July 15, 1997 SECY-97-148

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: RECOMMENDATION ON NEED FOR RULE ON ADVANCED LIGHT WATER REACTOR
SEVERE ACCIDENT PERFORMANCE

PURPOSE:

To provide the Commission with a recommendation on the need for generic rulemaking on Advanced Light Water Reactor (ALWR) severe accident performance.

BACKGROUND:

The staff proposed, in SECY 90-341, "Staff Study on Source Term Update and Decoupling Siting From Design," dated October 4, 1990, an integrated set of activities to address regulatory implementation of updated source term information and plant design requirements related to severe accidents. In that paper the staff outlined a two phased approach to decouple reactor siting and plant design via rulemaking changes to Parts 50 and 100. In Phase I, the staff proposed a rulemaking to revise reactor site criteria under 10 CFR 100 based on siting criteria described in Regulatory Guide 4.7. Under Phase II, a rulemaking would revise Part 100 to delete the dose calculation requirement and revise Part 50 to include a revised source term or plant design requirements based upon revised source term insights.

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An advance notice of proposed rulemaking was published (57 FR 44513) on

September 28, 1992, outlining alternative approaches to generic regulation addressing the challenges from severe accidents for future light water reactors. In SECY 93-226, "Public Comments on 57 FR 44513-Proposed Rule on ALWR Severe Accident Performance," dated September 14, 1993, the staff provided a summary and discussion of the public comments received on the proposed rule on advanced light water reactor (ALWR) severe accident performance and recommended delaying a final decision to issue a rule. In an SRM dated September 14, 1993, the Commission approved the staff recommendation to delay a decision on generic rulemaking at least until after the Final Safety Evaluation Reports (FSER) are issued for the evolutionary designs, the ABWR and the System 80+. The Commission also expressed the view that a staff recommendation on generic rulemaking should await and reflect some further experience with plant-specific design certification rulemaking proceedings. Additionally the Commission directed that the generic rulemaking, if needed, should follow completion of the revisions to 10 CFR 50 and 10 CFR 100 which address siting and source terms.

DISCUSSION:

The staff believes that the status of the reviews of the evolutionary and passive designs and related certification rulemakings has reached the point where our experience allows us to offer a recommendation on generic rulemaking. The staff believes that the value in pursuing generic severe accident rulemaking does not warrant the resource expenditure. Therefore, the staff recommends withdrawal of the advance notice of proposed rulemaking.

The design certification for the ABWR design was completed on May 19, 1997, (62 FR 25800) and the design certification of the System 80+ design was completed on May 21, 1997 (62 FR 27840). Further, on December 11, 1996, the Commission published the final revisions to 10 CFR 50 and 10 CFR 100. These activities, the ongoing review of the AP600 and the numerous interactions with the Commission relative to the review and design certification of future reactors have provided us with the necessary experience to recommend action on rulemaking.

The advance notice of proposed rulemaking published in 1992 (attached) outlined three alternative approaches to the specification of

requirements addressing severe accident performance. The first alternative, described as a hardware oriented rule, would specify reasonable design features or design characteristics directed towards prevention or mitigation of explicitly identified risk significant phenomena. The risk significant phenomena identified were: hydrogen generation, transport and combustion; high pressure melt ejection; core concrete interactions and basemat ablation; long term containment overpressurization; steam explosions from fuel-coolant interactions; and containment bypass. These phenomena represent the potential contributors to containment failure or bypass and thus the mechanisms for large offsite radioactive release. Alternative 2, described as a phenomena oriented rule, is a modification of the first alternative wherein an overall containment performance goal would be specified along with the phenomena to be considered, as identified above. The designer would then be required to perform analysis of the impact of those phenomena and develop and propose the design features to meet the goal. Regulatory guides would address analytical methods, acceptance criteria and design criteria for hardware. This approach, similar to Alternative 1, would be an overlay on the existing design basis specified in 10 CFR Part 50 and justified on an enhanced safety basis. The third alternative, described as a general design criteria (GDC) oriented rule, involved development of a set of new design requirements to address specific challenges and issued as changes to Appendix A, "General Design Criteria" to 10 CFR Part 50. Each new design criterion would describe the nature of the challenge as well as the success criterion. This approach, which was proposed by the ACRS in a letter to Chairman Carr, dated May 17, 1991, also involved the development of Regulatory Guides to provide additional guidance on analysis methods and assumptions. This approach is similar to the other alternatives, especially Alternative 2, but differs in that the existing 10 CFR Part 50 design basis would be modified to include severe accidents.

As discussed in the Supplementary Information of the advance notice of proposed rulemaking, a primary purpose for the generic severe accident rulemaking was to add consistency and standardization to the resolution of

severe accident issues for future designs based on current technical information. Further, in SECY-93-226, the staff expressed the view that the current requirements regarding severe accidents addressed in 10 CFR 50.34(f) do not completely reflect current technical information (10 CFR 50.34(f) was issued as a final rule on January 15, 1982). For example, while 10 CFR 50.34(f) contains requirements addressing the severe accident challenge associated with hydrogen generation and combustion, there were no provisions dealing with other phenomena that impact containment performance, e.g., high pressure melt ejection with direct containment heating and core concrete interactions and ex-vessel debris coolability. However, in addition to the requirements of 10 CFR 50.34 (f), 10 CFR 52.47 (a) requires an applicant to perform a design-specific PRA. The discussion and interactions on severe accident provisions, which served as the basis for the approval in the FSERs for System 80+ and ABWR, reflect an updated status of our understanding of severe accident challenges, including technical insights on high pressure melt ejection and ex-vessel debris coolability. While the staff's original technical recommendations were outlined in SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements," dated January 12, 1990, numerous subsequent SECY papers including SECY-93-087, "Policy Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," dated April 2, 1993, outlined the evolution of staff positions for the evolutionary and advanced passive reactors considering; 1) information from the review of current operating reactor designs, evolutionary designs and advanced passive ALWR designs, 2) insights from probabilistic risk assessments, 3) Commission guidance, 4) the review of the EPRI Utility Requirements for evolutionary and passive ALWR designs, and 5) insights from the severe accident research program. While, in general, the staff believes consistency among many design reviews is best achieved through generic rules, as a practical matter, since the number of new applicants is likely to remain quite limited, it is more efficient to proceed with design-specific reviews. In fact, the staff is not aware of any new applicants in the foreseeable future.

Another purpose of the generic severe accident rulemaking, i.e., facilitation of design certification rulemaking, has been rendered moot by the experience gained in design certification rulemakings. Furthermore, now that the design certification rulemakings are completed for the General Electric Advanced Boiling Water Reactor and ABB-CE System 80+, the only design currently under staff review is the Westinghouse AP600. This review is evaluating the AP600 design against the selected technical and severe accident requirements given in SECY-90-016 and SECY-93-087. The resolution of severe accident design specific requirements would be set forth in the AP600 design control document and approved in the AP600 design certification rulemaking. The Commission could ensure its expectations for standardization and enhanced safety are maintained by imposing a restrictive change process, as the Commission did in the certifications of the two evolutionary designs.

While certain arguments in favor of generic rulemaking (i.e., promoting consistency and standardization in the resolution of severe accident issues and providing guidance to future LWR designers and applicants) continue to apply in varying degrees, practical aspects limit the need for such an activity. At this point, given the lack of any new potential plant or design applicants, the staff believes that the benefits of generic rulemaking do not justify the allocation of staff resources to proceed with the development of new regulations addressing severe accidents. While severe accident research has made substantial progress in resolving specific technical issues (e.g., Mark I liner failure, direct containment heating, in-vessel steam explosions, hydrogen combustion) much of the issue resolution research has focussed on the consideration of these issues relative to current plant designs. Additional substantial effort would be required, depending on the approach taken, to develop generic regulatory requirements independent of plant design. While considerable effort went into developing the advance notice of rulemaking and addressing the public comments received on the three alternatives, there was no clear consensus on either the need for rulemaking or on a preferred regulatory approach. It is anticipated that considerable effort would be

required to develop a preferred regulatory approach. Finally, development over the next several years of a comprehensive integrated set of regulations addressing severe accident issues, with the accompanying regulatory guides, would be competing with other resource needs.

Upon consideration of the potential value of a generic rule, the status of the review and design certification of future reactors, and the potential resource requirements, the staff believes that the value in pursuing generic severe accident rulemaking does not warrant the resource expenditure. While the staff does not perceive the need for generic rulemaking in the foreseeable future, should conditions change regarding potential applicants, the staff would reassess the merits of rulemaking and advise the Commission at that time.

OGC has reviewed this paper and has no legal objection. The ACRS was briefed on the recommendation contained in this paper.

RECOMMENDATION:

That the Commission approve the staff's plans to withdraw the advance notice of proposed rulemaking on severe accident performance for future light water reactors.

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for Operations