May 11, 2005

MEMORANDUM TO: Ledyard B. Marsh, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Charles E. Ader, Director */RA/*
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

SUBJECT: TRANSMITTAL OF SUMMARIES OF FINAL ASP ANALYSES

This memorandum provides the results of five Accident Sequence Precursor (ASP) analyses of operational events or conditions which occurred at various plants during the fiscal year 2003. These are being issued as final analyses since they are non-controversial, lower risk precursors for which the ASP results are consistent with the results from the Significance Determination Process's (SDP's) final evaluation of the same condition. Elimination of the review and comment resolution cycle for these events will reduce the burden for the NRC staff and the licensee.

Transmittal to licensees requested. We are requesting NRR/DLPM to send the final ASP analyses to the appropriate licensees for information. Each analysis and a transmittal letter will be provided separately to the NRR ASP Program liaison (Donna Skay).

Final ASP analyses to be transmitted. Attachment 1 summarizes the final analyses of the following events and conditions:

- Loss of shutdown cooling and Emergency Diesel Generator start at Palisades on March 25, 2003 (LER 255/03-003). The ASP analysis calculated a mean conditional core damage probability (CCDP) of 3.0×10^{-6}.

- Degraded piping in Reactor Building Closed Loop Cooling System at Nine Mile Point 1 on March 7, 2003. (NRC Special Inspection Report 220/03-003). The ASP analysis calculated a delta core damage probability (ΔCDP) of 4.2×10^{-6}.

- Station Service Water (SSW) Train A Traveling Screen failed due to inadequate maintenance instructions at Hope Creek in July 2003 (IR 354/2003-006). The ASP analysis calculated a mean ΔCDP of 3.9×10^{-6}.

- Failure of Emergency Diesel Generator A fuel oil line at Waterford in September 2003 (LER 382/03-002). The ASP analysis calculated a ΔCDP of 2×10^{-6}.

- ESW A pump failed to run due to shaft failure, and inadequate repairs led to a second failure at Perry in September 5, 2003, and May 22, 2004 (LER 440/03-004). The ASP analysis calculated a mean ΔCDP of 1.2×10^{-6}.

Sensitive information. Previously, the detailed ASP analyses were classified as "SENSITIVE - NOT FOR PUBLIC DISCLOSURE" based on the guidance provided by the EDO in the memorandum to the Commission (dated April 4, 2002), concerning the release of information to the public that could provide significant assistance to support an act of terrorism. More recent guidance found in SECY-04-0191, allows the uncontrolled release of ASP analyses that do not contain information related to uncorrected configurations or conditions that could be useful to an adversary. The detailed ASP analyses in the Attachment 1 has been reviewed according to SECY-04-0191 and it was determined that they can be released to the public.

If you have any questions about the individual analysis, please contact the reviewer for that analysis. For questions concerning the transmittal letter or the ASP Program, please call Gary DeMoss (415-6225).

Attachment: Summaries of Final ASP Analyses

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Attachment: Summaries of Final ASP Analyses

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MEMORANDUM DATED: 05/11/05

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Attachment 1

SUMMARIES OF FINAL ASP ANALYSES

Loss of Shutdown Cooling and Emergency Diesel Generator Start at Palisades (March 2003.) This is the ASP analysis of operational conditions documented in LER 255/03-003, dated 20 May, 2003, and Inspection Report 05000255/2004005, dated 8 April, 2004.

Condition summary: On March 25, 2003, plant maintenance workers were installing signposts in the parking lot to designate parking spaces. One of the signposts was driven into a conduit and damaged a cable which contained protective relay circuitry for all sources of offsite power. An Alert was declared due to the loss of offsite power combined with the loss of shutdown cooling. The Alert was downgraded to an Unusual Event after about 1 hour when shutdown cooling was restored.

The reported event, loss of offsite power, occurred during a refueling outage, when the reactor vessel head was open, and the cavity was flooded. The decay heat was being removed by decay heat removal (DHR) system. The event caused temporary disconnection of the AC power from the grid (switchyard power disconnect event) which stopped the running DHR train and auto-started emergency diesel generators.

Results: The mean conditional core damage probability (CCDP) of this event is calculated as 3×10^{-6} with 5% and 95% uncertainty bounds of 3×10^{-7} and 8×10^{-6}, respectively. This relatively low CCDP is due to factors such as ease of proceduralized recovery of AC power to the buses if the diesel generators did not start; long time window for core damage to occur, and various credible (but not proceduralized) recovery processes available if the DHR system did not restart. One insight that can be derived from this analysis is to proceduralize backup processes in case the normal DHR system fails during shutdown operations

SDP/ASP comparison. The risk significance of this event has also been analyzed under the Significance Determination Process (SDP). The result was a white finding with a delta CDF of 1×10^{-6}. Thus, the ASP and SDP results are consistent.

A sensitivity analysis made as part of the ASP analysis to determine the CCDP if this event had occurred during power operation, shows that the event importance could have been as high as 4×10^{-5}, even when credit is given for easy AC power recovery operator action in this particular case.

The ASP analysis can be found at ML051190504. If you have any questions about the analysis, please contact Selim Sancaktar (415-8184).

Degraded Piping in Reactor Building Closed Loop Cooling System At Nine Mile Point Unit 1 (March 2003) This condition is documented in Inspection Report 50-220/03-003 dated 23 May, 2003.

Condition summary: From February 10, 2003, to March 7, 2003, the NRC conducted a special inspection of the Nine Mile Point Nuclear Station - Unit 1, with regard to degraded piping in the reactor building closed loop cooling (RBCLC) system. This special inspection followed three shutdowns from power operation to repair leaks in the RBCLC system within an 8-month period. The shutdowns for piping repair occurred as follows:

May 14-19, 2002	Repaired two RBCLC leaks
Dec 5-11, 2002	Repaired one RBCLC leak
Dec 13-24, 2002	Repaired one RBCLC leak

The loss of the RBCLC system would result in the loss of cooling to several other systems and their subsequent failure. Major components supplied by the RBCLC system include the instrument air compressors (2 out of 3), the high- pressure injection system (i.e., feedwater pumps, feedwater booster pumps, and condensate pumps), control room air conditioning equipment, shutdown cooling heat exchangers, reactor recirculation pump coolers, drywell air coolers, reactor building equipment drain tank cooler, and fuel pool heat exchangers.

The NRC special inspection team determined that degraded piping in the RBCLC system was extensive. During the numerous repairs of piping during shutdowns, the licensee had discovered notable and widespread wall thinning in RBCLC piping sections, which were most severe at threaded mechanical connections. The special inspection team concluded that the initiating event frequency for a loss of RBCLC had been increased over its nominal value and that other initiating events [loss-of-coolant accidents (LOCAs) and loss of all electrical ac power], if they occurred, would induce piping failures in the RBCLC system. The NRC special inspection team's review of the events determined that the root and contributing causes for the degraded piping included inadequate system design, inadequate corrective actions, and degraded RBCLC system water chemistry.

Results: The ASP analysis of this condition resulted in a delta core damage probability (ΔCDP) of 4.2×10^{-6}. Since the ASP program acceptance threshold is 1×10^{-6}, this condition is classified as a precursor.

SDP/ASP comparison: The risk significance of this condition has also been analyzed under the SDP. The SDP result which also took into account the seismic initiating event, was a white finding with a ΔCDP of 5.4×10^{-6}. Thus, the ASP and SDP results are consistent.

The ASP analysis can be found at ML051190518. If you have any questions about the analysis, please contact Selim Sancaktar (415-8184).

Station Service Water (SSW) Train A Traveling Screen Failed Due to Inadequate Maintenance Instructions at Hope Creek (July 2003). This condition is documented in Inspection Report 354/2003-006 dated April 20, 2004.

Condition summary. On July 1, 2003, with the plant in full power operation, the Station Service Water (SSW) system Train A traveling screen failed as a result of actions during prior maintenance action. The maintenance procedure for the SSW system traveling screens did not include appropriate quantitative acceptance criteria to ensure that the traveling screen head-shaft key was installed correctly.

Results: This operating condition resulted in mean ΔCDP of 3.9×10^{-6} with 5% and 95% uncertainty bounds of 1.8×10^{-7} and 1.3×10^{-5}, respectively.

SDP/ASP comparison. The result of the SDP analysis was a white finding, which estimated an increase in core damage frequency of 1.14×10^{-6}. Thus, the results from the SDP and ASP evaluations are consistent.

The ASP analysis can be found at ML051190633. If you have any questions about the analysis, please contact Erul Chelliah (415-6186)

Failure of Emergency Diesel Generator A Fuel Oil Line at Waterford (September 2003). This event is documented in LER 382/03-002, with an event date of 29 September, 2003.

Condition summary. On September 29, 2003 at about 1020 hours with the plant in Mode 1 (approximately 90% power and coasting down for Refueling), Emergency Diesel Generator (EDG) 'A' was started to perform the monthly surveillance run in accordance with station operating procedures. At approximately 1309 hours with EDG 'A' running loaded, the left/right bank cross connect fuel oil tubing failed rendering the engine inoperable. Although, EDG 'A' testing surveillances were successfully completed prior to September 29, 2003, there is firm evidence that after the last successful surveillance on September 2, 2003 EDG 'A' may not have been able to complete a mission run time of 24 hours.

Results: The ASP analysis calculated a ΔCDP of 2×10^{-6} . Since the ASP program acceptance threshold is 1×10^{-6}, this condition is a precursor.

SDP/ASP comparison. The result of the SDP analysis was a white finding. The SDP Phase 3 assessment estimated an increase in core damage frequency of 5.2×10^{-6} . Thus, the results from the SDP and ASP evaluations are consistent.

The ASP analysis can be found at ML051190648. If you have any questions about the analysis, please contact Gary DeMoss (415-6225)

ESW A Pump Failed to Run Due to Shaft Failure, and Inadequate Repairs led to a Second Failure at Perry (September 5, 2003, and May 22, 2004) This event was documented in licensee event report (LER) 440/03-004-01, event date September 5, 2003 and Inspection Report 50-440/03-006, dated October 30, 2003.

Condition summary. On September 1, 2003, with the plant at 100% of rated thermal power, the Emergency Service Water (ESW) A pump was started but failed to run after 42 minutes, resulting in loss of flow to its loads. The control room staff observed all ESW A flow indications for Residual Heat Removal A, Emergency Core Cooling A, and Division 1 Emergency Diesel Generator A at zero gallons per minute. This same failure event for the ESW A pump again occurred on May 22, 2004. The ASP analysis evaluated the ESW A pump failure event for a period of 551 hours over a one year period.

Results: This condition resulted in a mean ΔCDP of 1.2×10^{-6} with 5% and 95% uncertainty bound of 1.4×10^{-7} and 3.4×10^{-6}, respectively.

SDP/ASP comparison. The result of the SDP analysis was a white finding. The SDP Phase 3 assessment estimated an increase in core damage frequency of 2×10^{-6}. Thus the results from the SDP and ASP evaluations are consistent.

The ASP analysis can be found at ML051190665. If you have any questions about the analysis, please contact Erul Chelliah (415-6186).