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POLICY ISSUE

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For: The Commissioners **(Information)**

From: Victor Stello, Jr.
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Subject: DESIGN REQUIREMENTS RELATED TO THE EVOLUTIONARY ADVANCED LIGHT WATER REACTORS (ALWRS)

Purpose: To inform the Commission of the staff's intentions regarding the ongoing reviews of the evolutionary ALWR designs. It is the staff's intent to pursue the design review in a manner that may go beyond the present acceptance criteria defined in the Standard Review Plan (SRP). The staff believes this approach to be in keeping with the intent of the proposed 10 CFR Part 52 to enhance safety through the design certification process.

Background: The staff is presently reviewing three standardized evolutionary ALWRS for ultimate design certification. The first is Westinghouse's RESAR SP/90, which is under review for a preliminary design approval (PDA). Westinghouse plans to pursue a final design approval (FDA) and design certification at a later date. The second is Combustion Engineering's CESSAR System 80+ and the third is General Electric's Advanced Boiling Water Reactor, both under review for final design approvals and design certification. Also, the staff has under review the Electric Power Research Institute (EPRI) utility requirements document that will establish the design criteria for future ALWRS.

The staff expects applications for design certification for passive designed plants by Westinghouse and General Electric in the early 1990's.

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Discussion: The staff recently provided information to the vendors of the three standard designs and EPRI regarding the required scope of their designs and the intended scope and depth of the staff's review of those designs. The staff has notified Combustion Engineering, Westinghouse, General Electric, and EPRI that applications for design certification must be essentially complete and consistent with the proposed 10 CFR Part 52 in order for the staff to provide the appropriate priority resources to review their applications.

The three vendors and EPRI were also informed that the staff will be considering certain selected issues that go beyond the acceptance criteria defined in the Standard Review Plan in order to improve the design, construction, and operation of the future ALWRs. Two important issues for which the staff believes it is necessary to depart from previous practices and the acceptance criteria in the SRP are fire protection and station blackout.

With regard to fire protection, it is the staff's position that fire issues that have been raised through operating experience and through the External Events Program must be resolved for evolutionary ALWRs. To that end, it is the staff's intent to minimize fire as a significant contributor to severe accident likelihood for evolutionary advanced reactors by enhancing NRC's current guidance. Therefore, the designers of standard plants have been informed that they must demonstrate that safe shutdown of their designs can be achieved, assuming that all equipment in any one fire area has been rendered inoperable by fire and that reentry to the fire area for repairs and for operator actions is not possible. The control room should be excluded from this approach, subject to the need for an independent alternate shutdown capability that is physically and electrically independent of the control room. Fire protection for redundant shutdown systems in the Reactor Containment Building should ensure, to as great an extent as possible, that one shutdown division will be free of fire damage. Consideration should be given for safety-grade provisions for the fire protection systems to ensure that the remaining shutdown capabilities are protected. In addition, it should be demonstrated that smoke, hot gases, or the fire suppressant will not migrate into other fire areas to the extent that safe shutdown capabilities, including operator actions, could be adversely affected. Specific design details will be reviewed on an individual basis during the design certification reviews.

The electrical system design is another area for which the staff believes that improved criteria are needed for further assurance that safe shutdown of a reactor will be achieved in the event of a station blackout. This design may, in some cases, require consideration of features such as an extra diesel to facilitate

diesel maintenance during operation, an alternate diverse power source, such as a gas turbine generator, and redundant station batteries with the capability for off-line charging. Other design requirements for future ALWRs may arise during the development of the final acceptance criteria related to this issue. These criteria will be developed during the course of the ongoing design certification reviews.

Brief discussions follow of the staff's current views on some of the other issues to be dealt with during the reviews of future ALWR designs.

TECHNICAL SPECIFICATIONS:

The staff believes that (1) proposed Technical Specifications should be developed as early as practicable, but should be submitted no later than the FDA application, (2) proposed Technical Specifications representative of the design should be submitted for review and approval by the staff as part of the FDA submittal and should be included in the Design Certification process, and (3) applicants should identify design features that are necessary for testing and maintenance during operation without challenging safety systems.

The Technical Specifications should be developed, wherever practicable, based upon risk and reliability considerations.

RELIABILITY ASSURANCE:

Certification of a design will be based in part upon a probabilistic risk assessment (PRA) of that design. In that the validity of a PRA is highly dependent on the reliability of systems, structures, and components, the staff requires assurance that programs will be implemented that will ensure that the reliability of those systems, structures, and components (assumed in analyses) will be maintained throughout plant life. Therefore, a program to ensure design reliability must be provided as part of the FDA application. This program, which will be certified as part of the design, should address items such as (1) the Technical Specifications and Inservice Inspection/Inservice Testing (ISI/IST), (2) the maintenance program, (3) plant procedures, and (4) security.

LEAK BEFORE BREAK:

Consistent with the broad scope rule (modifications to GDC4), leak before break can be considered wherever it is justified. Also, designs should address issues of material embrittlement associated with current vessel materials and vessel supports.

A new rule and a draft of Section 3.6.3 of the SRP have been issued. The EPRI design requirements have adopted these criteria.

OPERATING BASES EARTHQUAKE/DYNAMIC ANALYSIS METHODS:

10 CFR Part 100 currently requires that the magnitude of the Operating Bases Earthquake (OBE) be at least one-half that of the safe shutdown earthquake. The NRC funded Piping Review Committee has noted that the OBEs at existing nuclear power plants were too high, therefore controlling the design of some safety systems, and recommended that the OBE be decoupled from the SSE. The staff will take this issue under consideration as part of the design certification process.

TYPE C CONTAINMENT LEAKAGE RATE:

In past analyses, it has been assumed that the containment leak rates were constant over the course of an accident. The staff believes that containment leakage considerations should be a function of the containment pressure.

HYDROGEN GENERATION:

10 CFR 50.34(f) related to the issue of a 100 percent metal water reaction will be invoked for ALWRs consistent with Commission Policy and the proposed 10 CFR Part 52.

PHYSICAL SECURITY:

Sabotage should be addressed in all future ALWR applications. As a minimum requirement, information should be provided to demonstrate the existence of adequate physical barriers to protect vital equipment in accordance with 10 CFR 73.55(c) and to identify access control points to all vital areas in accordance with 10 CFR 73.55(d). In addition, the staff expects designers to provide an appropriate discussion of insider and outsider sabotage applicable to their designs. This discussion should include an identification of design features that decrease reliance on physical security programs for sabotage protection.

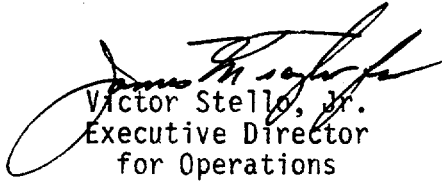
SOURCE TERMS:

The staff is concerned that the licensing basis source term "TID 14844" is not consistent with current knowledge; therefore, with EPRI input, realistic source terms will be established to be uniformly applied to future ALWRs.

60-YEAR LIFE:

For applications proposing a 60-year design life, the staff would review the designs for a 60-year life notwithstanding the fact that a 40-year license term limitation is presently specified in the Atomic Energy Act and NRC's regulations. It is the applicants' responsibility to identify the components and systems that are affected. Applications for design certification will have to provide information and programs to support design life, and the reviews for such issues as fatigue, corrosion, and thermal aging.

We believe that this information is consistent with the staff's experience from the review and operation of the current plants, and the Commission's policy that safety enhancements may be made for future plants that result in cost-effective reductions in the risk from severe accidents.


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