THIS PRELIMINARY PROPOSED RULE LANGUAGE AND ACCOMPANYING DISCUSSION IS BEING RELEASED TO SUPPORT INTERACTIONS WITH STAKEHOLDERS AND THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS). THIS LANGUAGE HAS NOT BEEN SUBJECT TO COMPLETE NRC MANAGEMENT OR LEGAL REVIEW, AND ITS CONTENTS SHOULD NOT BE INTERPRETED AS OFFICIAL AGENCY POSITIONS. THE NRC STAFF PLANS TO CONTINUE WORKING ON THE CONCEPTS AND DETAILS PROVIDED IN THIS DOCUMENT AND WILL CONTINUE TO PROVIDE OPPORTUNITIES FOR PUBLIC PARTICIPATION AS PART OF THE RULEMAKING ACTIVITIES.

THE STAFF IS PRIMARILY SEEKING INSIGHTS REGARDING THE CONCEPTS IN THIS PRELIMINARY LANGUAGE AND SECONDARILY SEEKING INSIGHTS RELATED TO DETAILS SUCH AS NUMERICAL VALUES FOR VARIOUS CRITERIA.

STAFF DISCUSSION OF SUBPART D (SITING REQUIREMENTS) – PRELIMINARY RULE LANGUAGE (01/2021)

Preliminary Language	Discussion
Subpart D – SITING REQUIREMENTS	This subpart addresses requirements associated with the siting of advanced nuclear plants. Note that source term-related footnotes to 10 CFR Parts 50, 52, and 100 are addressed within the requirements in Subpart C to Part 53.
§ 53.500 General Siting. Considerations must be given to the siting of each advanced nuclear plant such that, when combined with associated design features and programmatic controls, the plant will satisfy the first and second tier safety criteria defined in §§ 53.220 and 53.230. A siting assessment for each advanced nuclear plants must be performed and must ensure that external hazards and site characteristics that might contribute to the initiation, progression, or consequences of licensing basis events analyzed in accordance with § 53.240 are identified and addressed by design features or programmatic controls. The siting assessments must address the potential adverse impacts that an advanced nuclear plant may have on nearby environs as a result of normal operations or radiological accidents as required by Part 51, “Environmental protection regulations for domestic licensing and related regulatory functions,” of this chapter.	This section establishes the overall siting-related considerations in relation to the safety criteria in Subpart B and interfaces with areas such as design (e.g., external hazards) and environmental protection. For licenses issued under Part 53, Subpart D would be used in lieu of 10 CFR Part 100.

§ 53.510 External Hazards

(a) Structures, systems, and components needed to ensure the first tier safety criteria defined in § 53.220(b) are met must be designed to withstand the effects of natural phenomena (e.g., earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches) and man-related hazards (e.g., dams, transportation routes, military and industrial facilities) of magnitudes up to the design basis external hazard levels without losing the capability to perform the safety functions defined in § 53.210. The design bases external hazard level for the relevant external hazards for a site must be identified and must address a range of estimated external hazard frequencies from routine to once in one hundred thousand years, with sufficient margin for the limited accuracy, quantity, and period of time used to estimate the hazard.

(b) *Safe Shutdown Earthquake Ground Motion*. The geologic and seismic siting factors considered for design must include a determination of the Safe Shutdown Earthquake Ground Motion for the site. The Safe Shutdown Earthquake Ground Motion is the vibratory ground motion for which certain structures, systems, and components must be designed to remain functional. The Safe Shutdown Earthquake Motion for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface. The Safe Shutdown Earthquake Ground Motion for the site is determined considering the results of the geological, seismological, and engineering characteristics of a site and its environs. 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 vibratory ground motion, earthquake recurrence rates, fault geometry and slip rates, and site subsurface material properties must be obtained by reviewing pertinent literature and carrying out field investigations.

(a) Natural and manmade hazards must be identified and characterized such that safety-related SSCs are protected up to at least the design bases external hazard level. This section defines the design basis external hazard level for all external hazards using a frequency of 1 in 100,000 years (10^{-5} per year). As discussed in NEI 18-04/RG 1.233, existing approaches and guidance can support meeting this requirement.

(b) The siting of reactors has traditionally included specific requirements for addressing seismic hazards and this is maintained under this section. The requirements in this paragraph are taken from existing requirements in Part 100 and Appendix S to Part 50.

(c) This paragraph addresses the consideration of external hazards within the analyses beyond the protection of safety-related SSCs (second tier safety criteria). The analyses required by § 53.450 must address external hazard frequencies and related SSC fragilities in determining reasonable assurance that the safety criteria defined in § 53.230(b) will be met. Corresponding functional design criteria, programmatic controls and interfaces must be established to achieve and maintain the performance of SSCs relied upon to meet the safety criteria in § 53.230(b) and to maintain consistency with analyses required by § 53.450. ASME/ANS RA-S-1.4-2021 addresses assessing the risk of external hazards.

Uncertainties are inherent in the parameters and models used to estimate the Safe Shutdown Earthquake Ground Motion for the site. These uncertainties must be addressed through an appropriate analysis, such as a probabilistic seismic hazard analysis or suitable sensitivity analyses. The horizontal component of the Safe Shutdown Earthquake Ground Motion in the free-field at the foundation level of the structures must be an appropriate response spectrum with a peak ground acceleration of at least 0.1g.

(c) The analyses required by § 53.450 must address external hazard frequencies and related SSC fragilities in determining reasonable assurance that the second tier safety criteria defined in § 53.230(b) will be met. Corresponding functional design criteria, programmatic controls and interfaces must be established to achieve and maintain the performance of SSCs relied upon to meet the safety criteria in § 53.230(b) and to maintain consistency with analyses required by § 53.450.

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§ 53.520 Site Characteristics.

Meteorological, geological, seismological, topographical, hydrological, and other characteristics of the site and surrounding area that may have a bearing on the consequences of radioactive material escaping from the subject advanced nuclear plant should be identified, estimated, and considered in the design and analyses required by Subpart C of this part.

§ 53.530 Population-related Considerations.

Every site must have an exclusion area, low population zone, and provide a population center distance as defined in § 53.120. *[Note proposed definitions currently provided in 10 CFR 100.3*] The offsite radiological consequences estimated by the supporting analyses required by § 53.430 to ensure meeting the second tier safety criteria of § 53.230(b) are used to define:

(a) An exclusion area of such size that an individual located at any point on its boundary for any two-hour period following onset of the postulated fission product release would not receive in excess of 25 rem (250 mSv) total effective dose equivalent (TEDE).

(b) A low population zone of such size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive in excess of 25 rem (250 mSv) TEDE.

(c) The population center distance must be at least one and one-third times the distance from the reactor to the outer boundary of the low population zone. The boundary of the population center shall be determined upon consideration of population distribution. Political boundaries are not controlling in the calculation of population center distance.

(d) Reactor sites should be located away from very densely populated centers. Areas of low population density are, generally, preferred. However, in determining the acceptability of a particular site located away from a very densely populated center but not in an area of low population density, consideration will be given to safety,

This section would be supportive of siting guidance changes proposed in SECY-20-0045 (ADAMS Accession Number ML19262H055).

environmental, economic, or other factors, which may result in the site being found acceptable.

§ 53.540 Siting Interfaces.

External hazards and site characteristics must be incorporated into, confirmed to be consistent with, or otherwise addressed by the design features, programmatic controls, and supporting analyses used to demonstrate that the first and second tier safety criteria in §§ 53.220 and 53.230 are met for each advanced nuclear plant. Site characteristics must be such that adequate emergency plans and security plans can be developed and maintained. Changes to external hazards or site characteristics over the lifetime of an advanced nuclear plant should be considered in the assessments performed under the facility safety program required by § 53.800.

§ 53.550 Environmental Considerations.

Requirements to address environmental protection regulations must be addressed in accordance with 10 CFR part 51.

Note: There are ongoing, related activities such as development of the Advanced Nuclear Reactor Generic Environmental Impact Statement (ANR GEIS). The NRC will refer to 10 CFR Part 51, as applicable, through the development of proposed rule language for Part 53.