	The expected (and maximum) rate of removal of water from a natural source to replace water losses from a closed cooling water system.
3.5.9	Stored Water Volume	## gal	The quantity of water stored in cooling water system impoundments, basins, tanks and/or ponds.
3.5.10	Cooling Pond Temperature Range	##° F	The temperature difference between the cooling water entering and leaving the ponds.
3.5.11	Cooling Water Flow Rate	### gpm	The total cooling water flow rate through the condenser/heat exchangers.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
4	**Ultimate Heat Sink (UHS)**		
4.1	**CCW Heat Exchangers**		
4.1.1	Maximum Inlet Temperature to CCW Heat Exchanger	##° F	The maximum temperature of safety-related service water at the inlet of the UHS component cooling water heat exchanger.
4.1.2	CCW Heat Exchanger Duty	## Btu/hr (Normal) ## Btu/hr (Peak)	The heat transferred to the safety-related service water system for rejection to the environment in UHS heat removal devices.
4.2	**UHS Cooling Towers**		
4.2.1	Acreage	## ac.	The land required for UHS cooling towers or ponds, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.
4.2.2	Approach		The difference between the cold water temperature and the ambient wet bulb temperature.
4.2.3	Blowdown Constituents and Concentrations	Table C-2	The maximum expected concentrations for anticipated constituents in the UHS blowdown to the receiving water body.
4.2.4a	Blowdown Flow Rate (Normal)	## gpm	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during normal operations.
4.2.4b	Blowdown Flow Rate (Accident)	## gpm	The maximum flow rate of the blowdown stream from the UHS system to receiving water body for closed system designs during accident conditions.
4.2.5a	Blowdown Temperature (Normal)	< ##° F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during normal operations.
4.2.5b	Blowdown Temperature (Accident)	##° F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body during accident conditions.
4.2.6	Cycles of Concentration	#	The ratio of total dissolved solids in the UHS system blowdown streams to the total dissolved solids in the make-up water streams.
4.2.7a	Evaporation Rate (Normal)	## gpm	The maximum rate at which water is lost by evaporation from the UHS system during normal operations.
4.2.7b	Evaporation Rate (Accident)	## gpm	The maximum rate at which water is lost by evaporation from the UHS system during accident conditions.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
4.2.8a	Cooling Tower Deck Height	## ft.	The height of the cooling tower deck above grade.
4.2.8b	Exhaust Stack Height	## ft.	The height of the exhaust stacks above the deck.
4.2.9a	Makeup Flow Rate (Normal)	## gpm	The maximum rate of removal of water from a natural source to replace water losses from the UHS system during normal operations.
4.2.9b	Makeup Flow Rate (Accident)	### gpm	The maximum rate of removal of water from a natural source to replace water losses from the UHS system during accident conditions.
4.2.10	Noise	## dBA at 200 ft.	The maximum expected sound level produced by operation of mechanical draft UHS cooling towers, measured at 1000 feet from the noise source.
4.2.12	Cooling Water Flow Rate	## gpm (normal)	The total cooling water flow rate through the UHS system.
		## gpm (shutdown/accident)	
4.2.13a	Heat Rejection Rate (Normal)	## Btu/hr	The maximum expected heat rejection rate to the atmosphere during normal operations.
4.2.13b	Heat Rejection Rate (Accident)	## Btu/hr	The maximum expected heat rejection rate to the atmosphere during accident conditions.
4.2.16	Stored Water Volume	### gal.	The quantity of water stored in UHS impoundments.
4.2.17	Drift	# gpm	Rate of water lost from the tower as liquid droplets entrained in the vapor exhaust air stream.
4.3	**Ponds**		
4.3.1	Acreage	## ac.	The land required for UHS ponds, including support facilities such as equipment sheds, basins, canals, or shoreline buffer areas.
4.3.2	Blowdown Constituents and Concentrations	Table C-1	The maximum expected concentrations for anticipated constituents in the UHS blowdown to the receiving water body.
4.3.3	Blowdown Flow Rate	## gpm	The normal (and maximum) flow rate of the blowdown stream from the UHS system to the receiving water body for closed system designs.
4.3.4	Blowdown Temperature	##° F	The maximum expected UHS blowdown temperature at the point of discharge to the receiving water body.
4.3.5	Cycles of Concentration	##	The ratio of total dissolved solids in the UHS system blowdown streams to the total dissolved solids in the makeup water streams.

PPE Item		Design Parameter	Definition
4.3.6	Evaporation Rate	## gpm	The expected (and maximum) rate at which water is lost by evaporation from the UHS system.
4.3.7	Makeup Flow Rate	## gpm	The expected (and maximum) rate of removal of water from a natural source to replace water losses from the UHS system.
4.3.8	Cooling Pond Temperature Range	##° F	The temperature difference between the cooling water entering and leaving the UHS.
4.3.9	Cooling Water Flow Rate	## gpm	The total cooling water flow rate through the UHS system.
4.3.10	Heat Rejection Rate (Blowdown)	## BTU/hr	The expected heat rejection rate to a receiving water body, expressed as flow rate in gallons per minute at a temperature in degrees Fahrenheit.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
5	**Potable/Sanitary Water System**		
5.1	**Discharge to Site Water Bodies**		
5.1.1	Flow Rate (Potable/Sanitary Normal)	## gpm	The expected (normal) effluent flow rate from the potable and sanitary water systems to the receiving water body.
5.1.2	Flow Rate (Potable/Sanitary Maximum)	## gpm	The maximum effluent flow rate from the potable and sanitary water systems to the receiving water body.
5.2	**Raw Water Requirements**		
5.2.1	Maximum Use	## gpm	The maximum short-term rate of withdrawal from the water source for the potable and sanitary waste water systems.
5.2.2	Monthly Average Use	## gpm	The average rate of withdrawal from the water source for the potable and sanitary waste water systems.
6	**Demineralized Water System**		
6.1	**Discharge to Site Water Bodies**		
6.1.1	Flow Rate	## gpm	The expected (and maximum) effluent flow rate from the demineralized processing system to the receiving water body.
6.2	**Raw Water Requirements**		
6.2.1	Maximum Use	## gpm	The maximum short-term rate of withdrawal from the water source for the demineralized water system.
6.2.2	Monthly Average Use	## gpm	The average rate of withdrawal from the water source for the demineralized water system.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
7	**Fire Protection System**		
7.1	**Raw Water Requirements**		
7.1.1	Maximum Use	## gpm	The maximum short-term rate of withdrawal from the water source for the fire protection water system (does not include large area fire requirements).
7.1.2	Monthly Average Use	# gpm	The average rate of withdrawal from the water source for the fire protection water system.
8	**Miscellaneous Drain**		
8.1	**Discharge to Site Water Bodies**		
8.1.1	Flow Rate (Normal)	## gpm	The expected effluent flow rate from miscellaneous drains (other planned discharges excluding liquid radwaste and storm water) to the receiving water body.
8.1.2	Flow Rate (Maximum)	## gpm	The maximum effluent flow rate from miscellaneous drains (other planned discharges excluding liquid radwaste and storm water) to the receiving water body.
8.2	**Raw Water Requirements**		
8.2.1	Maximum Use	# gpm	The maximum short-term rate of withdrawal from the water source for miscellaneous activities, such as floor washing.
8.2.2	Monthly Average Use	# gpm	The average rate of withdrawal from the water source for miscellaneous activities, such as floor washing.
9	**Unit Vent/Airborne Effluent Release Point**		
9.1	**Atmospheric Dispersion (χ/Q) (Accident)**	Second/m^3	Vendor specific accident dispersion factors are included in SSAR Chapter 15.
9.3	**Calculated Dose Consequences**	rem	Vendor specific accident doses are included in SSAR Chapter 15.
9.4	**Release Point**		
9.4.2	Elevation (Normal)	Ground Level or elevation of release point in ft.	The elevation above finished grade of the release point for routine operational releases.

PPE Item		Design Parameter	Definition
9.4.3	Elevation (Post Accident)	Ground Level or elevation of release point in ft.	The elevation above finished grade of the release point for accident sequence releases.
9.4.5	Temperature	##° F	The temperature of the airborne effluent stream at the release point. Provided in the PPE if the release point is elevated and the applicant is taking credit for thermal buoyancy in the plume
9.4.6	Volumetric Flow Rate	## SCFM	The volumetric flow rate of the airborne effluent stream at the release point. Provided in the PPE if the release point is elevated and the applicant is taking credit for exhaust velocity of the plume

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
9.5	**Source Term**		
9.5.1	Gaseous (Normal)	Table C-7	The expected annual activity, by radionuclide, contained in routine plant airborne effluent streams.
9.5.2	Gaseous (Accident)	Provided in SSAR Chapter 15	The activity, by radionuclide, contained in post-accident airborne effluents.
9.5.3	Tritium	Table C-7	The expected annual activity of tritium contained in routine plant airborne effluent streams.
10	**Liquid Radwaste System**		
10.1	**Dose Consequences**	rem	**Normal and accident doses are provided in the body of the SSAR**
10.2	**Release Point**		
10.2.1	Flow Rate	## gpm	The discharge flow rate of potentially radioactive liquid effluent streams from plant systems to the receiving waterbody.
10.3	**Source Term**		
10.3.1	Liquid	Table C - 10	The annual activity, by radionuclide, contained in routine plant liquid effluent streams.
10.3.2	Tritium	Table C -10	The annual activity of tritium contained in routine plant liquid effluent streams.
11	**Solid Radwaste System**		
11.2	**Solid Radwaste**		
11.2.1	Activity	Table C - 3	The annual activity, by radionuclide, contained in solid radioactive wastes generated during routine plant operations.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
11.2.2	Volume	## ft^3/yr	The expected volume of solid radioactive wastes generated during routine plant operations.
13	**Auxiliary Boiler System**		
13.1	Exhaust Elevation	## ft.	The height above finished plant grade at which the flue gas effluents are released to the environment.
13.2	Flue Gas Effluents	Table C - 4	The expected combustion products and anticipated quantities released to the environment due to operation of the auxiliary boilers.
13.3	Fuel Type		The type of fuel required for proper operation of the auxiliary boilers.
13.4	Heat Input Rate (Btu/hr)	## Btu/hr	The average heat input rate due to the periodic operation of the auxiliary boilers (fuel consumption rate).
14	**Standby Power System**		
14.1	**Diesel**		
14.1.1	Diesel Capacity (kW)	## kW/unit (EDG) ## kW/unit (SBO)	The total generating capacity of the diesel generating system.
14.1.2	Diesel Exhaust Elevation	## ft.	The elevation above finished grade of the release point for standby diesel exhaust releases.
14.1.3	Diesel Flue Gas Effluents	Table C - 5	The expected combustion products and anticipated quantities released to the environment due to operation of the emergency standby diesel generators.
14.1.4	Diesel Noise	## dBA at 1000 ft.	The maximum expected sound level produced by operation of diesel generators, measured at 1000 feet from the noise source.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
14.1.5	Diesel Fuel Type		The type of diesel fuel required for proper operation of the diesel generator.
14.1.6	Exhaust Stack Diameter	## in.	The nominal diameter of the exhaust stack.
14.1.7	Flue Gas Flow Rate	## acfm	The maximum flue gas flow rate exiting the exhaust stack.
14.1.8	Flue Gas Temperature	## °F	The temperature of the flue gas exiting the exhaust stack.
14.1.10	Number of Units	EDG - # SBO - #	The number of generator units.
14.1.11	Diesel Usage	## hr/yr/unit (EDG) ## hr/yr/unit (SBO)	The expected duration of usage for each diesel.
14.1.12	Heat Input Rate (Btu/hr)	## Btu/hr	The average heat input rate (fuel consumption rate).
14.2	**Gas-Turbine**		
14.2.1	Gas-Turbine Capacity (kW)	## kW	The total generating capacity of the gas turbine generating system.
14.2.2	Gas-Turbine Exhaust Elevation	## ft.	The elevation above finished grade of the release point for standby gas-turbine exhaust releases.
14.2.3	Gas-Turbine Flue Gas Effluents	Table C - 6	The expected combustion products and anticipated quantities released to the environment due to operation of the standby gas-turbine generators
14.2.4	Gas-Turbine Noise	## dBA at 1000 ft.	The maximum expected sound level produced by operation of gas-turbines, measured at 1000 feet from the noise source.
14.2.5	Gas-Turbine Fuel Type		The type of fuel required for proper operation of the gas-turbines.
14.2.6	Exhaust Stack Diameter	## in.	The nominal diameter of the exhaust stack.
14.2.7	Flue Gas Flow Rate	## actual cfm	The maximum flue gas flow rate exiting the exhaust stack.
14.2.8	Flue Gas Temperature	## °F	The temperature of the flue gas exiting the exhaust stack.
14.2.10	Number of Units		The number of generator units (Class 1E / Non-Class 1E)
14.2.11	Gas-Turbine Usage	# hr/yr	The expected duration of usage for each gas-turbine.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
14.2.12	Heat Input Rate (Btu/hr)	### Btu/hr	The average heat input rate (fuel consumption rate).
15	**Plant Layout Considerations**		
15.2	**Acreage to support plant Operations**		
15.2.2	Parking Lots	# ac.	The land area required to provide space for parking lots.
15.2.3	Permanent Support Facilities	# ac.	The land area required to provide space for permanent support facilities.
15.2.4	Power Block	# ac.	The land area required to provide space for Power Block facilities. Power Block is defined as all structures, systems and components which perform a direct function in the production of, transport of, or storage of heat energy, electrical energy or radioactive wastes. Also included are structures, systems, and components that monitor, control, and protect the public health and safety.
15.2.6	Switchyard	# ac.	The land usage required for the high voltage switchyard used to connect the plant to the transmission grid.
15.2.7	Other Areas	## ac.	The land area required to provide space for plant facilities not provided in Parameters 15.2.2 - 15.2.4.
16	**Plant Operations Considerations**		
16.1	Megawatts Thermal	## MWt (single unit) ## MWt (dual unit)	The thermal power generated by the nuclear steam supply system.
16.2	Plant Design Life	## years	The operational life for which the plant is designed.
16.3	**Plant Population**		
16.3.1	Operation	## people	The number of people required to operate the plant.
16.3.2	Refueling/Major Maintenance	## people	The additional number of temporary staff required to conduct refueling and major maintenance activities.
16.4	Station Capacity Factor	## percent	The percentage of time that a plant is capable of providing power to the grid.

Table C1 – Plant Parameter Envelope

PPE Item		Design Parameter	Definition
16.5	Plant Operating Cycle	18 or 24 months	The normal plant operating cycle length.
17	**Construction**		
17.2	**Acreage**		
17.2.1	Laydown Area	## ac.	The land area required to provide space for construction support facilities.
17.2.2	Temporary Construction Facilities	## ac.	The land area required to provide space for temporary construction support facilities.
17.2.3	Construction Parking Lot	## ac.	The land area required to provide space for parking lots
17.3	**Construction**		
17.3.1	Noise	### dBA at 50 ft.	The maximum expected sound level due to construction activities, measured at 50 feet from the noise source.
17.4	**Plant Population**		
17.4.1	Construction	### people	Number of workers on-site for construction of the new plant.
18	**Miscellaneous Parameters**		
18.1	Maximum Fuel Enrichment	# weight percent	U-235 fraction (percent) in the fuel uranium.
18.2	Maximum Average Assembly Burnup	## MWD/MTU	Maximum assembly average burnup at end of assembly life.
18.3	Peak Fuel Rod exposure at end of life	## MWD/MTU	Peak fuel rod exposure at end of life.

Table C-2 – Blowdown Constituents and Concentrations

Constituents		CWS Blowdown	SWS/UHS Blowdown	SWS Water Treatment Discharge	Sanitary System Discharge	Other Plant Discharge[a]	Combined Discharge[b]
pH							
Alkalinity	mg/l as $CaCO_3$						
Suspended Solids	mg/l						
TDS	mg/l						
Total Hardness	mg/l as $CaCO_3$						
Calcium	mg/l						
Magnesium	mg/l						
Sodium	mg/l						
Chloride	mg/l						
Sulfate	mg/l						
Bicarbonate	mg/l						
Ammonia	mg/l						
ortho-Phosphate	mg/l						
Silica	mg/l as SiO_2						
BOD_5	mg/l						
Cycles of concentration							
H_2SO_4 added	mg/l						
Max TDS							

a) Other plant discharges include demineralizer wastes and other plant drains.
b) Combined discharge is the mass-balanced combination of the five primary flow paths.
c) Column headings are dependent on owner assumptions and included reactor designs
mg/l = milligrams per liter, TDS = Total Dissolved Solids

Table C3 – Single Unit Principal Radionuclides in Solid Radwaste

Radionuclide	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Bounding Value Quantity (Ci/yr)

Table C-4 – Emissions from Auxiliary Boilers

Pollutant Discharged	(lbs)[a]
Particulates (PM_{10})	
Sulfur Oxides	
Carbon Monoxide	
Volatile Organic Compounds[b]	
Nitrogen Oxides	

a) Emissions based on ## days continuous operation per boiler.
b) As total hydrocarbons

Table C-5 – Emissions from Standby Diesel Generators

Pollutant Discharged	Diesel Generators (lb/yr)[a]
Particulates (PM_{10})	
Sulfur Oxides	
Carbon Monoxide	
Volatile Organic Compounds[b]	
Nitrogen Oxides	

a) Emissions based on # hr/month operation for all of the generators.
b) As total hydrocarbons

Table C-6 – Standby Power System Gas Turbine Flue Gas Effluents

Pollutant	Emission Factor[(a)(b)] (lb/MMBtu)	Emission Rate (per GTG) [(f)] (Normal Operation)		
		(lb/hr)	(lb/24-hr)	(lb/2-yr)[(c)]
NOx (Uncontrolled)				
NOx (Water-Steam Injection)				
CO (Uncontrolled)				
CO (Water-Steam Injection)				
SO2				
Filterable Particulate Matter				
Condensable Particulate Matter				
Total Particulate Matter				
Total Hydrocarbons				

Table C-7 – Single Unit Composite Average Annual Normal Gaseous Release

Radionuclide	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Bounding Value Release (Ci/yr)

The information in these tables should be provided in Chapter 15 of the SSAR.

Table C-8 – Accidental Gaseous Radioactive Release

Reactor Vendor				
Nuclide	**Release (Ci)**		**Nuclide**	**Release (Ci)**

Table C-9 – LOCA (or other bounding DBA) by Post Accident Interval (Ci)

TABLE 9					
One Unit **LOCA (or other Bounding DBA) Atmospheric Release by Post Accident Interval (Curies)[1]**					
Time Period Radionuclide	0 to 2 hour	0 to 8 hour	8 to 24 hour	24 to 96 hour	96 to 720 hours

Table C-10 – Single Unit Composite Average Annual Normal Liquid Release

Radionuclide	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Vendor Release (Ci/yr)	Bounding Value Release (Ci/yr)

Table C-11 – Single Unit Composite Accidental Liquid Radioactive Release

Radionuclide	Vendor Release (Ci)	Vendor Release (Ci)	Vendor Release (Ci)	Vendor Release (Ci)	Bounding Value Release (Ci)