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NRC PLANS RULEMAKING ON SEVERE ACCIDENT DESIGNS  
FOR FUTURE LIGHT WATER POWER REACTORS

The Nuclear Regulatory Commission is planning to develop requirements which would govern the design of future light-water nuclear power reactors to withstand severe core damage accidents beyond the current design basis accidents.

As part of this effort, the Commission is inviting advice and recommendations from interested parties on the scope and method to incorporate such requirements into its existing safety regulations.

For existing plants, the Commission already has taken a number of steps to further reduce the risk from severe accidents including completed rulemakings on several key issues such as station blackout, anticipated transients without scram and hydrogen generation and control. In addition, it has initiated a containment performance improvement program and a program for individual plant examination (IPE) for severe accident vulnerabilities.

For future light-water reactors, the Commission plans to separate its acceptance criteria governing the suitability of proposed nuclear power plant sites from its criteria for the design of various engineered safety features.

The first phase of this effort involves updating and revising existing siting criteria. The second phase would be divided into three parts: (1) implementing new light-water reactor source term (the amount of radioactive materials available for release in an accident) information; (2) specifying performance criteria for plant design features based on improved knowledge of the release of radioactive materials into plant containment in the event of an accident; and (3) specifying criteria for plant performance under severe accident conditions--the subject of the current Advance Notice of Proposed Rulemaking.

The purposes of this rulemaking would be to: (1) codify the Commission's guidance on severe accident and containment issues that have resulted from on-going reviews of advanced light-water reactor designs; (2) provide assurance that the performance of future light-water reactors under severe accident conditions is consistent with assumptions about severe accident performance used in developing new source term information; and (3) provide guidance to future light-water reactor designers and potential applicants.

The Commission is proposing three alternative approaches, one of which could be used as the basis for rulemaking. All three are designed to ensure that risk significant severe accident phenomena which may cause loss of containment function are considered in the design of both evolutionary and passive light-water reactor designs.

These phenomena are: (1) hydrogen generation and transport, including burning and/or detonation, resulting from metal-water and core-concrete reactions; (2) high pressure ejection of molten core material from the reactor vessel; (3) interactions between molten core debris and reactor basemat material and containment wall and structural material; (4) containment overpressure and overtemperature from decay heat, non-condensable gas generation and metal-water reactions; (5) steam explosions from fuel-coolant interactions; and (6) containment bypass.

Alternative 1 would specify reasonable design features or attributes of design features directed toward prevention or mitigation of the severe accident phenomena of concern. Where design features could not be precisely specified to prevent or mitigate a severe accident phenomenon, an evaluation of the phenomenon with respect to the overall containment performance objective specified in the rule would be required. Regulatory Guides, developed by the NRC staff, would address detailed design issues for the proposed design features.

Alternative 2, like the first, would state an overall containment performance goal based on preventing or mitigating the severe accident phenomena of concern but, instead of specifying hardware designs, would specify the severe accident phenomena that need to be addressed in the design. Then a designer would develop and propose the actual design features necessary to meet the goal. Regulatory Guides, developed by the NRC staff, would address matters such as analytical methods, assumptions, acceptance criteria and guidance on design criteria for severe accident hardware.

Alternative 3 would involve development, by the NRC, of a set of new design requirements that would include definition of specific challenges posed by severe accidents and issue them as changes or additions to the existing "General Design Criteria"

spelled out in Appendix A to Part 50 of the Commission's regulations. Each new criteria would describe the nature of the severe accident challenge or containment load as well as a success criterion--usually maintenance of the containment function for an appropriate period following the particular challenge. Again, Regulatory Guides would be developed to provide additional guidance on matters such as analysis methods and assumptions.

Written comments on these alternatives as well as on a number of specific questions set forth in the Advance Notice of Proposed Rulemaking should be received by December 28. They should be addressed to the Secretary of the Commission, Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

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