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The following preliminary rule language follows an outline discussed in several public meetings, including the meeting held on September 22, 2020. Preliminary rule language is provided for selected sections related to the safety and risk criteria that would provide the foundations of the regulatory framework, whether using this outline or an alternative structure. Short summaries of other possible subparts and sections are provided for context.

PRELIMINARY RULE LANGUAGE October 20, 2020
10 CFR PART 53, "LICENSING AND REGULATION OF ADVANCED NUCLEAR REACTORS."

Subpart A - General Provisions

This subpart is envisioned to include sections related to topics such as scope, definitions, interpretations, relationships to other parts, communications, misconduct, employee protections, and exemptions. Most sections will be developed based on similar requirements in existing parts of NRC regulations.

Subpart B - Technology-Inclusive Safety Requirements

§ 53.20 Safety Objectives.

Each advanced nuclear plant must be designed, constructed, operated, and decommissioned such that there is reasonable assurance of adequate protection of the public health and safety and the common defense and security. In addition, each advanced nuclear plant must take such additional measures to protect public health and minimize danger to life or property as may be reasonable when considering technology changes, economic costs, operating experience, or other factors identified in the assessments performed under the facility safety program required by § 53.80.

§ 53.21 Safety Functions.

(a) The primary safety function is limiting the release of radioactive materials from the facility and must be maintained during routine operation and for licensing basis events over the life of the plant.

(b) Additional safety functions supporting the retention of radioactive materials during routine operation and licensing basis events—such as controlling heat generation, heat removal, and chemical interactions—must be defined.

(c) Design features and programmatic controls serve to fulfill the primary safety function and additional safety functions and must be maintained over the life of the plant.

§ 53.22 First Tier Safety Criteria.

(a) Design features and programmatic controls must be provided for each advanced nuclear plant to ensure the contribution to total effective dose equivalent to individual members of the public from normal plant operation does not exceed 0.1 rem (1 mSv) in a year and the contribution to dose in any unrestricted area does not exceed 0.002 rem (0.02 millisievert) in any one hour.

(b) Design features and programmatic controls must be provided for each advanced nuclear plant such that analyses of licensing basis events in accordance with § 53.24 demonstrate with high confidence that events with an upper bound frequency greater than approximately once per 10,000 years meet the following:

(1) An individual located at any point on the boundary of the exclusion area for any 2-hour period following the onset of the postulated fission product release would not receive a radiation dose in excess of 25 rem (250 mSv) total effective dose equivalent; and

(2) An individual located at any point on the outer boundary of the low population zone who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a radiation dose in excess of 25 rem (250 mSv) total effective dose equivalent.

(c) Design features and programmatic controls beyond those needed for paragraphs (a) and (b) of this section must be provided for each advanced nuclear plant to satisfy additional requirements established by the NRC for ensuring reasonable assurance of adequate protection of the public health and safety and maintaining common defense and security.

§ 53.23 Second Tier Safety Criteria.

(a) Design features and programmatic controls must be provided for each advanced nuclear plant to ensure the estimated total effective dose equivalent to individual members of the public from effluents resulting from normal plant operation are as low as is reasonably achievable taking into account the state of technology, the economics of improvements in relation to the state of technology, operating experience, the economics of improvements in relation to benefits to the public health and safety and other factors included in the assessments performed under the facility safety program required by § 53.80. Performance objectives for design features and programmatic controls must be established such that:

(1) The calculated annual total quantity of all radioactive material above background to be released from each advanced nuclear plant to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 3 millirems to the total body or 10 millirems to any organ.

(2) The calculated annual total quantity of all radioactive material above background to be released from each advanced nuclear plant to the atmosphere will not result in an estimated annual air dose from gaseous effluents at any location near ground level which could be occupied by individuals in unrestricted areas in excess of 10 millirads for gamma radiation or 20 millirads for beta radiation.

(b) Design features and programmatic controls must be provided to:

(1) Ensure plant SSCs, personnel, and programs provide the necessary capabilities and maintain the necessary reliability to address licensing basis events in accordance with § 53.24 and provide measures for defense-in-depth in accordance with § 53.25; and

(2) Maintain overall cumulative plant risk from licensing basis events such that the risk to an average individual within the vicinity of the plant receiving a radiation dose with the potential for immediate health effects remains below five in 10 million years and below two in one million years for a radiation dose with the potential to cause latent health effects.

§ 53.24 Licensing Basis Events.

Licensing basis events must be identified for each advanced nuclear plant and analyzed in accordance with § 53.[3x] to support assessments of the safety requirements of this subpart B. The licensing basis events must address combinations of malfunctions of plant SSCs, human errors, and the effects of external hazards ranging from anticipated operational occurrences to highly unlikely event sequences that are not expected to occur in the life of the advanced nuclear plant. The evaluation of licensing basis events must be used to confirm the adequacy of design features and programmatic controls needed to satisfy first and second tier safety criteria of this subpart and to establish related functional requirements for plant SSCs, personnel, and programs.

§ 53.25 Defense in Depth.

Measures must be taken for each advanced nuclear plant to ensure appropriate defense in depth is provided to compensate for epistemic and aleatory uncertainties such that there is high confidence that the safety criteria in this subpart B are met over the life of the plant. The epistemic and aleatory uncertainties to be considered include those related to the ability of barriers to limit the release of radioactive materials from the facility during routine operation and for licensing basis events and those related to the reliability and performance of plant SSCs and personnel, and programmatic controls. Measures to compensate for these uncertainties can include increased safety margins in the design of SSCs and providing alternate means to accomplish safety functions. No single design or operational feature, no matter how robust, should be exclusively relied upon to meet the safety criteria of 10 CFR part 53.

§ 53.26 Protection of Plant Workers.

(a) Design features and programmatic controls must exist for each advanced nuclear plant to ensure that radiological dose to plant workers does not exceed the occupational dose limits provided in subpart C to 10 CFR part 20.

(b) The licensee must use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable.

Subpart C - Design and Analysis Requirements

This subpart is envisioned to address design and analysis areas related to the functions needed to meet the first and second level safety criteria. Specific sections are likely to address areas such as quality assurance (e.g., Criterion III for design, analysis), internal and external events (including fire protection), requirements for deterministic analyses and probabilistic risk assessments, and design interfaces with programmatic controls and other subparts such as siting, construction, operations, etc.

Subpart D - Siting Requirements

This subpart is envisioned to address siting matters related to external hazards, design interfaces, population-related considerations, and compatibility with requirements for environmental reviews, emergency preparedness, and security.

Subpart E - Construction and Manufacturing Requirements

This subpart is envisioned to address areas such as construction, manufacturing, and procurement. Specific sections are likely to address areas such as quality assurance, testing, and interfaces with design (change control).

Subpart F - Requirements for Operation

This subpart is envisioned to address operational areas such as configuration control; maintaining availability and capabilities of SSCs; maintenance, repair and inspection programs; quality assurance; staffing (including operator licensing); emergency preparedness; security; radiation protection; and facility safety program.

Subpart G - Decommissioning Requirements

This subpart is envisioned to address transition to decommissioning.

Subpart H - Licenses, Certifications and Approvals

This subpart is envisioned to address requirements for initial applications for licenses, certifications, or approvals. The subpart will support either licensing under the Part 50 or Part 52 frameworks. Assessment and update of manufacturing licenses is possible. Other improvements could include combining Part 50 process for first of a kind (FOAK) applications and simpler transition to Part 52 for subsequent applications.

Subpart I - Maintaining and Revising Licensing Basis Information

This subpart is envisioned to address requirements for maintaining and revising licensing basis information related to licenses, certifications, or approvals. Specific provisions would include maintaining and updating safety analysis reports and amending licenses.

Subpart J - Reporting and Other Administrative Requirements

This subpart is envisioned to address requirements for maintaining records, making reports, and other administrative-type activities