

December 16, 2002

MEMORANDUM TO: William H. Ruland, Director  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

FROM: Drew Holland, Project Manager, Section 2 /RA/  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH THE BOILING WATER REACTOR  
OWNERS GROUP (BWROG) CONCERNING THE DEVELOPMENT OF  
A NEW REACTOR CORE STABILITY LIMIT

On November 5, 2002, an open meeting was held between the BWROG and the NRC staff to discuss the BWROG efforts to develop a new reactor core stability limit. If developed, the new stability limit will provide the best basis for the final resolution of this issue with the class of boiling water reactors referred to as the "detect and suppress" (D&S) plants. In June 2001, GE Nuclear Energy reported that generic delta I versus oscillation magnitude (DIVOM) curves could be non-conservative. This resulted in a 10 CFR Part 21 notification. Individual plants implemented corrective actions as a result and the BWROG D&S Committee was reformed to develop a new generic DIVOM correlation.

The committee considered several alternatives and selected an approach that uses the TRACG computer program to calculate a best estimate critical power ratio response to oscillations and initiating events. In addition, the alternative would establish a generic setpoint that would provide safety limit minimum critical power ratio protection. The new stability limit will no longer be based on the maximum critical power ratio.

The BWROG stated that requirements for the new limit include:

- satisfying regulatory requirements,
- satisfying fuel design limits for stability,
- allowing a return to operation immediately after a stability event and not requiring additional evaluations,
- applicability to all BWR fuel vendors,
- compatibility with existing stability based hardware/software,
- maintenance of stability scram setpoints near current values, and
- a limitation on oscillation magnitude and duration such that there is no predicted fuel rod failure and negligible change in fuel rod properties from those assumed in design and licensing analyses.

The presenters explained that the regulatory criteria being applied to this effort includes General Design Criterion 12, "Suppression of Reactor Power Oscillations" and Standard Review Plan (SRP) Section 4.2, "Fuel System Design." The new stability limit approach allows oscillations of limited magnitude and duration. In this way, fuel rods can go into and out of boiling transition. Also, sustained boiling transition will be avoided and clad temperature increase will be limited. The project will confirm that applicable fuel design limits are satisfied with the new stability limit. Based on feasibility study results, the design limits selected include:

- cladding and channel stress and strain pertaining to creep deformations, annealing of irradiation hardening and pellet/cladding mechanical interaction,
- cladding fatigue,
- cladding oxidation,
- dimensional changes including fuel rod growth and cladding collapse,
- increased fission gas release and fuel rod internal pressure, and
- fuel centerline melting.

These design limits establish all detailed fuel evaluations for stability.

In concluding, the BWROG stated that SRP Section 4.2 is the basis for stability design limits to protect the fuel. These design limits have been used in a feasibility study where annealing of fuel irradiation hardening has been identified as the most limiting requirement. This requirement can be met by limiting the peak cladding temperature and the duration of the instability event. The peak cladding temperature in turn is limited by the oscillation magnitude. Proper selection of the stability scram setpoint will control the oscillation magnitude. The feasibility study utilized the TRACG computer code. Based on preliminary results, the fuel rods are not predicted to fail and there are negligible changes to fuel rod properties.

The staff thanked the BWROG for the presentation and encouraged an update on developments in the next several months. The staff expressed that this would be an ambitious undertaking. This meeting was informational. No regulatory decisions were made. The meeting handouts can be found in ADAMS under Accession No. ML023450532.

Project No. 691

Attachment: Meeting Attendees

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MEETING WITH THE BOILING WATER REACTORS OWNERS GROUP

DEVELOPMENT OF A NEW REACTOR CORE STABILITY LIMIT

NOVEMBER 5, 2002

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