UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 19, 2002

MEMORANDUM TO: Paul Boehnert, Staff Engineer
Advisory Committee on Reactor Safeguards

FROM: Jack E. Rosenthal, Chief
Safety Margins and Systems Analysis Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF TECHNICAL REPORT FOR GSI-185 "CONTROL OF RECRITICALITY FOLLOWING SMALL-BREAK LOCAs IN PWRs"

Generic Safety Issue (GSI) 185 addresses those SBLOCA scenarios in PWRs that involve steam generation in the core and condensation in the steam generators, causing deborated water to accumulate in part of the RCS. Restart of RCS circulation may cause a recriticality event (reactivity excursion) by moving this deborated water into the core.

An effort was established at Brookhaven National Laboratory (BNL) to determine whether reactor core power excursions resulting from the above scenario could cause severe fuel damage. The BNL study performed coupled thermal-hydraulic/neutronic calculations of boron dilution scenarios to improve our understanding of the potential for unacceptable fuel damage and to clarify assumptions made in the prioritization phase of GSI 185.

Two boron dilution transients were simulated by BNL. In one, a conservative inlet plenum boron concentration as a function of time was used based on a B&WOG analysis. In the other, an even more conservative boron reactivity assumption was simulated by changing the inlet boron concentration. A beginning-of-cycle core model of the TMI-1 B&W reactor was used with the coupled PARCS/RELAP5 neutronics/thermal-hydraulics code.

The peak enthalpy change in the fuel was found to be 16 and 37 cal/g in the two BNL simulations. These fuel enthalpies are generally not larger than expected for the rod ejection accident (REA) in a PWR which is the design-basis accident for a PWR and for which NRC has an existing research program to understand fuel damage limits. Furthermore, the pulse widths for the boron dilution events are large compared with those expected for an REA and this is expected to have an ameliorating effect on fuel behavior.

Attached for use by the subcommittee is a copy of a draft report prepared by BNL entitled Analysis of Boron Dilution Transients in a PWR.

Attachment: BNL report

June 19, 2002

MEMORANDUM TO: Paul Boehnert, Staff Engineer
Advisory Committee on Reactor Safeguards

FROM: Jack E. Rosenthal, Chief ***Original signed by J. Rosenthal***
Safety Margins and Systems Analysis Branch
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF TECHNICAL REPORT FOR GSI-185 "CONTROL OF RECRITICALITY FOLLOWING SMALL-BREAK LOCAs IN PWRs"

Generic Safety Issue (GSI) 185 addresses those SBLOCA scenarios in PWRs that involve steam generation in the core and condensation in the steam generators, causing deborated water to accumulate in part of the RCS. Restart of RCS circulation may cause a recriticality event (reactivity excursion) by moving this deborated water into the core.

An effort was established at Brookhaven National Laboratory (BNL) to determine whether reactor core power excursions resulting from the above scenario could cause severe fuel damage. The BNL study performed coupled thermal-hydraulic/neutronic calculations of boron dilution scenarios to improve our understanding of the potential for unacceptable fuel damage and to clarify assumptions made in the prioritization phase of GSI 185.

Two boron dilution transients were simulated by BNL. In one, a conservative inlet plenum boron concentration as a function of time was used based on a B&WOG analysis. In the other, an even more conservative boron reactivity assumption was simulated by changing the inlet boron concentration. A beginning-of-cycle core model of the TMI-1 B&W reactor was used with the coupled PARCS/RELAP5 neutronics/thermal-hydraulics code.

The peak enthalpy change in the fuel was found to be 16 and 37 cal/g in the two BNL simulations. These fuel enthalpies are generally not larger than expected for the rod ejection accident (REA) in a PWR which is the design-basis accident for a PWR and for which NRC has an existing research program to understand fuel damage limits. Furthermore, the pulse widths for the boron dilution events are large compared with those expected for an REA and this is expected to have an ameliorating effect on fuel behavior.

Attached for use by the subcommittee is a copy of a draft report prepared by BNL entitled Analysis of Boron Dilution Transients in a PWR.

Attachment: BNL report

Distribution: SMSAB R/F, DSARE R/F, HScott R/F, PNorian, CAder, FEltawila, RHogan

G:\SMSAB\SECYS\SCOTT\GSI185toACRS.wpd
OAR in ADAMS? (Y or N) Y ADAMS ACCESSION NO.: _____ TEMPLATE NO. RES-006
Publicly Available? (Y or N) Y DATE OF RELEASE TO PUBLIC 6-20-02 SENSITIVE? N
To receive a copy of this document, indicate in the box: "C" = Copy without enclosures "E" = Copy with enclosures "N" = No copy

OFFICE	SMSAB	c	SMSAB		C:SMSAB	
NAME	HScott:mb		RLee		JRosenthal	
DATE	06/18/02*		06/18/02*		06/19/02*	