UNITED STATES
NUCLEAR REGULATORY COMMISSION
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July 2, 1997

MEMORANDUM TO: Marylee M. Slosson, Acting Director, NRR/DRPM
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FROM: Charles E. Rossi, Director
Safety Programs Division
Office for Analysis and Evaluation
of Operational Data

SUBJECT: REQUEST FOR REVIEW OF SPECIAL REPORT - HISTORICAL RELIABILITY OF THE HIGH PRESSURE CORE SPRAY SYSTEM, 1987-1993, INEL-95/0133

Attached for your information and review is the draft of the reliability report on the high pressure core spray (HPCS) system at U.S. commercial boiling water reactors. This study is part of our on-going evaluation of the reliability of risk-significant safety systems. Using data obtained from licensee event reports, the study provides an estimate of the associated system reliability based on actual demands between 1987 through 1993. The report also includes a comparison of the associated system reliability derived from this operating experience with values published in probabilistic risk assessments (PRAs) and individual plant examinations (IPEs), and an evaluation of the most significant trends. Notable findings and observations include:

- The HPCS system unreliability (including recovery) was 0.075 for observed operational missions. None of these missions involved an undervoltage condition requiring the Division III emergency diesel-generator to energize the bus, nor did any last long enough to require pump suction transfer to the suppression pool. For PRA missions, which do require Division III emergency power and pump suction transfer, the operational data- based unreliability is 0.23. No significant trend was identified in the HPCS system operational mission unreliability over the seven year study period. No significant variation was observed in unreliability with respect to plant age.

- Maintenance-out-of-service associated with the injection subsystem was the dominant contributor to the operational mission unreliability, followed by failure of the injection valve. The PRA-based mission unreliability was split fairly evenly between maintenance-out-of-service and specific failures in both the injection and emergency pow subsystems.

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- The overall HPCS system unreliability estimates approximated from the PRA/IPEs were lower than the mean estimates derived from operating experience data. Three of the eight plants estimates were below the uncertainty bounds of the observed operational demand-based unreliability. Although the unreliability estimates from the two sources for the emergency power subsystem tend to agree, the injection subsystem estimates from the PRA/IPEs are a factor of five lower than the operational unreliability. The difference in the injection subsystem estimate is primarily attributed to a two order of magnitude difference in the failure rates used in calculating the HPCS injection pump failure to run probability. The failure rate difference appears to be due to the use in the PRA/IPEs of generic pump failure data from either the Interim Reliability Evaluation Program (IREP) database or from INPO's Nuclear Plant Reliability Data System (NPRDS) rather than system-specific data.

- The failures that occurred in the HPCS system were distributed throughout the three subsystems: injection, emergency power, and service water. The unplanned demand failures were experienced in the emergency power subsystem, while the failures discovered during surveillance tests and via other means were associated with the injection and service water subsystems. Considering that there is sparse failure data, this distribution is not unusual.

We intend to have a review meeting on Tuesday, August 5, 1997, at 10:00 a.m. in room T4-B3 to discuss any comments or recommendations you might have before we issue the report. Please contact Tom Wolf (415-7576 or e-mail "TRW") if you have any questions.

Attachment:
Historical Reliability of the High Pressure Core Spray System, 1987-1993, February 1997, INEL-95/0133

cc w/o att:
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