April 2, 2001

Mr. Robert H. Bryan, Chairman
Westinghouse Owners Group (WOG)
Tennessee Valley Authority
1101 Market Street, Mail Stop LP4J
Chattanooga, TN 37402

SUBJECT: WESTINGHOUSE OWNERS GROUP RISK-INFORMED ANTICIPATED TRANSIENT WITHOUT SCRAM APPROACH

Dear Mr. Bryan,

The purpose of this letter is to provide NRC staff feedback on the Westinghouse Owners Group (WOG) proposed risk-informed Anticipated Transient Without Scram (RI-ATWS) approach as we understand it. Based on the January 24, 2001 meeting, the staff's understanding is that the WOG is developing a risk informed approach as the basis for revisions to moderator temperature coefficient (MTC) limits and related considerations at a number of operating plants. The planned WOG submittal will address identified concerns related to the prior approach (as described in WCAP-11992) as well as respond to issues discussed at more recent meetings.

The WOG RI-ATWS approach is being pursued, in part, because utilities are moving towards higher power cores and longer fuel cycles and for which more flexibility in fuel and core designs is desired. The WOG has stated that they want to eliminate the MTC and unfavorable exposure time (UET) restrictions associated with ATWS based on a probabilistic analysis in order to achieve these benefits.

The staff has considered the WOG approach in light of the current ATWS requirements in 10 CFR 50.62 and its supporting statement of consideration. The regulatory approach to mitigating ATWS events that formed the underlying basis for 10 CFR 50.62 focused on two aspects of the reactor coolant (primary) system response: (1) the integrity of the primary pressure boundary under peak ATWS pressure and (2) the capability to inject borated water to shut down the reactor and maintain core coverage. While these two areas of response capability are deterministic, they originated from the objective of preventing (or maintaining a sufficiently low probability of) an ATWS event propagating to a severe accident involving core melt and possibly containment failure. Therefore, in concept, your approach of assessing the proposed licensing action against ATWS risk is not in conflict with the basis of the ATWS rulemaking.

The basis for your proposed MTC (UET) limit change must appropriately evaluate the ATWS system response as part of your assessment. The peak ATWS pressure is primarily a function of the MTC and the primary system relief capacity. The capability to inject borated water could be adversely affected if the initial peak pressure deformed or disabled valves in the injection path or if the primary system pressure remained higher than the shutoff head of the high-head injection pumps for an extended period of time.

As the staff indicated at the January 24, 2001 meeting, a risk informed licensing action to revise operational MTC (UET) limits would be entertained if it met the guidance outlined in RG 1.174. Such a risk informed approach would require an integrated engineering and probabilistic assessment to demonstrate that the requested changes did not exceed the risk guidelines of that RG as well as demonstrating that the safety margins and defense-in-depth were not inappropriately reduced. If submitted as a risk informed action, the staff's review will focus on the quantified risk findings as well as defense-in-depth provisions and margins evaluations. Since an ATWS event has the potential to violate multiple barriers (e.g., fuel, primary system, reactor vessel, and containment), this will be a significant review area for the staff.

As outlined in the Commission's PRA policy statement, the goal of risk informed regulation is to utilize best estimate methods to the extent practicable. As we understand your proposal, the risk basis will include a configuration risk management program to assure high availability of components to mitigate the severity of ATWS events, such as automatic rod insertion, pressurizer power-operated relief valve (PORV) availability and auxiliary feedwater (AFW) availability. The effectiveness of this program will also be an important element of the staff's review focus. Additionally, in order to provide a sufficient risk informed basis, the staff notes that the WOG submittal should consider the risk impact of an effective configuration management program throughout the operating cycle, not solely during the "reference case" UET period (i.e., the UET period assuming all AFW and PORVs are available with rod insertion in manual mode).

In the enclosure to this letter, we have provided a discussion on ATWS thermal hydraulic response issues that were of central concern during the original ATWS rulemaking. We suggest that you consider this information in developing your submittal.

While I believe that the proposal you have outlined is a challenging application of risk informed methods, a comprehensive application based upon the principles of RG 1.174 may form the basis for the relief you have identified. If we can provide any additional information, please contact myself, or Jared Wermiel, Chief of the Reactor Systems Branch.

Sincerely,

/RA/

Gary M. Holahan, Director
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

Enclosure: As stated

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Gary M. Holahan, Director
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ATWS Thermal Hydraulic and System Response Issues Associated with 10 CFR 50.62

Issue #1–Peak Pressure

Meet ASME Service Level C (3200 psig)

In a PWR, the ATWS transient results in a primary system pressure rise, the magnitude of which is dependent upon the MTC, the primary relief capacity, and how much energy the steam generators can remove. If the pressure cannot be reduced, reactor coolant will be lost through the relief valves and the core will eventually be uncovered. If an ATWS occurs when the MTC is either positive or insufficiently negative to limit reactor power, the ATWS pressure increase will exceed the ASME Service Level C pressure and all subsequent mitigative functions are likely to be ineffective. The proposed WOG approach should address this situation.

Issue # 2–MTC/UET

Technical Specification MTC = 0 at Beginning of Cycle, Hot Standby, Zero Power

The MTC is a natural process that reduces the core reactivity as the water temperature increases. For a PWR with a negative MTC, an increase in the primary coolant temperature provides negative reactivity feedback to limit the power increase. During the first part of the fuel cycle below 100 percent power, the MTC can possibly be positive for a very short period of time. The MTC is more negative (less positive) at 100 percent power than at lower power. The MTC also becomes more negative (less positive) later in the fuel cycle. When the MTC is insufficient to maintain the primary system pressure below 3200 psig during an ATWS, it is designated in the basis of the ATWS rule as “unfavorble MTC” and in the WOG topical reports the equivalent condition is referred to as an UET. A Westinghouse analysis in December 1979 indicated that the MTC will be more negative than -8 pcm/ ^{0}F for 95 percent of the cycle time, and more negative than -7 pcm/ ^{0}F for 99 percent of the cycle time that the core is greater than 80 percent of nominal power. The -7 pcm/ ^{0}F was determined to be the point at which the core conditions became unfavorable. Under the approach proposed by the WOG, the values of the MTC and the doppler coefficient (DC) will have to be carefully examined to ensure that an accident does not result in a situation where the contribution from the MTC and DC effects results in an unacceptable reduction in the margin associated with the total temperature coefficient or results in a net positive reactivity feedback condition.

Enclosure