



U.S. NUCLEAR REGULATORY COMMISSION

DRAFT REGULATORY GUIDE DG-1471

Proposed Revision 2 to Regulatory Guide 1.208

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A PERFORMANCE-BASED APPROACH TO DEFINE THE SITE-SPECIFIC EARTHQUAKE GROUND MOTION

A. INTRODUCTION

Purpose

This regulatory guide (RG) describes an approach that is acceptable to the staff of the U.S. Nuclear Regulatory Commission (NRC) for assessment of seismic hazards in license applications. This RG endorses, subject to the conditions described in Section C of this RG, American National Standards Institute/American Nuclear Society (ANSI/ANS)-2.27-2020, “Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments,” (Ref. 1) ANSI/ANS-2.29-2020, “Probabilistic Seismic Hazard Analysis,” (Ref. 2) and American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 43-19, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities” (Ref. 3).

Applicability

This RG applies to applicants under Title 10 of the Code of Federal Regulations (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities” (Ref. 4), and 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants” (Ref. 5), that use Subpart B, “Evaluation Factors for Tier 2 Power Reactor Site Applications,” to 10 CFR Part 100, “Reactor Site Criteria” (Ref. 6). Though intended for Parts 50 and 52 nuclear power reactors, this RG may also provide useful guidance relevant to applications for power reactors in other licensing pathways or other nuclear installations.

Applicable Regulations

- 10 CFR Part 50 provides regulations for licensing production and utilization facilities.
 - 10 CFR Part 50, Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criterion 2, “Design Bases Protection Against Natural Phenomena,” requires, in part, that nuclear power plant structures, systems, and components (SSCs) important to safety be designed to withstand the effects of natural phenomena (e.g., earthquakes) without loss of capability to perform their safety functions. Subparagraph (1) requires that the design bases

This RG is being issued in draft form to involve the public in the development of regulatory guidance in this area. It has not received final staff review or approval and does not represent an NRC final staff position. Public comments are being solicited on this DG and its associated regulatory analysis. Comments should be accompanied by appropriate supporting data. Comments must be submitted through the Federal rulemaking website, <http://www.regulations.gov>, by searching for draft regulatory guide DG-1471. Comments must be submitted by the date indicated in the *Federal Register* notice.

Electronic copies of this DG, previous versions of DGs, and other recently issued guides are available through the NRC’s public website under the Regulatory Guides document collection of the NRC Library at <https://nrc.gov/reading-rm/doc-collections/reg-guides>. The DG is also available through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>, under Accession No. ML25349B314. The regulatory analysis is associated with a rulemaking and may be found in ADAMS under Accession No. ML26191A071.

for these SSCs reflect “appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.”

- 10 CFR Part 50, Appendix S, “Earthquake Engineering Criteria for Nuclear Power Plants,” requires that the safe-shutdown earthquake ground motion (SSE) or design basis ground motions (DBGMs) be derived from the site ground motion response spectra developed in accordance with 10 CFR Part 100 at the free ground surface and must take into consideration the risk-significance of SSCs and their safety functions. In addition, the horizontal component of the SSE or DBGMs in the free-field at the foundation level of the structures must be an appropriate response spectrum that is determined based on the risk-significance of SSCs and their safety functions.
- 10 CFR 52.17(a)(1)(vi) for an early site permit and 10 CFR 52.79(a)(1)(iii) for a combined license each state, in part, that the technical information in the final safety analysis report shall include “geologic characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and [period of] time in which the historical data have been accumulated.”
- 10 CFR Part 100 establishes siting requirements for power and test reactors subject to 10 CFR Part 50 or 10 CFR Part 52.
 - 10 CFR 100.10, “Factors to be considered when evaluating sites,” specifically, 10 CFR 100.10(c) states, in part, that the “[p]hysical characteristics of the site, including seismology, meteorology, geology, and hydrology” will be taken into consideration to determine the acceptability of a site.
 - 10 CFR 100.23(c), “Geological, seismological, and engineering characteristics,” states, in part, that “[t]he geological, seismological, and engineering characteristics of a site and its environs must be investigated in sufficient scope and detail to permit an adequate evaluation of the proposed site, to provide sufficient information to support evaluations performed to arrive at estimates of the Safe Shutdown Earthquake Ground Motion, and to permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site. The size of the region to be investigated and the type of data pertinent to the investigations must be determined based on the nature of the region surrounding the proposed site. Data on the vibratory ground motion, tectonic surface deformation, nontectonic deformation, earthquake recurrence rates, fault geometry and slip rates, site foundation material, and seismically induced floods and water waves must be obtained by reviewing pertinent literature and carrying out field investigations.”
 - 10 CFR 100.23(d)(1), “Determination of the Safe Shutdown Earthquake Ground Motion,” states, in part, that “[t]he Safe Shutdown Earthquake Ground Motion for the site is determined considering the results of the investigations required by paragraph (c) of this section. Uncertainties are inherent in such estimates. These uncertainties must be addressed through an appropriate analysis, such as probabilistic seismic hazard analysis or suitable sensitivity analyses.”

Related Guidance

- NUREG-0800, “Standard Review Plan (SRP) for the review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” Section 2.5.1 “Geologic Characterization Information,” Revision 5, issued July 2014 (Ref. 7), provides guidance for the staff’s review of the results of the investigations and assessments of the geologic characteristics that affect the site. Section 2.5.2 “Vibratory Ground Motion,” Revision 5, issued July 2014 provides guidance for the staff’s review of the seismological, geological, geophysical, and geotechnical investigations carried out to determine the site-specific Ground Motion Response Spectra (GMRS) and eventually the SSE for the site. Section 3.7.1 “Seismic Design Parameters,” Revision 4, issued December 2014 provides guidance for the staff’s review of analyses used to specify earthquake design ground motions for the soil-structure interaction analyses.
- NUREG-2213, “Updated Implementation Guidelines for SSHAC Hazard Studies,” (Ref. 8) provides guidance for conducting expert assessments through the structured process that is referred to as the Senior Seismic Hazard Analysis Committee (SSHAC) process. The SSHAC process is a multi-level, structured, assessment process that addresses how uncertainties in probabilistic seismic hazard analysis (PSHA) should be treated using expert judgement. The essence of the SSHAC process is the structured interaction among experts to achieve a well-documented hazard study that captures the center, body, and range of technically defensible interpretations.
- RG 1.132, “Geologic and Geotechnical Site Characterization Investigations for Nuclear Power Plants,” (Ref. 9) provides guidance on field investigations for determining the geologic, geotechnical, and hydrogeologic characteristics of a prospective site for engineering analysis and design on nuclear power plants.
- RG 1.138, “Laboratory Investigations of Soils and Rocks for Engineering Analysis and Design of Nuclear Power Plants,” (Ref. 10) provides guidance on laboratory and testing practices for determining soil and rock properties and characteristics needed for engineering analysis and design of foundations and earthworks for nuclear power plants.
- RG 1.198, “Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites,” (Ref. 11) provides guidance on acceptable methods for evaluating the potential for earthquake-induced instability of soils resulting from liquefaction and strength degradation.
- RG 4.7, “General Site Suitability Criteria for Nuclear Power Stations,” (Ref. 12) and RG 1.206, “Applications for Nuclear Power Plants,” (Ref. 13) provides guidance on siting and contents of applications for new nuclear power plants.
- RG 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors,” (Ref. 14) provides guidance on the identification and analysis of licensing basis events; safety classification of structures, systems, and components; and evaluation of defense in depth for nonlight-water reactor designs.
- DG-4036 (proposed RG 4.29), “Graded Approach to Site Characterization for New Reactor Applications” (Ref. 15), provides hazard-specific guidance on graded approaches to site characterization including human-induced external hazards; climatology, meteorology, and atmospheric dispersion; hydrology; geology; seismology; and geotechnical engineering.

Purpose of Regulatory Guides

The NRC issues RGs to describe methods that are acceptable to the staff for implementing specific parts of the agency's regulations, to explain techniques that the staff uses in evaluating specific issues or postulated events, and to describe information that the staff needs in its review of applications for permits and licenses. Regulatory guides are not NRC regulations and compliance with them is not required. Methods and solutions that differ from those set forth in RGs are acceptable if the applicant provides sufficient basis and information for the NRC staff to verify that the alternative methods comply with the applicable NRC regulations.

Paperwork Reduction Act

This RG provides voluntary guidance for implementing the mandatory information collections in 10 CFR Parts 50, 52, and 100 that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et. seq.). These information collections were approved by the Office of Management and Budget (OMB), under control numbers 3150-0011, 3150-0151 and 3150-0093, respectively.

Send comments regarding this information collection to Infocollects.Resource@nrc.gov, and to the OMB reviewer at: OMB Office of Information and Regulatory Affairs (3150-0011, 3150-0151 and 3150-0093), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street, NW, Washington, DC 20503.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

B. DISCUSSION

Reason for Revision or Issuance

On May 23, 2025, President Donald J. Trump signed Executive Order (E.O.) 14300, “Ordering the Reform of the Nuclear Regulatory Commission” (Ref.16). Section 5, “Reforming and Modernizing the NRC’s Regulations,” of the E.O. requires the NRC to undertake a review and wholesale revision of its regulations and guidance documents as guided by the policies set forth in section 2 of the E.O. As part of the NRC’s overarching review of all its regulations, the agency made many changes to its regulations that improved the efficiency and efficacy of its licensing process, and some of those changes are addressed in this RG.

This revision of RG 1.208 (Revision 2) updates and expands the technical contents of procedures acceptable to the NRC staff to satisfy the requirements of 10 CFR 100.23 and Appendix S to 10 CFR Part 50 related to the development of the GMRS and DBGMs, respectively, based on a graded approach for defining the vibratory ground motions for a reactor facility. This guide continues to provide an acceptable, risk-informed, and performance-based framework for determining a single GMRS or SSE for larger reactor facilities corresponding to seismic design category (SDC)-5 but now also includes an expanded and more flexible approach for establishing the GMRS or DBGMs for multiple types of nuclear facilities (including smaller reactor facilities), and related seismic design categories assigned to facility SSCs. In addition, the revisions incorporate developments in PSHA resulting from experience gained from numerous nuclear facility siting applications since the original development of this guide issued March 2007. Revisions to this guide are incorporated primarily through the endorsement, subject to the conditions described in Section C of this RG, of ANSI/ANS-2.27-2020, “Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments,” ANSI/ANS-2.29-2020, “Probabilistic Seismic Hazard Analysis,” and ASCE/SEI 43-19, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities.”

Background

As noted above, the revisions to this RG are incorporated primarily through the endorsement, with conditions, of the following ANS and ASCE standards:

- ANSI/ANS-2.27-2020, “Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments,” which provides guidance for the geologic, seismic, and geotechnical investigations to support the development of site-specific seismic hazard curves and the uniform hazard response spectra (UHRS). This standard also provides guidance to support the development of fault displacement and tectonic deformation hazard curves.
- ANSI/ANS-2.29-2020, “Probabilistic Seismic Hazard Analysis,” which specifies an approach to develop site-specific seismic hazard curves and the UHRS for SDC -2, SDC-3, SDC-4, and SDC-5 facilities. A clarification to Section 4.5.1 is provided below.
- ASCE/SEI 43-19, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities,” which specifies seismic design criteria and analysis methods. This standard also establishes design criteria and deformation limits corresponding to the limit states specified in ANSI/ANS-2.26 (Ref. 17). This RG endorses Sections 2.1 and 2.2 (as well as Sections C2.1 and C2.2) of ASCE/SEI 43-19, which discuss the seismic hazard evaluations and the development of design basis earthquake ground motions. Several clarifications to Section 2.2 are provided below.

The original version of the guide (Revision 0) specified the development of a performance-based GMRS for a site to characterize the regional and local seismic hazard. This characterization of the seismic hazard included the following four important steps:

- 1) Site- and region-specific geological, seismological, geophysical, and geotechnical investigations.
- 2) A PSHA, which considers the vibratory ground motions from all potential earthquakes in the region surrounding the site as well as the recurrence rates for these potential earthquakes.
- 3) A site response analysis to incorporate the effects of local geology on ground motions as they propagate to the ground surface.
- 4) The selection of appropriate performance goals and methodology.

While these four steps retain their importance in the development of a performance-based GMRS for a site, there have been considerable advances in performing PSHAs for nuclear facilities over the past 15 years. In addition, the original version of the guide specified a performance-based GMRS for only the highest SDC using the target performance goal and methodology in ASCE/SEI 43-05, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities” (Ref. 18). To accommodate the development of a performance-based GMRS for multiple types of nuclear facilities and related SDCs, this revision to the guide endorses, with conditions, the use of ASCE/SEI 43-19 for SDC levels 3 to 5 rather than just SDC 5, which is appropriate for large reactor facilities. The provisions in ASCE/SEI 43-19 endorsed in this RG refer to the design response spectrum (DRS). For purposes of this RG the terms GMRS and DRS are equivalent. The DBGMs are derived from the GMRS for each SDC, with the caveat that the DBGM for each SDC must meet the minimum peak ground acceleration (PGA) values specified in ASCE/SEI 43-19.

The update to this guide endorses ANSI/ANS-2.29-2020, with conditions, because this standard incorporates the most recent significant changes and additions with respect to the use of a PSHA to provide a technically-defensible assessment of the annual frequency of exceeding various levels of ground motion, including an explicit expression of the uncertainty in that assessment. ANSI/ANS-2.29-2020 presents the attributes and recommendations that should be followed in conducting a PSHA, drawing heavily from the SSHAC procedural guidance described in NUREG-2213. PSHA inputs include a seismic source model (SSM), a ground motion model (GMM), and may also include a site response analysis (SRA). ANSI/ANS-2.29-2020 provides detailed requirements for each of these model components, including the integration process of building the SSM and GMM as well as the model interfaces, proper documentation, and the different approaches for determining hazard-consistent site-specific motions at the ground surface or subsurface elevation of interest. These site-specific hazard curves are then used to develop GMRS that are specific to the SDCs of the SSCs of the reactor facility.

The update to this guide also endorses ANSI/ANS-2.27-2020, with conditions, because this standard provides the most recent and comprehensive guidance for conducting investigations and acquiring geological, geophysical, and geotechnical datasets needed for the assessment of seismic hazards at nuclear facilities. These investigations and datasets support the characterization of local and regional seismic sources for the SSM and the geotechnical conditions at the site needed to perform a site response analysis. Consistent with the multiple SDCs specified in ASCE/SEI 43-19, ANSI/ANS-2.27-2020 implements a graded approach with respect to the number, spacing, and depth of the site exploration; number and type of soil samples obtained; and the associated testing program.

The NRC has endorsed the SSHAC Level 3 seismic source and ground motion models for the central and eastern United States (CEUS) CEUS-SSC (Ref. 19) and Next Generation Attenuation Relationships for Central & Eastern North America (NGA-East) (Ref. 20) in Section 2.5.2 of NUREG-0800 and RIL-2020-011 (Ref. 21), respectively. To use these two models, applicants for sites located in the CEUS should first evaluate whether these two models need to be updated or revised using the SSHAC guidance provided in Section 4.2 of NUREG-2213 to determine the appropriate SSHAC level for the updates or revisions. Examples of potential updates to the CEUS-SSC model include the recurrence parameters, boundaries, and $M_{\max}$ values used for the areal source zones or the need to develop or assess whether a repeated large magnitude earthquake should be included in the source model. After either verification of the continued suitability or updating of these two CEUS level 3 SSHAC models, applicants should include the site amplification or site adjustment factors from the site response analysis to develop the final control point elevation hazard curves and GMRS for the site. The SSHAC Level 2 site response study sponsored by the NRC (RIL 2021-15 [Ref. 22]) demonstrates how the uncertainties in the site response analysis should be evaluated using a structured and systematic logic-tree approach. For the western United States (WUS), numerous SSHAC source and ground motion models have been developed for DOE facilities and in response to NTTF R2.1. In addition, the NRC recently sponsored a SSHAC Level 1 study for a site in Utah that demonstrates how lower SSHAC study levels can be used, where appropriate, to provide sufficient regulatory assurance for siting lower-risk (i.e., lower than SDC-4 and SDC-5 facilities) advanced reactors (RIL 2025-10 [Ref. 23], RIL 2025-11 [Ref. 24]).

Consideration of International Standards

The International Atomic Energy Agency (IAEA) works with member states and other partners to promote the safe, secure, and peaceful use of nuclear technologies. The IAEA develops Safety Requirements and Safety Guides for protecting people and the environment from harmful effects of ionizing radiation. This system of safety fundamentals, safety requirements, safety guides, and other relevant reports, reflects an international perspective on what constitutes a high level of safety. To inform its development of this RG, the NRC considered IAEA Safety Requirements and Safety Guides pursuant to the Commission's International Policy Statement (Ref. 25) and Management Directive and Handbook 6.6, "Regulatory Guides" (Ref. 26).

The following IAEA Safety Requirements and Guides were considered in the development/update of the Regulatory Guide:

- IAEA Safety Standard SSR-1, "Site Evaluation for Nuclear Installations" (Ref. 27), which establishes the safety objective in site evaluation for nuclear installations. With respect to seismic hazards, this Safety Standard establishes requirements for the evaluation of fault capability and the evaluation of ground motion hazards.
- IAEA Safety Guide SSG-9, "Seismic Hazards in Site Evaluation for Nuclear Installations" (Ref. 28), which provides recommendations on developing a database to evaluate earthquake hazards and the development of seismic source models specific to the nuclear installation site; methods for conducting vibratory ground motion analysis, including recommendations on probabilistic and deterministic evaluation methods; and methods for evaluating the potential for fault displacement hazard. In addition, this Safety Guide provides recommendations on the application of a graded approach to evaluate the seismic hazard for nuclear installations other than nuclear power plants.
- IAEA Safety Guide SSG-67, "Seismic Design for Nuclear Installations" (Ref. 29), which provides recommendations for the determination of the appropriate basis for the design and evaluation of a nuclear installation.

- IAEA Safety Standard NS-G-3.6, “Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants” (Ref. 30), which provides guidance on the geotechnical engineering aspects of the subsurface pertinent to the safety of nuclear power plants. The scope of this Safety Guide encompasses the site investigation program to determine site suitability, suitable geotechnical profiles and parameters, monitoring of geotechnical site parameters, methods of analysis for the safety assessment of the site.

This regulatory guide is consistent with the basic safety principles provided by the above IAEA safety guides. A significant exception is that IAEA Safety Guide SSG-9 provides guidance for using probabilistic and/or deterministic methods of seismic hazard analysis; the selection of the particular approach is primarily dependent on the national regulatory requirements. However, SSG-9 also states that the choice of approach also depends on the specification of the end user of the evaluation. For instance, a probabilistic approach should be used when the consideration of the likelihood of occurrence of the relevant seismic hazards (e.g., vibratory ground motion level) needs to be explicitly demonstrated. SSG-9 notes that the probabilistic safety assessment of a nuclear installation can only be performed using the results of the PSHA. In comparison, this regulatory guide presents only PSHA as an acceptable approach due to the requirements of 10 CFR 100.23. Deterministic approaches do not adequately capture the uncertainty in the development of the SSE and do not incorporate fault slip rates or earthquake recurrence rates as required by 10 CFR 100.23.

Documents Discussed in Staff Regulatory Guidance

This RG endorses, in part, the use of one or more codes or standards developed by external organizations, and other third party guidance documents. These codes, standards and third party guidance documents may contain references to other codes, standards or third party guidance documents (“secondary references”). If a secondary reference has itself been incorporated by reference into NRC regulations as a requirement, then licensees and applicants must comply with that standard as set forth in the regulation. If the secondary reference has been endorsed in a RG as an acceptable approach for meeting an NRC requirement, then the standard constitutes a method acceptable to the NRC staff for meeting that regulatory requirement as described in the specific RG. If the secondary reference has neither been incorporated by reference into NRC regulations nor endorsed in a RG, then the secondary reference is neither a legally-binding requirement nor a “generic” NRC approved acceptable approach for meeting an NRC requirement. However, licensees and applicants may consider and use the information in the secondary reference, if appropriately justified, consistent with current regulatory practice, and consistent with applicable NRC requirements.

C. STAFF REGULATORY GUIDANCE

The guidance in ANSI/ANS-2.27-2020, ANSI/ANS-2.29-2020, and ASCE/SEI 43-19 provides an acceptable approach to the NRC staff for meeting the NRC's regulatory requirements assessment of seismic hazards in license applications, subject to the following.

1. Clarification of development of design response motions in ANSI/ANS-2.29, Section 4.5.1: this section states that consistent with the procedure defined in Section 2.3 of ASCE/SEI 43-19, scale factors appropriate for SDC-2, SDC-3, SDC-4, or SDC-5 facilities may be applied to the mean UHRS to generate a DRS. This RG is applicable only to SDC-3, SDC-4, and SDC-5 facilities; DG-4036 provides guidance for SDC-1, SDC-2, and certain SDC-3 facilities.
2. Clarification of seismic design criteria in ASCE/SEI 43-19, Section 2.2: for Seismic Design Categories (SDC) 2, 3, 4, and 5, the DRS are specified as the product of the UHRS obtained using ANS-2.27 and 2.29 and the scale factor (SF) specified in equation 2-1 of ASCE/SEI 43-19. As noted above, this RG is applicable only to SDC-3, SDC-4, and SDC-5 facilities; DG-4036 provides guidance for SDC-1, SDC-2, and certain SDC-3 facilities.
3. Clarification of minimum peak ground acceleration values in ASCE/SEI 43-19, Section 2.2: this section states that, if required, the DRS shall be scaled up by one factor across the entire frequency range such that the zero period acceleration, or PGA, is not less than 0.04 g for SDC-2, 0.06 g for SDC-3, 0.08 g for SDC-4, or 0.10 g for SDC-5. As noted above, this RG is applicable only to SDC-3, SDC-4, and SDC-5 facilities; DG-4036 provides guidance for SDC-1, SDC-2, and certain SDC-3 facilities.

D. IMPLEMENTATION

Licensees generally are not required to comply with the guidance in this regulatory guide. If the NRC proposes to use this regulatory guide in an action that would constitute backfitting, as that term is defined in 10 CFR 50.109, “Backfitting,” and as described in NRC Management Directive 8.4, “Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests” (Ref. 31); affect the issue finality of an approval issued under 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants”; or constitute forward fitting, as that term is defined in Management Directive 8.4, then the NRC staff will apply the applicable policy in Management Directive 8.4 to justify the action. If a licensee believes that the NRC is using this regulatory guide in a manner inconsistent with the discussion in this Implementation section, then the licensee may inform the NRC staff in accordance with Management Directive 8.4.

REFERENCES¹

1. American Nuclear Society (ANS), “Criteria for Investigations of Nuclear Facility Sites for Seismic Hazard Assessments,” ANSI/ANS-2.27-2020, LaGrange Park, IL.
2. ANS, “Probabilistic Seismic Hazard Analysis,” ANSI/ANS-2.29-2020, LaGrange Park, IL.
3. American Society of Civil Engineers (ASCE), “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities,” ASCE/SEI 43-19, Reston, VA
4. *Code of Federal Regulations* (CFR), “Domestic Licensing of Production and Utilization Facilities,” Part 50, Chapter 1, Title 10, “Energy”
5. CFR, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Part 52, Chapter 1, Title 10, “Energy”
6. CFR, “Reactor Site Criteria,” Part 100, Chapter 1, Title 10, “Energy”
7. U.S. Nuclear Regulatory Commission (NRC), NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” Washington, DC.
8. NRC, “Updated Implementation Guidelines for SSHAC Hazard Studies,” NUREG-2213, Washington, DC, October 2018. (ADAMS No. ML18282A082)
9. NRC, Regulatory Guide (RG) 1.132, “Geologic and Geotechnical Site Characterization Investigations for Nuclear Power Plants,” Washington, DC.
10. NRC, RG 1.138, “Laboratory Investigations of Soils and Rocks for Engineering Analysis and Design of Nuclear Power Plants,” Washington, DC.
11. NRC, RG 1.198, “Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites,” Washington, DC.
12. NRC, RG 4.7, “General Site Suitability Criteria for Nuclear Power Stations,” Washington, DC.
13. NRC, RG 1.206, “Applications for Nuclear Power Plants,” Washington, DC.
14. NRC, RG 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors,” Washington, DC.

¹ Publicly available NRC published documents are available electronically through the NRC Library on the NRC’s public website at <http://www.nrc.gov/reading-rm/doc-collections/> and through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html>. For problems with ADAMS, contact the Public Document Room staff at 301-415-4737 or (800) 397-4209, or email pdr.resource@nrc.gov. The NRC Public Document Room (PDR), where you may also examine and order copies of publicly available documents, is open by appointment. To make an appointment to visit the PDR, please send an email to pdr.resource@nrc.gov or call 1-800-397-4209 or 301-415-4737, between 8 a.m. and 4 p.m. eastern time (ET), Monday through Friday, except Federal holidays.

15. NRC, DG-4036 (proposed RG 4.29), “Graded Approach to Site Characterization for New Reactor Applications,” Washington, DC.
16. Executive Order (EO) 14300, “Ordering the Reform of the Nuclear Regulatory Commission,” Federal Register, dated May 23, 2025, Vol. 90, No. 102: pp. 22587-22590 (90 FR 22587), Washington, DC.
17. ANS, “Categorization of Nuclear Facility Structures, Systems, and Components for Seismic Design,” ANSI/ANS-2.26-2004, LaGrange Park, IL.
18. American Society of Civil Engineers (ASCE), “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities,” ASCE/SEI 43-05, Reston, VA
19. NRC, “Central and Eastern United States Seismic Source Characterization for Nuclear Facilities,” NUREG-2115, Washington, DC, January 2012.
20. Pacific Earthquake Engineering Research Center (PEER), “Central and Eastern North America Ground-Motion Characterization – NGA-East Final Report,” PEER Report 2018/08.
21. NRC, Research Information Letter (RIL) 2020-011, “NRC Staff Evaluation of the Next Generation Attenuation for Central and Eastern North America Project (NGA-EAST) Ground Motion Model Characterization,” Washington, DC.
22. NRC, Research Information Letter (RIL) 2021-15, “Documentation Report for SSHAC Level 2: Site Response,” Washington, DC.
23. NRC, RIL 2025-10, “Documentation Report for Skull Valley SSHAC Level 1 Demonstration Project,” Washington, DC. March 2025. (ADAMS No. ML25044A212)
24. NRC, RIL 2025-11, “Recommendations Report for SSHAC Level 1 Demonstration Project,” Washington, DC. March 2025. (ADAMS No. ML25044A147)
25. NRC, “International Policy Statement,” 79 FR 39415, July 10, 2014.
26. NRC, Management Directive (MD) 6.6, “Regulatory Guides,” Washington, DC.
27. International Atomic Energy Agency (IAEA), Safety Standard SSR-1, “Site Evaluation for Nuclear Installations,” Vienna, 2019.
28. IAEA, Safety Guide SSG-9, “Seismic Hazards in Site Evaluation for Nuclear Installations,” Vienna, 2022.
29. IAEA, Safety Guide SSG-67, “Seismic Design for Nuclear Installations,” Vienna, 2021.
30. IAEA Safety Standard NS-G-3.6, “Geotechnical Aspects of Site Evaluation and Foundations for Nuclear Power Plants,” Vienna, 2004.
31. NRC, “Management of Backfitting, Forward Fitting, Issue Finality, and Information Requests,” Management Directive 8.4