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Docket No. 50-293
License No. DPR-35

SUBJECT: TECHNICAL REVIEW AND COMMENTS ON NRC PRELIMINARY ACCIDENT SEQUENCE PRECURSOR ANALYSIS OF PILGRIM EVENTS

Please find enclosed our comments on the NRC Preliminary Accident Sequence Precursor (ASP) analysis of two Pilgrim Station events.

We have reviewed the NRC preliminary ASP program analysis of operational events that occurred at Pilgrim on May 31, 1993, and September 10, 1993. As requested in your July 29, 1994 letter, we reviewed the technical accuracy of the analyses including the depiction of plant equipment and equipment capabilities at Pilgrim. Based on our review, we believe neither event should be considered as an accident sequence precursor event. The NRC preliminary models of the events do not include key plant specific information regarding our plant configurations at the times of the aforementioned events , nor do the models credit additional capabilities for short and long term core cooling. Our specific comments are presented in the enclosure to this letter.

We recommend the comments also be used for other Pilgrim events that may be under consideration as preliminary accident sequence precursors. Should you have questions regarding our technical review and comments on this subject, please contact Mr. Clem Littleton (508) 830-7790 of our Systems and Safety Analysis Division.

We appreciate the opportunity to provide technical review and comment on NRC preliminary ASP analyses of Pilgrim events.

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Enclosure

DWE/lam/RAP94/ASPLET

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ENCLOSURE

TECHNICAL REVIEW AND COMMENTS ON THE
NRC PRELIMINARY ASP ANALYSIS

I. Reactor Scram (5/31/93)

Summary

- Although declared inoperable, no credit was given for the ability to recover the RCIC System. The RCIC System was recoverable if required. It had been declared inoperable on 5/30/93 at 1820 hours. The EGR was replaced and the RCIC System operability surveillance procedure 8.5.5.1 was started on 5/31/93 at 1130 hours and terminated at 1220 hours due to RCIC turbine speed oscillations. The scram occurred on 5/31/93 at 1921 hours. Although the RCIC System was still considered inoperable, it was available to perform its high pressure injection function. Adequate time would have been available to reset the RCIC turbine if speed oscillations caused a turbine trip. Thus, although technically inoperable, the RCIC System remained available in the event of a HPCI System failure.

- No credit was given for the CRD System as a qualified high pressure injection source even though it was available if the feedwater, HPCI, and RCIC Systems were unavailable. Although not fully credited in Pilgrim's Individual Plant Examination (IPE) submittal, the CRD System would be a viable source of high pressure injection and is referenced in the appropriate Emergency Operating Procedure for this scenario.

- Only the Residual Heat Removal (RHR) System was credited for providing long term core/containment cooling whereas the main condenser was available, and in extreme cases, the direct torus vent is available for use.

Discussion

The NRC conditional core damage probability calculations are based on the non-specific reactor trip event tree included in Appendix A of NUREG/CR-4674. The event tree identifies two risk significant sequences (identified by number) that lead to core damage. As described below, the sequences are not considered risk significant.

The ASP analysis is dominated by sequence number 20, a transient initiated scram followed by a failure of high pressure injection and a failure to depressurize.

> "Unavailability of vessel depressurization following successful scram and failure of continued power conversion system operation, safety relief valve challenge and successful reseat. Failure of the main feedwater, high-pressure coolant injection, reactor core isolation cooling, and control rod drive cooling."

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ENCLOSURE (Cont.)

Sequence number 20 is considered unlikely due to the availability of the HPCI, RCIC, and CRD Systems to provide high pressure make up in the event of a feedwater failure. Additionally, the power conversion system remained available for this event.

The next most probable sequence, number 11, deals with the loss of long term core cooling.

> "Unavailability of long-term core cooling (failure of residual heat removal in shutdown and suppression cooling modes) following successful scram and failure of continued power conversion system operation, safety relief valve challenge and reseat, and successful main feedwater."

Only the RHR System is credited in the analysis for this function. During the event, the condenser remained available as a heat sink. Additionally, the analysis does not credit the capability of the direct torus vent for performing the long term core cooling function. The use of the direct torus vent could prevent violation of the primary containment pressurization limit if all other means of heat removal were to fail. Thus, sequence 11 is considered unlikely due to the availability of the condenser and the torus vent to provide long term core/containment cooling in the event of an RHR System failure.

II. **Reactor Scram (9/10/93)**

Summary

- No credit was given for the CRD System as a qualified high pressure injection source even though it was available if the HPCI and RCIC Systems were unavailable. Although not credited in Pilgrim's IPE submittal, the CRD System would be a viable source of high pressure injection.
- No credit was given for manually starting the HPCI System (for pressure control) and RCIC System (for level control) within 1 minute of the scram.
- No credit was given for recovery of the Feedwater System which was available when the start-up transformer was reenergized 10 minutes after the scram.
- Only the RHR System was credited for providing long term core/containment cooling whereas the main condenser was available, and in extreme cases, the direct torus vent was available for use.

Discussion

The NRC conditional core damage probability calculations are based on the loss of offsite power event tree included in NUREG/CR4674 Appendix A. The event tree identifies three risk significant sequences that lead to core damage.

ENCLOSURE (Cont.)

The dominant sequence, number 48, involves successful scram, recovery of emergency power, challenge and reclosure of the SRVs, followed by failure of the HPCI, RCIC, CRD Systems, and failure to depressurize.

> "Unavailability of vessel depressurization following a loss of offsite power with successful emergency power and reactor scram. Safety relief valve challenge and reseat, with failure of high-pressure injection systems."

This sequence is considered unlikely due to the availability of the CRD System to provide high pressure make up in the event of failure of the HPCI and RCIC Systems. Additionally, the HPCI and RCIC Systems were manually initiated within 1 minute of the scram. Also, the Feedwater System was available for use 10 minutes after the scram in the event of failure of the HPCI, RCIC, and CRD Systems.

The next most probable sequence, number 40, involves a loss of long term cooling.

> "Unavailability of long-term cooling (failure of residual heat removal in shutdown and suppression cooling modes) following a loss of offsite power with successful emergency power, reactor scram, safety relief valve challenge and reseat, and successful high-pressure coolant injection."

Sequence number 40 is considered unlikely due to the long term recoverability of the condenser and the torus vent to provide long term core/containment cooling in the event of an RHR System failure. The flowpath from the vessel to the condenser was reestablished about 90 minutes after the scram.

The last sequence, number 55, involves a stuck open safety relief valve (SRV) followed by loss of high pressure injection and failure to depressurize.

> "Unavailability of vessel depressurization following a loss of offsite power with successful emergency power and reactor scram. Safety relief valve challenge and unsuccessful reseat, and failure of the high-pressure coolant injection system."

If an SRV were to remain open, depressurization would occur in time to prevent core damage whether or not high pressure injection is successful. This conclusion was verified through use of the Modular Accident Analysis Program. Therefore, sequence number 55 is not a core damage sequence.