



# U.S. NUCLEAR REGULATORY COMMISSION

## STANDARD REVIEW PLAN

### 3.2.1 SEISMIC CLASSIFICATION

#### REVIEW RESPONSIBILITIES

**Primary** - Organization responsible for mechanical engineering reviews

**Secondary** - Organizations responsible for the review of component performance and testing

#### I. AREAS OF REVIEW

General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Plants," in part, requires that structures, systems, and components (SSCs) important to safety be designed to withstand the effects of earthquakes without loss of capability to perform their safety functions. Important to safety SSCs are those SSCs that provide reasonable assurance that the facility can be operated with adequate protection to the health and safety of the public. The earthquake against which these plant features are designed is defined as the operating basis earthquake (OBE) in 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," and Appendix S to 10 CFR Part 50, "Earthquake Engineering Criteria for Nuclear Power Plants." Appendix S to 10 CFR Part 50 and 10 CFR Part 100 require safety-related SSCs must be designed to withstand a safe shutdown earthquake (SSE). Regulatory Guide (RG) 1.29, "Seismic Design Classification" defines the list of SSCs that need to be designed to withstand an SSE and designates these plant features as seismic Category I. The SSE is based upon an

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#### USNRC STANDARD REVIEW PLAN

This Standard Review Plan (SRP) NUREG-0800, has been prepared to establish criteria that the U.S. Nuclear Regulatory Commission (NRC) staff responsible for the review of applications to construct and operate nuclear power plants intends to use in evaluating whether an applicant/licensee meets the NRC regulations. The SRP is not a substitute for the NRC regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC regulations.

The SRP sections are numbered in accordance with corresponding sections in Regulatory Guide (RG) 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Not all sections of RG 1.70 have a corresponding review plan section. The SRP sections applicable to a combined license application for a new light-water reactor (LWR) are based on RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)." These documents are made available to the public as part of the NRC policy to inform the nuclear industry and the general public of regulatory procedures and policies. Individual sections of NUREG-0800 will be revised periodically, as appropriate, to accommodate comments and to reflect new information and experience. Comments may be submitted electronically by email to [NRO\\_SRP@nrc.gov](mailto:NRO_SRP@nrc.gov).

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evaluation of the maximum earthquake potential and is that earthquake which produces the maximum vibratory ground motion for which seismic Category I SSCs are designed to remain functional, in accordance with 10 CFR Part 50, Appendix S. Appendix S also requires consideration of surface deformation.

The specific areas of review are as follows:

1. This SRP section reviews the seismic classification design criteria and application of that criterion on a sampling basis to those SSCs (including their foundations and supports) that are important to safety and are specified as seismic Category I by the applicant's safety analysis report (SAR) and designed to withstand, without loss of function, the effects of a SSE. The review also covers identification of SSCs that are not required to remain functional following a seismic event, but whose failure could reduce the functioning of any seismic Category I SSCs to an unacceptable safety level, or could result in incapacitating injury to control room occupants, and therefore must be analyzed and designed to maintain their integrity under seismic loading from the SSE. In addition, the staff reviews the identification of radioactive waste management SSCs that require seismic design considerations as specified in RG 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."
2. This review, which is coordinated with each branch that has primary review responsibility for these plant features, is performed for both construction permit (CP) and operating license (OL) applications, and for both design certification (DC) and combined license (COL) applications. The staff review of seismic Category I SSCs and other SSCs with specific seismic design provisions include the following plant features: structures, dams, ponds, cooling towers, reactor internals, fluid systems important to safety that are identified in RG 1.29, safety-related instrument sensing lines that are identified in RG 1.151, "Instrument Sensing Lines," ventilation systems, standby diesel generator auxiliary systems, fuel handling systems, and cranes.
3. The staff reviews seismic Category I SSCs that are identified in RG 1.189, "Fire Protection for Nuclear Power Plants," to establish the design provisions of fire protection to withstand seismic loading from the SSE. This RG identifies portions of fire protection SSCs needing seismic design consideration.
4. The applicant's proposed seismic classification may in part be presented in the form of a table<sup>1</sup> that identifies those SSCs that are designated as seismic Category I. The table should identify all activities affecting the safety functions of these seismic Category I plant features that should also meet GDC 1, "Quality Standards and Records," and the pertinent quality assurance (QA) requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The acceptability of QA applied to SSCs that have seismic design considerations is determined in accordance with RG 1.29. Details of the seismic classification of these

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<sup>1</sup> See SRP Section 3.2.2 - "System Quality Group Classification," for guidance.

plant features may be shown on plot plans, general arrangement drawings, and piping and instrumentation diagrams.

- a. If the applicant has established the OBE ground motion at less than or equal to one-third of the SSE ground motion, per Staff Requirement Memorandum to SECY-93-087 approved by the Commission, the OBE is eliminated from the design of SSCs. The OBE will serve as an “inspection level earthquake” below which the effect on health and safety of the public would be insignificant and above which the licensee would be required to shut down the plant and inspect the damage, in accordance with 10 CFR Part 50, Appendix S. A list of the SSCs necessary for continued safe operation during and following an OBE is not required at the design stage. However, a list of SSCs necessary for continued safe operation during and following an OBE is needed to support plant inspections for damage after an earthquake; timing for providing the list should be determined by NUREG-0800, Standard Review Plan (SRP), Chapter 13, “Conduct of Operations,” reviewers or those responsible for pre-earthquake planning and post-earthquake inspection procedures.
  - b. Certain equipment that is only designed to withstand the OBE is addressed by specific regulatory guidance, such as RG 1.143.
5. Where portions of structures and fluid systems are seismic Category I, they also need to be clearly identified. For fluid systems important to safety, the classification tables in the SAR should identify system components such as pressure vessels, heat exchangers, storage tanks, pumps, piping, and valves, have suitable footnotes defining interfaces, and be in sufficient detail so that there is a clear understanding of the extent of those portions of the system that are classified as seismic Category I.
  6. Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). For DC and COL reviews, the staff reviews the applicant’s proposed ITAAC associated with the SSCs related to this SRP section in accordance with SRP Section 14.3. The staff recognizes that the review of ITAAC cannot be completed until after the rest of this portion of the application has been reviewed against acceptance criteria contained in this SRP section. Furthermore, the staff reviews the ITAAC to ensure that all SSCs in this area of review are identified and addressed as appropriate in accordance with SRP Section 14.3.
  7. COL Action Items and Certification Requirements and Restrictions. For a DC application, the review will also address COL action items and requirements and restrictions (e.g., interface requirements and site parameters).

For a COL application referencing a DC, a COL applicant must address COL action items (referred to as COL license information in certain DCs) included in the referenced DC. Additionally, a COL applicant must address requirements and restrictions (e.g., interface requirements and site parameters) included in the referenced DC. For more specific guidance, refer to RG 1.206, “Combined License Applications for Nuclear Power Plants.”

## Review Interfaces

Other SRP sections interface with this section are as follows:

1. The acceptability of the quality group classification of system components is determined in accordance with SRP Section 3.2.2, "System Quality Group Classification." The quality group classification information may be combined or cross-referenced with the seismic classification information reviewed in this SRP section to minimize repetition of similar information (e.g., tables or lists of components, system drawings.).
2. The systems and components important to safety that are designated as seismic Category I items are verified as designed in accordance with the regulatory guides, industry codes and standards that are referenced in SRP Sections 3.2.2, 3.9.1, "Special Topics for Mechanical Components," through 3.9.3, "ASME Code Class 1, 2, and 3 Components, and Component Supports, and Core Support Structures," 3.10, "Seismic and Dynamic Qualification of Mechanical and Electrical Equipment," and 3.11, "Environmental Qualification of Mechanical and Electrical Equipment."
3. The adequacy of the qualification and inservice testing program for pumps and valves is determined in accordance with SRP Section 3.9.6, "Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints."
4. Consistency with seismic requirements for electrical equipment is evaluated in the SRP sections for Chapter 8. The seismic qualification of equipment is assessed in accordance with SRP Section 3.10.
5. The radioactive waste management SSCs are reviewed in accordance with SRP Sections 11.2, "Liquid Waste Management System," through 11.4, "Solid Waste Management System."
6. The seismic design of fire protection systems installed in safety-related areas is reviewed in accordance with SRP Section 9.5.1, "Fire Protection Program."
7. The quality assurance program for design, construction and operation is reviewed in accordance with SRP Sections 17.5, "Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants."
8. The classification and design of safety-related structures are reviewed in accordance with SRP Sections 3.8.1, "Concrete Containment," through 3.8.5, "Foundations."
9. Consistency with seismic requirements for reactor pressure vessel internals is reviewed in accordance with SRP Section 3.9.5, "Reactor Pressure Vessel Internals."
10. The list of SSCs necessary for continued operation that must remain functional during and following an OBE to support plant inspections for damage after an earthquake is reviewed in SRP Chapter 13 and those responsible for pre-earthquake planning and post-earthquake inspection procedures. RG 1.206 clarifies guidance for the list of SSCs.

11. The identification and evaluation of nonsafety-related risk-significant SSCs is reviewed in accordance with the guidance in SRP Chapters 17, "Quality Assurance," and 19, "Severe Accidents," and DC/COL-ISG-018 concerning QA and reliability assurance.

To assist in the review of seismic classification, the staff in other branches that review information presented in other SRP sections referenced in this SRP section will coordinate evaluations that interface with the overall review of system seismic classification addressed in those sections.

The specific acceptance criteria and review procedures are contained in the referenced SRP sections.

## II. ACCEPTANCE CRITERIA

### Requirements

Acceptance criteria are based on meeting the relevant requirements of the following Commission regulations:

1. GDC 1, and the pertinent QA requirements of 10 CFR Part 50, Appendix B, as they relate to applying QA requirements to activities affecting the safety functions of SSCs designated as seismic Category I commensurate with their importance to safety.
2. GDC 2, as it relates to the requirements that SSCs important to safety shall be designed to withstand the effects of earthquakes without loss of capability to perform necessary safety functions.
3. GDC 60, "Control of Releases of Radioactive Materials to the Environment," as it relates to the design of means to control suitably the release of radioactive materials in gaseous and liquid effluents.
4. 10 CFR Part 100, Appendix A and 10 CFR Part 50, Appendix S, as it relates to certain SSCs being designed to withstand the SSE and remain functional.
5. 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the DC has been constructed and will be operated in conformity with the DC, the provisions of the Atomic Energy Act (AEA), and the NRC's rules and regulations.
6. 10 CFR 52.80(a), which requires that a COL application contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the combined license, the provisions of the AEA, and the NRC's rules and regulations.

7. 10 CFR 52.47, “Contents of Applications; General Information,” which requires that the information submitted for a DC include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant. The Commission will require, before DC, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination.
8. 10 CFR 50.34, “Contents of Applications; Technical Information,” and 10 CFR 52.47, which require that the final safety analysis report (FSAR) include the design bases and the technical justification upon which the design requirements have been established. Design bases, as defined in 10 CFR 50.2, “Definitions,” means that information which defines the specific functions to be performed by SSCs and the specific values or ranges of values chosen for controlling parameters as reference bounds by design.

### SRP Acceptance Criteria

Specific SRP acceptance criteria acceptable to meet the relevant requirements of the NRC’s regulations identified above are as follows for the review described in this SRP section. The SRP is not a substitute for the NRC’s regulations, and compliance with it is not required. However, an applicant is required to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide acceptable methods of compliance with the NRC regulations.

1. RG 1.29 provides guidance used to establish the seismic design classification to meet the requirements of GDC 2, 10 CFR Part 100, Appendix A, and 10 CFR Part 50, Appendix S. This guide describes an acceptable method of identifying and classifying those plant features that must be designed to withstand the effects of the SSE (e.g., seismic Category I features).
2. RG 1.151 provides guidance with regard to seismic design provisions and classification of safety-related instrument sensing lines.
3. RG 1.143 provides guidance used to establish the seismic design provisions of radioactive waste management SSCs to meet the requirements of GDC 2 and GDC 60 as they relate to designing these SSCs to withstand earthquakes. The guide identifies several radioactive waste SSCs requiring some level of seismic design consideration.
4. RG 1.189 provides guidance used to establish the design provisions of fire protection SSCs, including seismic design consideration and seismic classification for certain SSCs. These provisions support an overall system design that meets the requirements of GDC 2 as it relates to designing these SSCs to withstand earthquakes.

### Technical Rationale

The technical rationale for application of these acceptance criteria to the areas of review addressed by this SRP section is discussed in the following paragraphs:

1. Compliance with GDC 1 and 10 CFR Part 50, Appendix B, requires that SSCs important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. GDC 1 requires, in part, that a QA Program be established and implemented to provide adequate assurance that SSCs important to safety will satisfactorily perform their safety functions. Regulations in 10 CFR Part 50, Appendix B, establish QA program requirements for the design, construction, and operation of SSCs important to safety. The requirements of 10 CFR Part 50, Appendix B apply to activities affecting the safety-related functions of those SSCs, including those SSCs defined by the guidance of RG 1.29 as seismic Category I SSCs. Specifying and using appropriate quality standards and requirements in accordance with 10 CFR Part 50, Appendix B, for the design of SSCs important to safety minimizes the potential for failures of those SSCs, including seismic Category I SSCs that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public.
2. Compliance with GDC 2 requires that nuclear power plant SSCs important to safety be designed to withstand the effects of natural phenomena, including earthquakes, without loss of capability to perform their safety functions. Also, compliance with 10 CFR Part 100, Appendix A and 10 CFR Part 50, Appendix S, requires that certain SSCs be designed to withstand the SSE and remain functional. The SSCs are those necessary to ensure: (1) the integrity of the reactor coolant pressure boundary; (2) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100.
  - a. RG 1.29 describes an acceptable method of identification and classification of SSCs important to safety that should be designed to withstand the SSE. RG 1.29 states that systems and components required for safe shutdown, including their foundations and supports, are designated as seismic Category I and should be designed to withstand the effects of the SSE and remain functional. In addition, RG 1.29 recommends that systems, other than radioactive waste management systems, that contain, or may contain, radioactive material and whose postulated failure would result in potential offsite whole body (or equivalent) doses that are more than 0.005 Sv (0.5 rem), should also be classified as seismic Category I. Conformance with RG 1.29 assures that, by designing the SSCs identified in the guide to withstand the effects of an SSE, a designed-in safety margin is provided for bringing the reactor to a safe, shutdown condition, while also reducing potential offsite doses from seismic events.
  - b. In addition, certain system-specific regulatory guides provide information on seismic classification of portions of those systems at a more precise level of detail than is provided in the general statements in RG 1.29. RG 1.151 provides guidance for the proper seismic classification of safety-related instrumentation sensing lines used to actuate or monitor safety-related systems.

- c. Compliance with the above requirements and guidance assures that the SSCs important to safety are properly classified as seismic Category I and will function during an SSE enabling accomplishment of the safety functions described above.
- 3. Compliance with GDC 60 requires, in part, that the nuclear power unit design include means to control suitably the release of radioactive materials in gaseous and liquid effluents. RG 1.143 provides acceptable methods and guidance relative to seismic design and classification for radioactive waste management SSCs. RG 1.143 also provides classification information and design criteria to assure that components and structures used in radioactive waste management systems are designed, constructed, installed and tested in a manner that protects the health and safety of the public and the plant operating personnel. Designing and constructing the radioactive waste management SSCs to meet the requirements of GDC 60 and the guidance on seismic design and classification contained in RG 1.143 provides assurance that SSCs containing radioactivity will be properly classified and radiation exposures as a result of seismic events will be as low as reasonably achievable.

### III. REVIEW PROCEDURES

The reviewer will select material from the procedures described below, as may be appropriate for a particular case.

These review procedures are based on the identified SRP acceptance criteria. For deviations from these acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II.

- 1. RG 1.29, which identifies SSCs of light-water-cooled reactors on a functional basis, is the principal document used for identifying those plant features important to safety which, as a minimum, should be designed to seismic Category I provisions. RG 1.151 provides guidance for the seismic classification of safety-related instrument sensing lines. RG 1.29 also recommends that systems, other than radioactive waste management systems, that contain, or may contain, radioactive material and whose postulated failure would result in conservatively calculated potential offsite whole body (or equivalent to any part of the body) doses that are more than 0.005 Sv (0.5 rem), should also be classified as seismic Category I. RG 1.143 provides seismic design provisions for radioactive waste management system SSCs. Those radioactive waste management systems needing seismic design considerations should be clearly identified. RG 1.189 provides guidance for seismic classification and analysis of fire protection systems SSCs. Those portions of fire protection systems needing seismic design considerations should be clearly identified.
  - a. The staff review should determine whether the applicant has indicated conformance with RGs 1.29, 1.143, 1.151, and 1.189 in the SAR. Where there are differences with respect to the Guides, these differences should be identified and the staff's evaluation of whether they are acceptable (after requesting additional information from the applicant, if necessary) should be documented in the safety evaluation report.



2. The information in the SAR identifying seismic Category I SSCs and other SSCs with specific seismic design requirements is reviewed for completeness and to assure there is sufficient detail to permit identification of specific items. This may include a review of the SAR text, tables, plot plans, general arrangement drawings, structural drawings, and piping and instrumentation diagrams, as appropriate. Where portions of a system are classified as seismic Category I, the boundary limits of that portion of the system designed to seismic Category I provisions are reviewed on the piping and instrumentation diagrams. For fluid systems that are partially seismic Category I, the seismic Category I portion of the system should extend to the first seismic restraint beyond the isolation valves that isolate the part that is seismic Category I from the non-seismic Category I portion of the system. At the physical interface between seismic and non-seismic Category I piping systems, the seismic Category I dynamic analysis will be extended to either the first anchor point in the nonseismic system or to a sufficient distance in the nonseismic system so as not to degrade the validity of the seismic Category I analysis. In addition, where portions of a structure are classified seismic Category I, those portions of the building foundations and supports designed to seismic Category I provisions are identified on the plant arrangement drawings. The interfaces between components and associated support structures designed to seismic Category I provisions are then checked to assure compatibility.
  - a. The reviewer verifies that the seismic classification of safety-related instrumentation sensing lines is in accordance with the guidance in RG 1.151.
3. SSCs that are classified as seismic Category I and other SSCs with specific seismic design requirements are also reviewed to determine appropriate inclusion of plant features that are within the scope of an applicant's QA Program. This QA Program should be in compliance with the pertinent QA requirements of 10 CFR Part 50, Appendix B. In accordance with RG 1.29, the pertinent QA requirements of 10 CFR Part 50, Appendix B should be applied to all activities affecting the safety functions of seismic Category I SSCs. The seismic classification review of SSCs important to safety and the review verifying that these plant features are constructed in accordance with a 10 CFR Part 50, Appendix B, QA Program is normally performed concurrently with the quality group classification review of SRP Section 3.2.2.
  - a. Other SSCs that may be necessary for operation of the facility (excluding electrical features) need not be designed to seismic Category I provisions. Those SSCs of lower safety significance such that they need not be designed to seismic Category I provisions include those portions of seismic Category I systems such as vent lines, drain lines, fill lines and test lines on the downstream side of isolation valves and those portions of the system not required to perform a safety function.
4. Classification guidelines for selected BWR main steam system SSCs are addressed in SRP Section 3.2.2, Appendix A. For BWRs that do not include a main steam isolation valve leakage control system, and for which main steam line fission product hold-up and retention is credited in the analysis of design basis accident radiological consequences, an acceptable alternative seismic classification for the main steam lines and associated systems is provided in Appendix A of SRP Section 3.2.2.

5. The information in the SAR is reviewed to identify SSCs whose continued function is not required following a seismic event, but whose failure could reduce the functioning of any seismic Category I feature to an unacceptable safety level, or could result in incapacitating injury to control room personnel, to assure that such items will be analyzed and designed to maintain their integrity under seismic loading from the SSE.
  - a. The information in the SAR is also reviewed to identify radioactive waste management system and fire protection SSCs to assure that those SSCs calling for seismic design considerations have been identified consistent with those systems specified in RG 1.143 and RG 1.189.
6. In the event an applicant intends to take exception to RGs 1.29, 1.143, 1.151, or 1.189 but has not provided an adequate justification for resultant proposed seismic classifications, the staff prepares questions whose answers may require additional documentation or analysis to establish an acceptable basis for the proposed seismic classification. The staff may also prepare comments requesting clarification in order to assure a clear understanding of the seismic classification assigned to a system by the applicant.
  - a. If the staff's questions are not resolved in a satisfactory manner, a staff position is taken requesting conformance to RGs 1.29, 1.143, 1.151, 1.189 and with the positions discussed in the above Review Procedures.
7. For review of a DC application, the reviewer should follow the above procedures to verify that the design, including requirements and restrictions (e.g., interface requirements and site parameters), set forth in the FSAR meets the acceptance criteria. DCs have referred to the FSAR as the design control document (DCD). The reviewer should also consider the appropriateness of identified COL action items. The reviewer may identify additional COL action items; however, to ensure these COL action items are addressed during a COL application, they should be added to the DC FSAR.
  - a. For review of a COL application, the scope of the review is dependent on whether the COL applicant references a DC, an early site permit (ESP) or other NRC approvals (e.g., manufacturing license, site suitability report or topical report).
  - b. For review of both DC and COL applications, SRP Section 14.3 should be followed for the review of ITAAC. The review of ITAAC cannot be completed until after the completion of the review under this section.
8. Regulations in 10 CFR 52.47 also state that the Commission will require, before DC, that information normally contained in certain procurement specifications and construction and installation specifications be completed and available for audit if the information is necessary for the Commission to make its safety determination. The staff may elect to audit available design documents such as design specifications; system description and schematics or piping and instrumentation diagrams. If available, QA lists and procurement documents associated with the seismic classification of risk-significant systems and mechanical components should be made available as supporting documents for such an audit. An audit should be scheduled based on the availability of design documents and prior to the DC or COL issuance. The staff review may include

an assessment of the degree of completeness of design information supporting classifications and how seismic classification is translated into design documents. The audit may also be used to support resolution of seismic classification open items identified during the review of the application. Depending on the audit plan, the scope may be limited to a review of the seismic classification process and a sampling of risk-significant systems and mechanical components to validate that the applicant has an appropriate classification process in place.

9. GDC 2 requires SSCs that are important to safety be designed to withstand earthquakes. To support compliance with GDC 2, such SSCs should be appropriately classified to ensure that they are designed to withstand earthquakes. In addition to safety-related SSCs, nonsafety-related SSCs are to be designed to withstand earthquakes if they perform an important to safety function. The extent that these nonsafety-related SSCs are to be classified and designed for earthquakes depends on the specific need to be functional or to preclude their failure, consistent with risk insights. The risk informed approach that utilizes the probabilistic risk assessment (PRA) can be utilized to supplement and enhance the deterministic approach in order to identify these nonsafety-related SSCs that are credited in the PRA. Where industry consensus standards for seismic classification are consistent with NRC regulations, they may be acceptable for licensing purposes.
10. Various approaches, such as the regulatory treatment of nonsafety systems (RTNSS) process, may be considered to designate appropriate seismic requirements, including industry consensus standards and regulatory guidance. The RTNSS process is described in detail in an NRC memorandum from Dennis M. Crutchfield entitled "Consolidation of SECY-94-084 and SE CY-95-132," dated July 24, 1995 (ADAMS Accession No. ML003708048), which consolidates approved policy positions from the two subject Commission papers and their associated Staff Requirements Memoranda. The RTNSS process is generally applied to passive designs and is considered for advanced reactors on a case by case basis. The designer will impose design requirements and classifications for these SSCs commensurate with their risk significance. For example, in SECY-96-128 and its associated SRM, it was decided that certain RTNSS SSCs for passive advanced light-water reactors (ALWRs) (RTNSS B) need not be safety-related or subject to dynamic qualification, but their anchorage did need to be designed for seismic events and their equipment enclosed in a seismically designed structure. Depending on the particular safety function, other design classifications and criteria may be considered for nonsafety-related SSCs. As part of the PRA, the seismic margins analysis may also be considered in determining which SSC are credited for seismic events and the degree to which they are to be designed for seismic events.

#### IV. EVALUATION FINDINGS

The reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the following type to be included in the staff's safety evaluation report. The reviewer also states the bases for those conclusions.

SSCs (excluding electrical features) that are important to safety have been classified as seismic Category I items, have been designed to withstand the effects of an SSE, and have been

identified in an acceptable manner in Tables 3.X.X and 3.X.X, and on system piping and instrumentation diagrams in the SAR. Other SSCs not identified as seismic Category I, but whose failure could reduce the functioning of any seismic Category I feature to an unacceptable safety level or injure control room personnel, are identified for analysis to assure the SSE will not cause such failures.

The staff concludes that the SSCs important to safety that are within the scope of this review have been properly classified, are within the scope of the applicant's QA Program, and thus meet the relevant requirements of GDC 1, 2, and 60, 10 CFR Part 50, Appendix B, 10 CFR 50.34(a)(1), and 10 CFR Part 100, Appendix A.

This conclusion is based on:

1. The applicant's having met the requirements of GDC 1 by providing a commitment in the SAR that seismic Category I SSCs will be designed, constructed and operated under a QA Program, in compliance with the requirements of 10 CFR Part 50, Appendix B.
2. The applicant's having met the requirements of GDC 2, 10 CFR Part 100, Appendix A and 10 CFR 50, Appendix S, by having properly classified SSCs important to safety as seismic Category I items in accordance with the positions of RG 1.29, RG 1.151, and RG 1.189.
3. Those SSCs not identified as seismic Category I, but whose failure could reduce the functioning of any seismic Category I feature to an unacceptable safety level or result in incapacitating injury to control room personnel, having been identified by the applicant for analysis during the detailed design stage to assure they will not fail during an SSE.
4. Radioactive waste system and fire protection SSCs requiring seismic design considerations having been identified consistent with the positions of RG 1.143 and RG 1.189.
5. For BWRs, the applicant's having properly classified the main steam and associated systems in accordance with the guidance contained in Appendix A of SRP Section 3.2.2.

For DC and COL reviews, the findings will also summarize the staff's evaluation of requirements and restrictions (e.g., interface requirements and site parameters) and COL action items relevant to this SRP section.

In addition, to the extent that the review is not discussed in other SER sections, the findings will summarize the staff's evaluation of the ITAAC, including design acceptance criteria, as applicable.

## V. IMPLEMENTATION

The staff will use this SRP section in performing safety evaluations of DC applications and license applications submitted by applicants pursuant to 10 CFR Part 50, or 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." Except when the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the staff will use the method described herein to evaluate conformance with Commission regulations.

## VI. REFERENCES

1. U.S. *Code of Federal Regulations*, “Domestic Licensing of Production and Utilization,” Part 50, Chapter 1, Title 10, “Energy,” Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criterion 1, “Quality Standards and Records.”
2. U.S. *Code of Federal Regulations*, “Domestic Licensing of Production and Utilization,” Part 50, Chapter 1, Title 10, “Energy,” Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criterion 2, “Design Bases for Protection Against Natural Phenomena.”
3. U.S. *Code of Federal Regulations*, “Domestic Licensing of Production and Utilization,” Part 50, Chapter 1, Title 10, “Energy,” Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criterion 60, “Control of Releases of Radioactive Materials to the Environment.”
4. U.S. *Code of Federal Regulations*, “Domestic Licensing of Production and Utilization,” Part 50, Chapter 1, Title 10, “Energy,” Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.”
5. U.S. *Code of Federal Regulations*, “Domestic Licensing of Production and Utilization,” Part 50, Chapter 1, Title 10, “Energy,” Appendix S, “Earthquake Engineering Criteria for Nuclear Power Plants.”
6. U.S. *Code of Federal Regulations*, “Contents of Applications; Technical Information,” § 50.34, Chapter 1, Title 10, “Energy.”
7. U.S. *Code of Federal Regulations*, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Part 52, Chapter 1, Title 10, “Energy.”
8. U.S. *Code of Federal Regulations*, “Contents of Applications; Technical Information.” § 52.47, Chapter 1, Title 10, “Energy.”
9. U.S. *Code Of Federal Regulations*, “Reactor Site Criteria,” Part 100, Chapter 1, Title 10, “Energy,” Appendix A, “Seismic and Geologic Siting Criteria for Nuclear Power Plants.”
10. U.S. Nuclear Regulatory Commission, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” NUREG-0800.
11. U.S. Nuclear Regulatory Commission, “Seismic Design Classification,” Regulatory Guide 1.29, Revision 4. March, 2007. ADAMS Accession No. ML070310035.
12. U.S. Nuclear Regulatory Commission, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” Regulatory Guide 1.143, ADAMS Accession No. ML013100305.
13. U.S. Nuclear Regulatory Commission, “Instrument Sensing Lines,” Regulatory Guide 1.151, ADAMS Accession No. ML092330219.
14. U.S. Nuclear Regulatory Commission, “Fire Protection for Nuclear Power Plants,” Regulatory Guide 1.189, ADAMS Accession No. ML14325A144.

15. U.S. Nuclear Regulatory Commission, "Combined License Applications for Nuclear Power Plants," Regulatory Guide 1.206, ADAMS Accession No. ML070720184.
16. U.S. Nuclear Regulatory Commission, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," SECY-93-087, April, 1993.
17. U.S. Nuclear Regulatory Commission, "Policy and Key Technical Issues Pertaining to the Westinghouse AP600 Standardized Passive Reactor Design," SECY-96-128.
18. U.S. Nuclear Regulatory Commission, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," SECY-94-084.
19. U.S. Nuclear Regulatory Commission, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084)," SECY-95-132.

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**PAPERWORK REDUCTION ACT STATEMENT**

The information collections contained in the Standard Review Plan (SRP) are covered by the requirements of 10 CFR Part 50, 10 CFR Part 52 and 10 CFR Part 73, and were approved by the Office of Management and Budget, approval numbers 3150-0011, 3150-0151 and 3150-0002.

**PUBLIC PROTECTION NOTIFICATION**

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## **SRP Section 3.2.1 Description of Changes**

### **Section 3.2.1, “Seismic Classification”**

In addition to the changes itemized below, editorial changes were made throughout for consistency and applicability. Changes incorporated into Revision 3 include:

#### **I. AREAS OF REVIEW**

- Changes were made to clarify applicability to Part 52 applications.
- A definition of important to safety SSCs was added for clarity.
- Discussion of SSC scope was broadened to include other SSCs with specific seismic design provisions.
- A review area was added to address review of SSCs identified in RG 1.189.
- The review area addressing operating basis earthquakes was updated for clarity and to include guidance from RG 1.143.
- A pointer was added to RG 1.206.
- The review interface with SRP Section 3.2.2 was edited for clarity.
- A pointer to Chapter 8 for seismic requirements for electrical equipment was added for clarity.
- A pointer to SRP Section 3.9.5 for seismic requirements for reactor pressure vessel internals was added for clarity.
- A pointer to SRP Chapter 13 and RG 1.206 for applicable SSCs was added for clarity.
- A pointer to SRP Chapters 17 and 19 and DC/COL-ISG-018 was added to address evaluation of RTNSS SSCs.

#### **II. ACCEPTANCE CRITERIA**

- Requirements from 10 CFR 52.47 and 50.34 were added to clarify requirements for design certification applications and the FSAR.
- References to RG 1.151 and RG 1.189 were updated for clarity.
- References to GDC 61 were changed to GDC 60 for consistency with RG 1.143.

### III. REVIEW PROCEDURES

- Specifics applicable only to General Electric BWR/6 plants were removed.
- Procedures were added to address application content and level of detail required by 10 CFR 52.47.
- Procedures were added to address the regulatory treatment of non-safety systems, including pointers to applicable SECY papers.

### V. IMPLEMENTATION

- A minor correction was made to the applicability of this SRP section based on the docketing date of the application.

### VI. REFERENCES

- References were updated in concert with changes referenced above.