



# U.S. NUCLEAR REGULATORY COMMISSION

# STANDARD REVIEW PLAN

## INTRODUCTION

### Purpose of the Standard Review Plan

The Standard Review Plan (SRP) provides guidance to US Nuclear Regulatory Commission (NRC) staff in performing safety reviews of construction permit (CP) or operating license (OL) applications (including requests for amendments) under 10 CFR Part 50 and early site permit (ESP), design certification (DC), combined license (COL), standard design approval (SDA), or manufacturing license (ML) applications under 10 CFR Part 52 (including requests for amendments).

The principal purpose of the SRP is to assure the quality and uniformity of staff safety reviews. It is also the intent of this plan to make information about regulatory matters widely available and to improve communication between the NRC, interested members of the public, and the nuclear power industry, thereby increasing understanding of the NRC's review process.

### Background

The NRC first issued the SRP in 1975 as NUREG-75/087. It was developed from many years of NRC experience in establishing safety requirements and staff experience in applying those requirements in evaluating the safety of various designs for nuclear facilities. NRR Office Letter No. 2, dated August 12, 1975, established the SRP as a routine tool for the NRC staff to use in evaluating the safety of nuclear power plant designs. Specifically, that office letter described the SRP as representing "the integrated result of the hundreds of conscious choices made by the staff and by the nuclear industry in developing design criteria and design requirements for nuclear power plants" and "the most definitive basis available for specifying the NRC's interpretation of an acceptable level of safety for light-water reactor facilities."

Following an extensive revision program, the NRC reissued the SRP as NUREG-0800 in July 1981. This revision identified all NRC requirements that were relevant to each review topic; described how a reviewer would determine that safety requirements had been met; and incorporated a number of newly established regulatory positions, including those related to the Three Mile Island (TMI) Action Plan.

In 1991, the NRC established the Standard Review Plan Update and Development Program (SRP-UDP) to update NUREG-0800 for use in reviewing future reactor design applications. The staff subsequently issued an "Implementing Procedures Document (IPD)," NUREG-1447, in May 1992 to describe the SRP-UDP and establish procedures for updating the SRP. This update reflected the experience of the safety reviews conducted on design certification applications for evolutionary nuclear power plant designs. The SRP-UDP resulted in a draft revision to the SRP

in 1996. NRC staff used acceptance criteria and procedures introduced in the 1996 draft in reviewing license amendment applications and new applications submitted under 10 CFR Part 52, provided that the changes embodied in it were based on new regulations or regulatory guidance approved through other means. In addition, new SRP sections issued as part of the 1996 draft were used as the primary means to evaluate new applications submitted under 10 CFR Part 52 (e.g., Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria - Design Certification") since these sections represented the only guidance available for the given review area. Applicants under 10 CFR Part 52, however, were not required to address these new SRP sections in their applications.

In 2005, the Commission directed the staff to revise applicable sections of the NUREG-0800, other guidance documents and office procedures to ensure up-to-date guidance would be available for the next generations of staff that would be responsible for reviewing and licensing new sites and new reactors. The staff was to develop an integrated and continuing plan for updating licensing review guidance and provide the plan, along with a schedule for completion, to the Commission. "Briefing of Status of New Site and Reactor Licensing," (M050406) Staff Requirements Memorandum dated May 10, 2005 (ML051300673). The staff response to this SRM is contained in SECY-06-0019, "Semiannual Update of the Status of New Reactor Licensing Activities and Future Planning for New Reactors," dated January 31, 2006. In the next semiannual update, SECY-06-0187 dated August 25, 2006, the staff informed the Commission that they had accelerated the SRP schedule to March 2007.

Some of the changes incorporated into this revision include:

- extended applicability to 10 CFR 52 licensing processes;
- technical rationale was developed and added to each SRP section to provide a basis for the acceptance criteria;
- assigning the review responsibilities by function, with the responsible organizations maintained separately from the SRP itself to minimize impacts of office reorganizations,
- consistent format applied to each section
- NRC metrication policy was implemented;
- resolution of unresolved safety issues (USIs) and generic safety issues (GSIs) were incorporated within the applicable sections;
- consideration of operating experience insights from Generic Letters and Bulletins was incorporated within the applicable sections;
- TMI Action Plan requirements<sup>1</sup> were reconciled;
- where applicable, staff affirmed the technical accuracy of the draft SRP issued in 1996; and
- staff renumbered branch technical positions to remove dated branch acronyms.

Changes to specific sections are detailed at the end of this Introduction.

NRR Office Instruction LIC-200, "Standard Review Plan Process," was used as the guiding document in performing the March 2007 revision to the SRP.

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<sup>1</sup>For 10 CFR Part 50 applicants not listed in 10 CFR 50.34(f), "Additional TMI-related requirements," the applicable provisions of 10 CFR 50.34(f) will be made a requirement during the licensing process.

## **Objectives of the SRP**

The SRP is intended to be a comprehensive and integrated document that provides the reviewer with guidance that describes methods or approaches that the staff has found acceptable for meeting NRC requirements. Implementation of the criteria and guidelines contained in the SRP by staff members in their review of applications provides assurance that a given design will comply with NRC regulations and provide adequate protection of the public health and safety. The SRP also makes the staff's review guidance for licensing nuclear power plants publicly available and is intended to improve industry and public stakeholder understanding of the staff review process. It should be noted that the SRP is not a substitute for NRC regulations, and compliance with the SRP is not required.

In addition to documenting current methods of review, the SRP provides a basis for orderly modification of the review process. The NRC disseminates information regarding current safety issues and proposed solutions through various means, such as generic communications and the process for treating generic safety issues. When current issues are resolved, it is necessary to determine the need, extent and nature of revision that should be made to the SRP to reflect new NRC guidance.

The staff should use the SRP as superseded or supplemented by new or revised regulations, regulatory guidance, staff analyses of previous applications, and other published staff positions to perform its review of a power reactor operating license application and a proposed change to an existing operating license under 10 CFR Part 50, or a new reactor license application under 10 CFR Part 52.

## **Scope of Review of License Applications (Initial Applications and Amendments)**

Because the staff's review constitutes an independent audit of the applicant's analysis, the staff may emphasize or de-emphasize particular aspects of an SRP section, as appropriate, for the application being reviewed. Prior to the initiation of a review, the technical branch chief and assigned reviewer establish the scope and depth of the review to be performed, including the use of acceptance criteria and review guidelines to be used. In some cases, the staff may propose justification for not performing certain reviews called for by the SRP. These areas of increased or decreased emphasis are acceptable, if the reviewer has management approval and documents the scope and depth of the review in the SER. Examples of acceptable variations in the scope of a review include reduced emphasis on design reviews that the design and its underlying conditions of acceptance are identical to that of another unit that was recently reviewed and approved or increased emphasis on certain aspects of the design review as a result of recent operating experience or consideration of unique design features that are not addressed in the SRP. Risk-insights can also be used in determining the depth of review. The staff should generally limit its review of a proposed amendment to an existing operating license to those parts of the SRP that are directly affected by the proposed change.

The SRP will provide pertinent review guidance to the staff for review of new license applications submitted under 10 CFR Part 52. This will include ESP, DC, COL, SDA, and ML applications. The SRP sections applicable to a COL application for a new light-water reactor (LWR) are based on Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)." The SRP sections applicable to an ESP and a DC application are based on the site-related sections and design-related sections of RG 1.206. Furthermore, RG 1.206 delineates different content based on whether the COL application references an ESP, a DC, both or neither.

In general, review of a SDA or a ML application will be similar to that of a DC.

The SRP was originally written for 10 CFR Part 50 license applications. For DC and COL applications submitted under 10 CFR Part 52, the level of design information reviewed should be consistent with that of a final safety analysis report (FSAR) submitted in an OL application. However, verification that the as-built facility conforms to the approved design is performed through the inspections, tests, analyses, and acceptance criteria (ITACC) verification process.

For the review of COL applications, specific sections of the SRP will be used to review operational programs. The review will be performed consistent with guidance contained in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," and the related SRM dated February 22, 2006. Consistent with this guidance, the staff will review and obtain a reasonable assurance finding on the program and its implementation schedule. In addition, the staff will include a license condition on subsequent implementation milestones for each program for which specific implementation requirements are not specified in the regulations. In lieu of the implementation schedule the applicant may propose inspections, tests, analyses, and acceptance criteria for the program.

#### **Deviation from the SRP by Applicants**

Because the SRP generally describes an acceptable means of meeting the regulations, but not necessarily the only means, applications may deviate from the acceptance criteria in the SRP. On March 10, 1982, the Commission approved 10 CFR 50.34(g), "Conformance with the Standard Review Plan (SRP)." 10 CFR 50.34(g) was subsequently renumbered as 10 CFR 50.34(h). Specifically, § 50.34(h) requires applications for light water cooled nuclear power plant operating licenses docketed after May 17, 1982, to include an evaluation of the facility against the SRP in effect on May 17, 1982 or the SRP revision in effect six months prior to the docket date of the application, whichever is later. The evaluation must include an identification and description of all differences in design features, analytical techniques, and procedural measures proposed for a facility and those corresponding features, techniques, and measures given in the SRP acceptance criteria. Where such a difference exists, the evaluation shall discuss how the alternative proposed provides an acceptable method of complying with those rules or regulations of the Commission, or portions thereof, that underlie the corresponding SRP acceptance criteria. Similar provisions are in 10 CFR Part 52 contents of application sections of the different license processes contained in the Subparts to 10 CFR Part 52. Staff guidance for reviewing the applicant's evaluation is contained in SRP Chapter 1.0, "Introduction and Interfaces."

The General Design Criteria (GDC) do not apply to the plants that received construction permits (CPs) before 1971. For these plants, the Principal Design Criteria (PDC) in the CP, which are discussed in the FSAR, apply. For amendment requests for plants to which the GDC do not apply, the review should follow the SRP in light of applicable plant-specific PDC. In addition, certain identified SRP acceptance criteria are not readily applicable to new light-water reactor designs that use simplified, passive, or other innovative means to accomplish their safety functions.

## Organization of SRP

Each SRP section is organized as follows:

**Review Responsibilities:** This subsection identifies the primary and, as applicable, secondary review functions. The organizational review responsibilities are maintained separate from the SRP.

### **I. Areas of Review**

The areas of review subsection describes the scope of review by the branch having primary responsibility for the identified functional area. Specifically, this subsection contains a description of the systems, components, analyses, data, or other information that is reviewed as part of the particular Safety Analysis Report (SAR) section. It also contains a discussion of the information needed or the review expected from other branches to permit the primary review branch to complete its review, as well as a list of applicable interfacing sections.

### **II. Acceptance Criteria**

The acceptance criteria subsection identifies the applicable NRC requirements including specific regulations, NRC orders, and industry codes and standards referenced by regulations. Note, NRC orders are temporal in nature and are not applied to applicants. NRC orders are imposed when an applicant is issued a license.

For new reactor license applications submitted under 10 CFR Part 52, the applicant is also required to address the proposed technical resolution of unresolved safety issues (USIs) and medium- and high-priority generic safety issues (GSIs) that are identified in the version of NUREG-0933 current on the date 6 months before application and that are technically relevant to the design, TMI requirements, and relevant operating experience<sup>2</sup>. These requirements are not identified within specific SRP sections, rather, these requirements are identified within SRP Chapter 1, "Introduction and Interfaces." An applicant will tabulate information within Chapter 1, but will address the technical issues to satisfy the requirements within the specific sections, themselves.

This subsection also identifies the regulatory guidance which the staff has determined to provide an acceptable approach for satisfying the applicable requirements (i.e., SRP acceptance criteria). The types of guidance documents include but are not limited to: Regulatory Guides, Commission policy as described in SECY papers and corresponding Staff Requirement Memoranda, NRC-approved or endorsed industry codes and standards, certain technical reports (e.g., NUREGs and topical reports and corresponding safety evaluations), and Branch Technical Positions (BTPs), which are provided as appendices to the SRP. BTPs typically set forth solutions and approaches previously determined to be acceptable by the staff in dealing with a similar safety or design matter. These solutions and approaches are documented in this form so that staff reviewers can take uniform and

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<sup>2</sup>Consideration of operating experience for design certification applications only is currently addressed in a SRM, dated February 15, 1991, on SECY-90-377, "Requirements for Design Certification under 10 CFR Part 52."

well-understood positions as similar matters arise in the review of other applications. Each SRP section explicitly states that the SRP is not a substitute for the NRC's regulations, and compliance with them is not required. However, applicants are required to identify differences from the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP acceptance criteria provide an acceptable method of complying with the NRC's regulations.

Lastly, this subsection also contains, as necessary, the technical bases for applicability of the requirements to the subject areas of review or relationship of regulatory guidance to the associated requirement.

### **III. Review Procedures**

This subsection discusses how the review is accomplished. The subsection is a step-by-step procedure to be implemented by the reviewer to obtain reasonable assurance that the applicable regulatory requirements have been met. These review procedures are based on the identified SRP acceptance criteria. For deviations from these specific acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives to the SRP criteria provide an acceptable method of complying with the relevant NRC requirements identified in specific review areas.

For new reactor license applications submitted under 10 CFR Part 52, this subsection should address staff review procedures for how operating experience insights identified in generic letters and bulletins or equivalent international operating experience has been incorporated into the plant design.

### **IV. Evaluation Findings**

This subsection presents the type of conclusion that is sought for the particular review area. For each SRP section, the staff's conclusion is incorporated into a published Safety Evaluation Report (SER). The SER describes the review and the aspects of the review the staff emphasized, and identifies (1) the changes the applicant made to the application, (2) the matters addressed by additional information, (3) the matters for which additional information is expected to be forthcoming, (4) the matters remaining unresolved, and (5) deviations from the SRP in design and operational programs, and the bases for the acceptability of such deviations. The SER also clearly identifies any requested exemptions from the regulations and the staff's basis for its determinations on these requests.

### **V. Implementation**

This subsection provides guidance to applicants and licensees regarding the NRC's plans for using the SRP section. 10 CFR 50.34(h) and similar provisions in 10 CFR Part 52 require each application to include an evaluation of the facility against the SRP of record 6 months prior to docketing, including all differences between the design features, analytical techniques, and procedural measures proposed for a facility and those in the SRP acceptance criteria.

While the applicant's evaluation is performed against the SRP in effect 6 months prior to the docket date of the application, the NRC staff will use the SRP in effect at the time of the application review.

## **VI. References**

This subsection lists the references used in the review process.

### **Maintenance of the SRP**

The SRP will be revised and updated periodically as the need arises to clarify the content or correct errors and to incorporate modifications approved by the Director of the Office of Nuclear Reactor Regulation or the Director of the Office of New Reactors.

A revision number and publication date are printed at a lower corner of each page of each SRP section. Since individual sections have been, and will continue to be, revised as needed, the revision numbers and dates will not be the same for all sections. As necessary, corresponding changes to the RG 1.206 will also be made. Comments may be submitted electronically by email to [NRR\\_SRP@nrc.gov](mailto:NRR_SRP@nrc.gov). Notices of errors or omissions should also be sent to the same address.

Comment resolution will be addressed in subsequent SRP revisions. Prior to revision to individual sections, comment resolution may establish a basis for how alternatives to the NUREG-0800 acceptance criteria provide an acceptable method of complying with the NRC's regulations.

### **Specific Changes to SRP Sections**

#### **New Sections - in March 2007**

- SRP Chapter 1, "Introduction and Interfaces" - this incorporates guidance previously contained in SRP Section 1.8;
- SRP Section 2.0, "Site Characteristics and Site Parameters;"
- SRP Section 3.12, "ASME Code Class 1, 2, and 3 Piping Systems and Associated Supports Design;"
- SRP Section 3.13, "Threaded Fasteners - ASME Code Class 1, 2, and 3;"
- SRP Section 5.4.13, "Isolation Condenser System (BWR);"
- Appendix 7.1-D, "Guidance for Evaluation of Conformance to IEEE Std. 7-4.3.2;"
- SRP Section 8.4, "Station Blackout;"
- Branch Technical Position (BTP) 11-6, "Postulated Radioactive Releases Due to Liquid-Containing Tank Failures;"
- SRP Section 13.4, "Operational Programs;"
- SRP Section 13.6.1, "Physical Security - Combined License;"
- SRP Section 13.6.2, "Physical Security - Design Certification;"
- SRP Section 13.6.3, "Physical Security - Early Site Permit;"
- SRP Section 14.3 and associated subsections on Inspections, Tests, Analyses, and Acceptance Criteria;
- SRP Section 15.0.3, "Design Basis Accident Radiological Consequence Analyses for Advanced Light Water Reactors;"
- SRP Section 15.9, "BWR Core Stability;"
- SRP Section 17.4, "Reliability Assurance Program;"

- SRP Section 17.5, “Quality Assurance Program Description - Design Certification, Early Site Permit and New License Applicants;”
- SRP Section 17.6, “Maintenance Rule”

### **Reorganization of Content**

Several sections have reorganized review content to better align with functional review responsibilities:

- SRP Section 9.1.1, “Criticality Safety of Fresh and Spent Fuel Storage and Handling” and SRP Section 9.1.2, “New and Spent Fuel Storage” - the content was reorganized from new fuel in SRP Section 9.1.1 and spent fuel in SRP Section 9.1.2 to have criticality issues addressed in one SRP section and the other review topics in the other section.

### **Sections not revised in March 2007:**

#### **SRP sections that are considered current for intended application:**

- SRP Section 3.9.7, “Risk-Informed Inservice Testing of Pumps and Valves,” August 1998;
- SRP Section 3.9.8, “Risk-Informed Inservice Inspection of Piping,” September 2003;
- SRP Section 14.2.1, “Generic Guidelines for Extended Power Uprate Testing Programs,” August 2006;
- SRP Section 15.0.1, “Radiological Consequence Analyses Using Alternate Source Terms,” July 2000;
- SRP Section 15.0.2, “Review of Transient and Accident Analysis Methods,” January 2006

#### **Guidance relocated:**

- Branch Technical Position 7-16, “Guidance on Level of Detail Required for Design Certification Applications Under 10 CFR Part 52,” see Regulatory Guide 1.206;
- SRP Section 13.5.1.2, “Administrative Procedures - Initial Test Program,” see SRP Section 14.2;
- SRP Section 13.5.2.2, “Maintenance and Other Operating Procedures,” see SRP Section 17.5;
- SRP Section 15.1.5.A, “Radiological Consequences of Main Steam Line Failures Outside Containment of a PWR,” see SRP Section 15.0.3;
- SRP Section 15.4.9.A, “Radiological Consequences of Control Rod Drop Accident (BWR),” see SRP Section 15.0.3;
- SRP Section 15.6.2, “Radiological Consequences of the Failure of Small Lines Carrying Primary Coolant Outside Containment,” see SRP Section 15.0.3;
- SRP Section 15.6.3, “Radiological Consequences of Steam Generator Tube Failure (PWR),” see SRP Section 15.0.3;
- SRP Section 15.6.4, “Radiological Consequences of Main Steam Line Failure Outside Containment (BWR),” see SRP Section 15.0.3;
- SRP Section 15.6.5.A, “Radiological Consequences of a Design Basis Loss-of-Coolant Accident Including Containment Leakage Contribution,” see SRP Section 15.0.3;



- SRP Section 15.6.5.B, “Radiological Consequences of a Design Basis Loss-of-Coolant Accident Leakage From Engineered Safety Feature Components Outside Containment,” see SRP Section 15.0.3;
- SRP Section 15.6.5.D, “Radiological Consequences of a Design Basis Loss-of-Coolant Accident: Leakage From Main Steam Isolation Valve Leakage Control System (BWR),” see SRP Section 15.0.3;
- SRP Section 15.7.3, “Postulated Radioactive Releases Due to Liquid-Containing Tank Failures,” see Branch Technical Position 11-6.
- SRP Section 15.7.4, “Radiological Consequences of Fuel Handling Accidents,” see SRP Section 15.0.3;
- SRP Section 15.7.5, “Spent Fuel Cask Drop Accidents,” see SRP Section 15.0.3;
- SRP Section 17.1, “Quality Assurance During the Design and Construction Phases,” see SRP Section 17.5;
- SRP Section 17.2, “Quality Assurance During the Operations Phase,” see SRP Section 17.5;
- SRP Section 17.3, “Quality Assurance Program Description,” see SRP Section 17.5.

**SRP Sections not necessary for intended applications:**

- SRP Section 6.2.1.1.B, “Ice Condenser Containments;”
- SRP Section 6.5.4, “Ice Condenser as a Fission Product Cleanup System;”
- SRP Section 6.7, “Main Steam Isolation Valve Leakage Control System (BWR).”

SRP Sections withdrawn

- SRP Section 9.2.3, “Demineralized Water Makeup System”

The March 2007 SRP revision is located in ADAMS. The package accession number is ML070660036.