



U.S. NUCLEAR REGULATORY COMMISSION

DESIGN-SPECIFIC REVIEW STANDARD for NuScale SMR DESIGN

9.5.2 COMMUNICATIONS SYSTEMS

REVIEW RESPONSIBILITIES

Primary - Organization responsible for the review of instrumentation and controls

Secondary - None

I. AREAS OF REVIEW

The communications systems discussed herein are involved primarily with verbal communication functions between personnel and organizations, although there may be physical communication links also used in some cases to transmit limited data communications (e.g., Web page or as facsimile (fax) transmission over the telephone lines). Design-Specific Review Standard (DSRS) Chapter 7 and Standard Review Plan (SRP) Section 13.3 address the review of systems for communicating data among portions of the instrumentation systems and among site-related facilities such as the Main Control Room, Technical Support Center (TSC), Operations Support Center (OSC), Emergency Operations Facility (EOF), metrological stations, and security stations.

This review of the communications systems is limited to that portion of the system used in intraplant (including among multiple modules, units, and control rooms at a single plant site) and plant-to-offsite communications during normal operation, transients, fire, accident, off-normal phenomena including tornado, hurricane, flood, tsunami, lightning strike, and earthquake and declared emergencies, and security-related events.

The specific areas of review are as follows:

1. System Capabilities. The communications system is reviewed with respect to assuring the capability of the system and related plant design features to supply effective intraplant communications and effective plant-to-offsite communications during normal plant operations and emergencies, including loss of offsite power, and to support plant security and meet regulations.
2. Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC). For design certification (DC) and combined license (COL) reviews, the staff reviews the applicant's proposed ITAAC associated with the structures, systems, and components (SSCs) related to this DSRS section in accordance with SRP Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria." 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 DSRS 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 Sections 14.3 and 13.3.

3. **COL Action Items and Certification Requirements and Restrictions**. For a DC application, the review will also address COL action items, 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.

Review Interfaces

Other DSRS sections interface with this section as follows:

1. Verification that the offsite communication system equipment provided will adequately support emergency plan requirements for accident conditions plus notification of the U.S. Nuclear Regulatory Commission (NRC) and site personnel and implementation of evacuation procedures is performed under SRP Section 13.3.
2. The review of procedures and testing to determine the acceptability of the preoperational and startup tests is performed under DSRS Section 14.2.
3. Verification that onsite communications are adequate for the coordination of firefighting, including support of alternative and dedicated shutdown capabilities, is performed under SRP Sections 9.5.1.1 or 9.5.1.2. Regulatory Guide (RG) 1.189, Revision 2, "Fire Protection for Nuclear Power Plants," offers guidance on communication system functions needed to support firefighting activities.
4. Verification that onsite and offsite communications are adequate for coordination and support of security activities both within the plant and with external security and law enforcement organizations is performed under SRP Section 13.6.
5. Verification of the adequacy of control room communications and features to support reliable human performance is performed under SRP Chapter 18.

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

II. ACCEPTANCE CRITERIA

Requirements

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

1. Appendix E to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities," particularly Part IV.E(9), as it relates to the provision of at least one onsite and one offsite communications system, each with a backup power source
2. 10 CFR 50.34(f)(2)(xxv), regarding Three Mile Island (TMI) Action Plan Item III A.1.2
3. 10 CFR 50.47(b)(6) and 10 CFR 50.47(b)(8), regarding equipment and facilities to support emergency response
4. 10 CFR 50.55a, "Codes and Standards"
5. General Design Criterion (GDC) 1, "Quality Standards and Records"
6. GDC 2, "Design Bases for Protection against Natural Phenomena"
7. GDC 3, "Fire Protection"
8. GDC 4, "Environmental and Dynamic Effects Design Bases"
9. GDC 19, "Control Room"
10. 10 CFR 73.45(e)(2)(iii), regarding performance capabilities for fixed site physical protection systems - communications subsystems
11. 10 CFR 73.45(g)(4)(i), regarding provided communications networks
12. 10 CFR 73.45(g)(4)(ii) (regarding provided communications networks)
13. 10 CFR 73.46(f), regarding fixed-site physical protection systems, subsystems, components, and procedures—communications subsystems
14. 10 CFR 73.55(e)(9)(vi)(B), regarding requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage—vital areas
15. 10 CFR 73.55(j), regarding requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage—communication requirements
16. 10 CFR 52.47(b)(1), which requires a DC application to contain the proposed ITAACs necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the DC is built and will operate in accordance with the DC, the provisions of the Atomic Energy Act (AEA), and the NRC's regulations
17. 10 CFR 52.80(a), which requires a COL application to contain the proposed inspections, tests, and analyses, including those applicable to emergency planning, that the licensee shall perform, and the acceptance criteria 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 operate in conformity with the COL, the provisions of the AEA, and the NRC's regulations

DSRS Acceptance Criteria

Specific DSRS acceptance criteria acceptable to meet the relevant requirements of the NRC's regulations identified above are set forth below. The DSRS is not a substitute for the NRC's regulations, and compliance with it is not required. As an alternative, and as described in more detail below, an applicant may identify the differences between a DSRS section and the design features (for DC and COL applications only), analytical techniques, and procedural measures proposed in an application and discuss how the proposed alternative provides an acceptable method of complying with the NRC regulations that underlie the DSRS acceptance criteria.

Many of the regulations are related to the emergency plan, site and plant physical protection of licensed activities against radiological sabotage, and other security activities. In these cases the technical and safety review should focus on whether the physical communications equipment provided and its capability and attributes are adequate to support the emergency plan and security needs. For example, if there is a loss of normal power, is there a reliable alternate source. The actual review of the application of the communications equipment concerning security and the emergency plan is addressed in the sections of this DSRS related to security and the emergency plan.

1. Information on the requirements of Appendix E to 10 CFR Part 50, Part IV.E(9), will be found acceptable if adequate provisions for communications are made and described for emergency facilities and equipment, including, but not limited to, at least one onsite and one offsite communications system; each system shall have a backup power source.
2. Information on the requirements of 10 CFR 50.34(f)(2)(xxv) and TMI Action Plan Item III A.1.2 will be found acceptable if adequate provisions for communications are made to support an onsite TSC, an onsite OSC, and, a nearsite EOF.
3. Information on the requirements of 10 CFR 50.47(b)(6) and 10 CFR 50.47(b)(8) will be found acceptable if adequate provisions for communications are provided and maintained in the emergency facilities and control room to support the emergency response, including prompt communication among principal response organizations to emergency personnel and to the public.
4. Information on the requirements of 10 CFR 50.55a will be found acceptable if SSCs are designed, fabricated, erected, constructed, tested, and inspected to quality standards commensurate with the importance of the safety function to be performed.
5. For a DC application, information on the requirements of 10 CFR 52.47(b)(1) will be found acceptable if adequate ITAAC for the communications systems are described (in the application) that are necessary and sufficient to provide reasonable assurance that, if the inspections, test, and analysis are performed and the acceptance criteria met, a facility that incorporates the DC will have been constructed and will be operated in conformity with the DC, the provisions of the AEA, and the NRC's regulations.

6. For a COL application, information on the requirements of 10 CFR 52.80(a) will be found acceptable if adequate ITAAC for the communications systems are described that are necessary and sufficient to provide reasonable assurance that, if the inspections, test, and analysis are performed and the acceptance criteria met, a facility will have been constructed and will operate in conformity with the COL, the provisions of the AEA, and the NRC's regulations.
7. Information on the requirements of GDC 1 will be found acceptable if communication equipment and related support equipment important to safety are designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function.
8. Information on the requirements of GDC 2 will be found acceptable if communication equipment and related support equipment important to safety are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions and other requirements specifically identified in GDC 2.
9. Information on the requirements of GDC 3 will be found acceptable if communication equipment and related support equipment important to safety are designed and located to minimize, consistent with other safety requirements, the probability and effect of fires, smoke effects from fires, and explosions and other requirements specifically identified in GDC 3.
10. Information on the requirements of GDC 4 will be found acceptable if communication equipment and related support equipment important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents and other requirements specifically identified in GDC 4.
11. Information on the requirements of GDC 19 will be found acceptable if adequate communication equipment is described that is designed and provided at appropriate locations inside the control room with the capability to support all normal and emergency operations, including intraplant communications and plant to emergency facilities and offsite communication requirements even in the event of a single failure within a communication subsystem or the loss of the normal power source and other requirements specifically identified in GDC 19.
12. Information on the requirements of 10 CFR 73.45(e)(2)(iii), 10 CFR 73.45(g)(4)(i), and 10 CFR 73.45(g)(4)(ii) will be found acceptable if adequate provisions for communications subsystems and procedures are made and described that support site physical protection including the ability to transmit rapid and accurate security information among onsite forces for routine security operations, assessment of a

contingency, response to a contingency, detection and assessment information to offsite assistance forces, and other requirements specifically identified in the regulations.

13. Information on the requirements of 10 CFR 73.46(f) will be found acceptable if adequate provisions for communications are made and described that support site security, including the ability for each guard, watchman, or armed response individual on duty shall be capable of maintaining continuous communication with an individual in each continuously manned alarm station required by 10 CFR 73.46(e)(5), who shall be capable of calling for assistance from other guards, watchmen, and armed response personnel and from law enforcement authorities and other requirements specifically identified in the regulation.
14. Information on the requirements of 10 CFR 73.55(e)(9)(vi)(B) will be found acceptable if adequate provisions for the secondary power supply systems for non-portable communications equipment is located within a vital area.
15. Information on the requirements of 10 CFR 73.55(j) will be found acceptable if adequate provisions for communications are made and described that support site security including the capability to establish and maintain continuous communication with onsite and offsite resources to ensure effective command and control during normal and emergency situations and other requirements specifically identified in the regulation.

III. REVIEW PROCEDURES

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

1. Selected Programs and Guidance—In accordance with the guidance in NUREG-0800, "Introduction – Part 2: Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: Light-Water Small Modular Reactor Edition" (NUREG-0800, Intro Part 2), as applied to this DSRS Section, the staff will review the information proposed by the applicant to evaluate whether it meets the acceptance criteria described in Subsection II of this DSRS. As noted in NUREG-0800, Intro Part 2, the NRC requirements that must be met by an SSC do not change under the small modular reactor (SMR) framework. Using the graded approach described in NUREG-0800, Intro Part 2, the NRC staff may determine that, for certain SSCs, the applicant's basis for compliance with other selected NRC requirements may help demonstrate satisfaction of the applicable acceptance criteria for that SSC in lieu of detailed independent analyses. The design-basis capabilities of specific SSCs would be verified, where applicable, as part of completing the applicable ITAAC. The use of the selected programs to augment or replace traditional review procedures is shown in Figure 1 of NUREG-0800, Intro Part 2. Examples of such programs that may be relevant to the graded approach for these SSCs include:

- 10 CFR Part 50, Appendix A, GDC, Overall Requirements, Criteria 1–5
- 10 CFR Part 50, Appendix B, Quality Assurance (QA) Program
- 10 CFR 50.49, Environmental Qualification of Electrical Equipment (EQ) Program
- 10 CFR 50.55a, Code Design, Inservice Inspection, and Inservice Testing (ISI/IST) Programs
- 10 CFR 50.65, Maintenance Rule requirements
- Reliability Assurance Program (RAP)
- 10 CFR 50.36, “Technical Specifications”
- Availability Controls for SSCs Subject to Regulatory Treatment of Nonsafety Systems (RTNSS)
- Initial Test Program (ITP)
- Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)

This list of examples is not intended to be all inclusive. It is the responsibility of the technical reviewers to determine whether the information in the application, including the degree to which the applicant seeks to rely on such selected programs and guidance, demonstrates that all acceptance criteria have been met to support the safety finding for a particular SSC.

2. In accordance with 10 CFR 52.47(a)(8), (21), and (22), and 10 CFR 52.79(a)(17), (20), and (37), for DC or COL applications submitted under 10 CFR Part 52, the applicant is required to (1) address the proposed technical resolution of unresolved safety issues and medium- and high-priority generic safety issues which are identified in the version of NUREG-0933, “Resolution of Generic Safety Issues,” current on the date up to 6 months before the docket date of the application and which are technically relevant to the design, (2) demonstrate how the operating experience insights have been incorporated into the plant design, and (3) provide information necessary to demonstrate compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f), except paragraphs (f)(1)(xii), (f)(2)(ix), and (f)(3)(v), for a DC application, and except paragraphs (f)(1)(xii), (f)(2)(ix), (f)(2)(xxv), and (f)(3)(v), for a COL application. These cross-cutting review areas should be addressed by the reviewer for each technical subsection and relevant conclusions documented in the corresponding safety evaluation report (SER) section.
3. The reviewer will evaluate information provided in the final safety analysis report pertaining to the design of the communication system and related plant features to determine whether intraplant communication equipment needed in vital areas during recovery actions from transient, fire, or accident conditions is provided in a manner that

supports proper operation of other plant equipment. The reviewer should note that additional design detail may be provided as part of the COL application.

4. The staff will review the design-basis, design criteria, and system description sections and the analyses that demonstrate the effectiveness of the system when plant noise levels are at their maximum during incident and accident conditions to verify that the communication system will function effectively. Reviewers should use engineering judgment in conjunction with a comparison of the system capabilities with equipment and communication systems provided for previously approved plants. Reviewers will assess the capability of proposed communications systems to ensure adequate intraplant communication among multiple modules, units, and control rooms at a single plant site in normal operating and accident conditions.

For new applications, the review should involve the following activities:

- A. Verification that effective communication will not be impeded by transmission through barriers, high-noise areas, personnel use of protective equipment, inadequate number of communication channels, interference between channels or subsystems, or interference from other electronic or electrical equipment.
- B. Verification that coverage of wireless communications capability is adequate to support needed communications with plant and offsite personnel.
- C. Verification that the number and location of hardwired communication sets are adequate to support communications with plant and offsite personnel.
- D. Verification that the features that alert personnel in high-noise environments to use the communication systems are adequate.
- E. Verification that system equipment required to mitigate the consequences of a specific design-basis event (DBE) (e.g., natural phenomena, violent external attack) is independent of, and physically separated from, the effects of the DBE (e.g., fire suppression actuation, loss of offsite power) to the degree necessary to retain the communications capability during these events.
- F. Verification that pre-operational functional testing is planned under conditions that simulate the maximum plant noise levels generated during the various operating conditions, including fire and accident conditions, to demonstrate system capabilities. Regulatory Position 4.1.7 of RG 1.189 provides direction related to communication capabilities during fires.
- G. Verification that the communications equipment, including offsite equipment, will remain operable in the event of loss of primary power and that secondary power supplies for non-portable equipment are located within vital areas. Configuration of communications equipment should include consideration of the concerns raised in NRC IE Bulletin 80-15, "Possible Loss of Emergency Notification System (ENS) with Loss of Offsite Power."

- H. Verification that communications systems and equipment have been evaluated to determine their applicability, adequacy, and sufficiency to assure a quality product in keeping with the required functions and the application from the guidance from Electric Power Research Institute (EPRI) NP-5652, "Guideline for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications," (conditionally endorsed by Generic Letter (GL) 89-02), and the guidance of EPRI TR-106439, "Guideline on Evaluation and Acceptance of Commercial Grade Digital Equipment for Nuclear Safety Applications," (accepted by an NRC safety evaluation, dated July 17, 1997 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12205A284 and ML092190664)) should be considered if computer-based equipment or digital components requiring software or software developed logic devices are involved.
 - I. Verification that communications equipment will be compatible with the electromagnetic interference (EMI) and radiofrequency interference (RFI) environments of the plant and that design measures have been taken such that there will be no interference between wireless communications systems and other plant equipment, including application of the appropriate guidance from RG 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems." Although nonsafety systems are not a part of this RG, control of EMI/RFI from these systems is necessary to ensure that safety-related instrumentation and controls systems can continue to perform properly in the nuclear power plant environment. When feasible, the emissions from nonsafety-related systems should be held to the same levels as those from safety-related systems.
 - J. Verification of the adequacy of any special equipment facilitating communications with personnel using protective equipment (e.g., respirators, underwater diving equipment).
5. The reviewer may decide that, for a specific case, specific aspects of the design should receive emphasis, while other aspects of the design need not receive the same emphasis and in-depth review. Typical reasons for such nonuniform emphasis are the introduction of new communication system designs or the use of communication systems previously found acceptable in similar circumstances. However, in all cases, the review must be sufficient to conclude conformity with the requirements of the NRC's regulations. For deviations from specific acceptance criteria, the staff should review the applicant's evaluation of how the proposed alternatives to the DSRS criteria provide an acceptable method of complying with the relevant NRC requirements identified in Subsection II of this document above.
6. 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), is set forth in the design control document (DCD). The reviewer should also consider the appropriateness of COL action items identified in the DCD. 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 DCD.

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 or other NRC approvals (e.g., manufacturing license, site suitability report, or topical report (TR)).

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 this section.

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 SER. The reviewer also states the bases for those conclusions.

The communication system includes all components for intraplant and plant-to-offsite communications. The scope of review of the communications system for the plant includes verification that offsite equipment is capable of providing for notification of personnel and implementation of evacuation procedures, and verification that onsite communications are adequate in the event of an emergency.

The basis for acceptance of the communication system in the review is conformance of the design, design criteria, and design bases to the applicable regulations and industry standards as demonstrated in meeting the DSRS Acceptance Criteria identified above; and the ability of the system to provide effective communications between plant personnel in all vital areas during the full spectrum of accident or incident conditions under maximum potential noise levels.

The staff concludes that the design of the communications system meets the staff's criteria and industry standards and is therefore acceptable.

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 DSRS 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 regulations in 10 CFR 52.17(a)(1)(xii), 10 CFR 52.47(a)(9), and 10 CFR 52.79(a)(41) establish requirements for applications for ESPs, DCs, and COLs, respectively. These regulations require the application to include an evaluation of the site (ESP), standard plant design (DC), or facility (COL) against the SRP revision in effect 6 months before the docket date of the application. While the SRP provides generic guidance, the staff developed the SRP guidance based on the staff's experience in reviewing applications for construction permits and operating licenses for large light-water nuclear power reactors. The proposed SMR designs, however, differ significantly from large light-water nuclear power plant designs.

In view of the differences between the designs of SMRs and the designs of large light-water power reactors, the Commission issued Staff Requirements Memorandum (SRM)-COMGBJ-10-0004/COMGEA-10-0001, “Use of Risk Insights To Enhance Safety Focus of Small Modular Reactor Reviews,” dated August 31, 2010. In the SRM, the Commission directed the staff to develop risk-informed licensing review plans for each of the SMR design reviews, including plans for the associated preapplication activities. Accordingly, the staff has developed the content of the DSRS as an alternative method for evaluating a NuScale-specific application submitted pursuant to 10 CFR Part 52, and the staff has determined that each application may address the DSRS in lieu of addressing the SRP, with specified exceptions. These exceptions include particular review areas in which the DSRS directs reviewers to consult the SRP and others in which the SRP is used for the review. If an applicant chooses to address the DSRS, the application should identify and describe all differences between the design features (DC and COL applications only), analytical techniques, and procedural measures proposed in an application and the guidance of the applicable DSRS section (or SRP section, as specified in the DSRS), and discuss how the proposed alternative provides an acceptable method of complying with the regulations that underlie the DSRS acceptance criteria.

The staff has accepted the content of the DSRS as an alternative method for evaluating whether an application complies with NRC regulations for NuScale SMR applications, provided that the application does not deviate significantly from the design and siting assumptions made by the NRC staff while preparing the DSRS. If the design or siting assumptions in a NuScale application deviate significantly from the design and siting assumptions the staff used in preparing the DSRS, the staff will use the more general guidance in the SRP, as specified in 10 CFR 52.17(a)(1)(xii), 10 CFR 52.47(a)(9), or 10 CFR 52.79(a)(41), depending on the type of application. Alternatively, the staff may supplement the DSRS section by adding appropriate criteria to address new design or siting assumptions.

VI. REFERENCES

1. *U.S. Code of Federal Regulations*, “Standards for Protection against Radiation,” Part 20, Title 10, “Energy.”
2. *U.S. Code of Federal Regulations*, “Domestic Licensing of Production and Utilization Facilities,” Part 50, Title 10, “Energy.”
3. *U.S. Code of Federal Regulations*, “Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants,” Part 52, Title 10, “Energy.”
4. GDC 61, “Fuel Storage and Handling and Radioactivity Control.”
5. GDC 19, “Control Room.”
6. GDC 4, “Environmental and Dynamic Effects Design Bases.”
7. U.S. Nuclear Regulatory Commission, “Control of Combustible Gas Concentrations in Containment Following a Loss-of-Coolant Accident,” Regulatory Guide (RG) 1.7,

Revision 3, March 2007, Agencywide Documents Access and Management System (ADAMS) Accession No. ML070290080.

8. U.S. Nuclear Regulatory Commission, "Calculations of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors," RG 1.112, Revision 1, March 2007, ADAMS Accession No. ML070320241.
9. U.S. Nuclear Regulatory Commission, RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," RG 1.183, July 2000, ADAMS Accession No. ML003716792.
10. American National Standards Institute/American Nuclear Society (ANSI/ANS), "Source Term Specification," American National Standards Institute/American Nuclear Society," ANSI/ANS Standard 18.1-1999 (withdrawn 2009).
11. U.S. Nuclear Regulatory Commission, "Clarification of TMI Action Plan Requirements," NUREG-0737, November 1980, ADAMS Accession No. ML051400209.
12. *U.S. Code of Federal Regulations*, "Environmental Radiation Protection Standards for Nuclear Power Operations," Part 190, Title 40, "Protection of the Environment."
13. U.S. Nuclear Regulatory Commission, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," RG 1.89, Revision 1, June 1984, ADAMS Accession No. ML031480399.
14. U.S. Nuclear Regulatory Commission, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," RG 1.143, Revision 1, October 1979, ADAMS Accession No. ML003740200.
15. U.S. Nuclear Regulatory Commission, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," RG 1.26, Revision 4, March 2007, ADAMS Accession No. ML070290283.
16. U.S. Nuclear Regulatory Commission, "Seismic Design Classification," RG 1.29, Revision 4, March 2007, ADAMS Accession No. ML070310052.
17. U.S. Nuclear Regulatory Commission, "Tornado Design Classification," RG 1.117, June 1976, ADAMS Accession No. ML13350A280.
18. U.S. Nuclear Regulatory Commission, "Combined License Applications for Nuclear Power Plants (LWR Edition)," RG 1.206.
19. Electric Power Research Institute (EPRI), "Pressurized Water Reactor Primary Water Chemistry Guidelines," ADAMS Accession Nos. ML081230449 and ML081230448.
20. Electric Power Research Institute (EPRI), "Pressurized Water Reactor Primary Water Zinc Application Guidelines."

21. Electric Power Research Institute (EPRI), "Advanced Light Water Reactor Utility Requirements Document, Volume III, ALWR Passive Plant."
22. U.S. Nuclear Regulatory Commission, "NRC Review of Electric Power Research Institute's Advanced Light Water Reactor Utility Requirements Document, Passive Plant Designs," NUREG-1242, Volume 3, Part 1 and Volume 3, Part 2, ADAMS Accession Nos. ML070600372 and ML070600373.
23. Electric Power Research Institute (EPRI), "Cobalt Reduction Guidelines."
24. U.S. Nuclear Regulatory Commission, RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," RG 8.8, Revision 3, June 1978, ADAMS Accession No. ML003739549.