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Mr. James Wilson, Project 669
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: **Basis for Regulatory Treatment of Nonsafety Systems in Passive Designs**

Dear Mr. Wilson:

Attached is the final version of the **Basis for Regulatory Treatment of Nonsafety Systems in Passive Designs.** This revision to our May 13, 1993 submittal reflects our agreements with NRC staff on May 20, 1993.

We appreciate the staff's efforts in working with us to finalize this important document.

Very truly yours,

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enclosure

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Basis for Regulatory Treatment of Nonsafety Systems (RTNSS) for Passive ALWRs

<u>Introduction</u>

The use of passive systems in meeting current licensing criteria gives rise to questions, on the part of NRC, designers, and prospective utility users regarding the regulatory treatment of nonsafety systems. This matter, identified as the "RTNSS Issue", has been the subject of considerable ALWR Program/NRC interaction over the last few years. The basis outlined below has been agreed upon as the resolution to this issue.

<u>Objectives and Key Attributes</u>

The RTNSS approach provides a means of gaining additional safety insights and potential safety improvements for passive plant designs. Furthermore, the basis for RTNSS will provide a means of determining regulatory oversight for nonsafety systems, structures and components (SSCs) based on their risk significance. To meet this objective, designers will determine safety and risk significant nonsafety SSCs and their reliability/availability (R/A) missions relied on to meet NRC requirements and safety goal guidelines.

Several attributes of the RTNSS basis are considered central to achieving the above objectives in a practical and mutually acceptable way. These are:

- The approach must be brought to a timely conclusion, such that its outcome and implications regarding operational regulatory requirements are known to the designer and prospective owner/operators in time to accommodate them or explore alternative measures.

- The approach must be an integral part of the design process. In particular, the results of identification of risk important systems and their R/A missions and comparisons with the safety goal guidelines should be used by the designer and reported in the PRA. By including this information, the staff review of the PRA and related discussions with the designer will permit determination of regulatory oversight requirements in the most efficient and timely way.

- In principle, all nonsafety SSCs are subject to assessment regarding their risk significant functions. However, for those nonsafety SSCs not found to have risk significant functions, the extent of their regulatory oversight should be determined accordingly.

- The RTNSS process does not presently establish, beyond general terms, the type of regulatory oversight that would be applied to risk significant SSC functions. This oversight depends on the risk significance of specific SSC functions and R/A missions identified in the RTNSS approach. Continued effort is required to develop examples of the types and levels of regulatory oversight for representative categories of risk significant SSC functions.

Scope:

The RTNSS basis is broadly applicable to those nonsafety SSCs which have risk significant functions, and are therefore candidates for regulatory oversight. The plant designer will identify these SSC functions, utilizing the following criteria:

A. SSC functions relied upon to meet beyond design basis deterministic NRC performance requirements: 10 CFR 50.62 for ATWS mitigation, and 10CFR 50.63 for loss of all ac power.

B. SSC functions relied upon to resolve long term safety (beyond 72-hours) and to address seismic events.

C. SSC functions relied upon under operating and shutdown conditions to meet the Commission's Safety goal guidelines of core damage frequency of less than 1.0E-4 per reactor year and large release frequency of less than 1.0E-6 per reactor year.

D. SSC functions needed to meet the containment performance goal (SECY-93-087,issue I.J), including containment bypass, during severe accidents.

E. SSC functions relied upon to prevent significant adverse systems interactions.

Steps in the RTNSS Process for each design:

1. Comprehensive Baseline PRA:

The evaluation process starts with designer constructed comprehensive Level 3 PRAs (Baseline PRAs) prepared in accordance with the ALWR URD. These PRAs must include all appropriate internal and external events considering both power and shutdown operations. Seismic events will be evaluated by a margins approach. Adequate treatment of uncertainties, long term safety operation, and containment performance should be included. Containment performance should be addressed with considerations for sensitivities and uncertainties in accident progression and inclusion of severe accident phenomena, including explicit treatment of containment bypass. Appropriate uncertainty distributions and mean values must be used for passive systems unavailabilities and for core damage frequency and large release frequency. Results of an adverse systems interaction study will also be considered in the PRA.

2. <u>Search for Adverse Systems Interactions:</u>

The designers must provide a systematic evaluation of adverse systems interactions between the active nonsafety and passive systems. The results of this analysis should be used for design improvements to minimize adverse systems interaction, and also be factored into the PRA model.

3. <u>Focused PRA:</u>

The designers should construct Focused PRAs. The Focused PRA is used to determine the R/A missions of nonsafety SSCs which are risk significant. There are two main considerations in constructing Focused PRAs.

First, the scope of initiating events and their frequencies are maintained in the Focused PRA as in the Baseline PRA. As a result, nonsafety SSCs used to prevent the occurrence of initiating events will be subject to regulatory oversight applied commensurate with their R/A missions for prevention, as discussed in steps 4 and 5.

Second, the effect of nonsafety SSCs is removed from the comprehensive Level 3 PRA event tree logic. As a minimum, the defense-in-depth functions and their support such as ac power are removed. This is to determine if the passive safety systems, when challenged, can provide sufficient capability without nonsafety backup to meet the NRC safety goal guidelines of core damage frequency of 10^{-4} per year and large release frequency of 10^{-6} per year. The containment performance, including bypass, during a severe accident should also be evaluated. Nonsafety SSCs which re[illegible] the Focused PRA model are subject to regulatory ov[illegible] based on their risk significance in steps 4 and 5.

4. <u>Selection of Important Nonsafety Systems:</u>

The designers determine what combination (if any) of nonsafety SSCs are necessary to meet NRC regulations, safety goal guidelines and the containment performance goal objectives. This is done both for scope items A and F where NRC regulations are the primary consideration and scope items C and D where PRA methods are prevalent. For the long term safety issues in scope B, the design's ability to maintain core cooling and containment integrity beyond 72 hours will be established by means of PRA insights and sensitivity studies as well as deterministic methods. Nonsafety SSC functions required to meet beyond design basis requirements (item A), to resolve the long term safety and seismic issues (item B), and to prevent significant adverse interactions (item E) are subject to regulatory oversight as discussed in step 5.

The Focused PRA is used to determine the nonsafety SSCs important to risk. This is done in two parts.

First, nonsafety SSCs needed to maintain initiating event frequencies at the Baseline PRA levels will be identified from the PRA.

Second, the designers will, if needed, add the necessary success paths with nonsafety systems and functions in the "Focused PRA" in order to meet safety goal guidelines, containment performance goal objectives and NRC regulations. The designers can choose those systems needed by considering the factors for optimizing design impact and benefit of particular systems. All relevant issues which are addressed by PRA should be included in this evaluation. PRA importance studies should be performed to assist in determining the importance of these SSCs. In principle, all nonsafety SSCs in the Focused PRA model needed to meet NRC requirements, the safety goal guidelines and containment performance goals are potentially subject to regulatory oversight, commensurate with their risk significance.

5. Nonsafety System Reliability/Availability Missions:

The designer will identify and document risk significant nonsafety systems functional R/A missions from the Focused PRA which are needed to meet the safety goal guidelines, containment performance goals, and other NRC requirements per Step 4. Steps 4, 5 and 6 should be iterated to optimize the selection of risk-significant nonsafety systems and their R/A missions.

6. Regulatory Oversight Evaluation:

Based on the outcome of steps 1 through 5, the designers will propose for the staff's consideration appropriate regulatory oversight measures. This regulatory oversight may include the following:

a. Reviews of the SSAR, PRA and audits of plant performance calculations to determine that the design of these risk significant nonsafety SSCs satisfies the performance capabilities and R/A missions identified.

b. Reviews of the SSAR to determine that proper operational reliability assurance program inputs have been identified, including those for maintenance rule implementation.

c. Reviews of the SSAR to determine that proper short term availability control mechanisms have been identified, if required for safety and determined by risk significance such as simple technical specifications.

7. <u>NRC/Designer Interaction:</u>

The staff, the designers and the ALWR Program will interact on the appropriateness of the Focused PRA models and reliability values, R/A missions, and level of regulatory oversight on various nonsafety systems. This interaction must begin early in the review process to provide timely and complete resolution of the issue.