Jim McKnight
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

December 13, 1995

NRC INFORMATION NOTICE 95-57: RISK IMPACT STUDY REGARDING MAINTENANCE DURING LOW-POWER OPERATION AND SHUTDOWN

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform licensees of an NRC Office of Research study on the effect of system or equipment maintenance on boiling water reactor low-power and shutdown core damage frequency. It is expected that licensees will review the information for applicability to their facilities and consider actions, as appropriate, to avoid risk-significant situations. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Discussion

The details of the study were published in October of 1994 in NUREG/CR-6166, "Risk Impact of BWR Technical Specifications Requirements During Shutdown," (Accession No. 9411040066) which evaluated the risk impact of limiting conditions for operation at low power and shutdown in the current technical specifications for Grand Gulf Nuclear Station. These limiting conditions for operation include allowed outage times, that is, the time allotted for system maintenance outages.

A probabilistic model was developed for each of the eight plant operational states, which are a reclassification of the five modes of operation defined in the technical specifications. These eight plant operational states address the range of plant conditions from refueling with the vessel head off and the upper pool filled to full-power operation. The models were developed in sufficient detail to allow for comparisons among the plant operational states. Figure-of-merit measures included increase in conditional core damage frequency. The measures explicitly accounted for the impact of test and maintenance activities (e.g., allowed outage times and surveillance time intervals) for both power and shutdown conditions.

NUREG/CR-6166 indicates that the increase in conditional core damage frequency for taking a single train of standby service water out of service during different plant operational states in an operating cycle can be substantial. Single-train standby service water maintenance outages have been shown to result in an increase in conditional core damage frequency during low power

and the first few days of hot shutdown (plant operational states 1, 2, and 3) that is comparable to the increase in conditional core damage frequency at full-power operation (plant operational state 0). During plant operational state 4 (hot shutdown with shutdown cooling operating down to 0 psig) and plant operational state 5 (cold shutdown with temperatures ≤ 200 °F), the study indicates that the increase in conditional core damage frequency could exceed that at full-power operation. NUREG/CR-6166 states, "Based on the Increase in Conditional CDF {core damage frequency}, single and multiple train maintenance on SSW {standby service water} should probably not be scheduled for the late phases of hot shutdown and the early phases of cold shutdown, when the Alternate Decay Heat Removal System (ADHRS) is not an alternative for decay heat removal."

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Dennis M. Crutchfield

Dennis M. Crutchfield, Director
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95-55	Handling Uncontained Yellowcake Outside of a Facility Processing Circuit	12/06/95	All Uranium Recovery Licensees.
95-54	Decay Heat Management Practices during Refueling Outages	12/01/95	All holders of OLs or CPs for nuclear power reactors.
95-53	Failures of Main Steam Isolation Valves as a Result of Sticking Solenoid Pilot Valves	12/01/95	All holders of OLs or CPs for nuclear power reactors.
95-47, Rev. 1	Unexpected Opening of a Safety/Relief Valve and Complications Involving Suppression Pool Cooling Strainer Blockage	11/30/95	All holders of OLs or CPs for nuclear power reactors.
94-13, Supp. 2	Control and Oversight of Contractors during Refueling Activities and Clarificaiton of Applicability of Section 50.120 of Title 10 of The Code of Federal Regulations to Contractor Personnel	11/28/95	All holders of OLs or CPs for nuclear power reactors.
95-13, Supp. 1	Potential for Data Collection Equipment to Affect Protection System Performance	11/22/95	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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cold shutdown or when the alternate decay heat removal system is not capable of serving as a backup to the normal decay heat removal system.

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when the alternate decay heat removal system (e.g., Grand Gulf) is not capable of serving as a backup to the normal decay heat removal system.

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