

July 7, 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 four Accident Sequence Precursor (ASP) analyses of operational events or conditions which occurred at various plants during the fiscal years 2003 and 2004. The events at Oyster Creek, Brunswick 2, and Surry Units 1 & 2 are being issued as final analyses since they are non-controversial, lower risk precursors for which the ASP results are consistent with final evaluation results from the Significance Determination Process (SDP). Elimination of the review and comment resolution cycle for these events will reduce the burden for the NRC staff and the licensees. The Palo Verde event is being issued as a final analysis since the internal and external peer review comments are incorporated.

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:

- C Loss of 4.16 kV Emergency Bus "1C" due to ground fault in a normally energized underground cable at Oyster Creek on May 20, 2003 (LER 219/03-002). The ASP analysis calculated an increase in core damage probability (Δ CDP) of 1.4×10^{-6} .
- C Emergency Diesel Generator No. 3 condition prohibited by the Technical Specifications at Brunswick 2 on January 4, 2004 (LER 325/04-001). The ASP analysis calculated a Δ CDP of 2.3×10^{-6} .
- C Unanalyzed condition related to loss of RCP seal cooling during an Appendix R fire event at Surry Units 1 & 2 on November 3, 2003 (LER 280/03-005). The ASP analysis calculated a Δ CDP of 1×10^{-6} .
- C Loss of offsite power to all three units and failure of a Unit 2 Emergency Diesel Generator at Palo Verde Units 1, 2, & 3 on June 14, 2004 (IR 50-528/04-012). The ASP analyses calculated conditional core damage probabilities (CCDPs) for this event were 4×10^{-5} (Unit 2) and 9×10^{-6} (Units 1 & 3).

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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SUMMARIES OF FINAL ASP ANALYSES

Loss of 4.16 kV Emergency Bus “1C” due to ground fault in a normally energized underground cable at Oyster Creek (May 2003) This condition is documented in LER 219/03-002, dated May 20, 2003 and Inspection Report 50-255/04-05, dated April 8, 2004.

Condition summary: On May 20, 2003, with the plant operating at 100%, the emergency bus 1C normal supply breaker tripped and locked out, de-energizing the bus. Subsequent investigation by AmerGen determined that the breaker trip was due to a ground fault in one of the cables that connect the “1C” bus to the associated, No. 1 EDG output breaker. The loss of bus “1C” resulted in the loss of certain system components required for normal operation and accident mitigation. The loss of one of two emergency buses also led to a Technical Specification required shutdown of the plant. This was achieved via a controlled down-power and a manual scram at 9:43 a.m., approximately 9 hours after the event. Cold shutdown was achieved at 7:13 p.m. of the same day.

Results: The ASP analysis of this condition resulted in an increase core damage probability (Δ CDP) of 1.4×10^{-6} , which covers both at-power and shutdown conditions. 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 event has also been analyzed under the Significance Determination Process (SDP). The result was a WHITE finding, which estimated an increase in core damage frequency of 1.14×10^{-6} . Thus, the ASP and SDP results are consistent.

The ASP analysis can be found at ML051790372. If you have any questions about the analysis, please contact Selim Sancaktar (415-8184).

Emergency Diesel Generator No. 3 condition prohibited by the Technical Specifications at Brunswick 2 (January 2004). This condition is documented in LER 325/04-001 dated March 4, 2004.

Condition summary: During a monthly surveillance test and maintenance on EDG turbo charger #3 on January 4, 2004, when Brunswick Steam Electric Plant, Unit 2 was at power, a jacket water cooling system piping leak with an estimated flow rate of one gallon per minute was identified by the licensee. The licensee determined that the volume of the identified leak rendered EDG #3 inoperable due to insufficient jacket water cooling. The licensee corrected the EDG #3 inoperability problem on January 7, 2004 and declared it to be operable.

Results: The ASP analysis of this condition resulted in a mean increase core damage probability (Δ CDP) of 2.1×10^{-6} with 5% and 95% uncertainty bounds of 1.2×10^{-7} and 8.0×10^{-6} , respectively. 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 was a WHITE finding, which estimated an increase in core damage frequency of 1.1×10^{-6} . Thus, the ASP and SDP results are consistent.

The ASP analysis can be found at ML051790348. If you have any questions about the analysis, please contact Erul Chelliah (415-6186).

Unanalyzed condition related to loss of RCP seal cooling during an Appendix R fire event at Surry Units 1 & 2 (November 2003) . This condition is documented in LER 280/03-005 dated December 17, 2003 and Inspection Report 50-280/03-07 and 50-281/03-07 dated September 15, 2004.

Condition summary: During the fire protection inspection conducted January 24–31, 2003 and February 10–14, 2003, the NRC inspectors determined that the licensee’s fire response procedures were not effective in assuring a safe shutdown of Unit 1 or Unit 2 during a severe fire in emergency switch gear and relay rooms No. 1 or No. 2. These procedures may not preclude an extended loss of reactor coolant pump seal injection flow and may initiate a reactor coolant pump seal loss of coolant accident which could result in pressurizer level failing to be maintained within the indicating range as required by 10 CFR 50, Appendix R.

Results: This operating condition resulted in a mean Δ CDP of 1×10^{-6} . Since the ASP program acceptance threshold is 1×10^{-6} , this condition is classified as a precursor.

SDP/ASP comparison: The result of the SDP analysis was a WHITE finding, which estimated an increase in core damage frequency of 2.3×10^{-6} . Thus, the results from the SDP and ASP evaluations are consistent.

The ASP analysis can be found at ML051790376. If you have any questions about the analysis, please contact Selim Sancaktar (415-8184).

Loss of offsite power to all three units and failure of a Unit 2 Emergency Diesel Generator at Palo Verde Units 1, 2, & 3 (June 2004). This event is documented in Inspection Report 50-528/04-012 dated July 16, 2004.

Condition summary: On June 14, 2004, at approximately 7:41 a.m. MST, a ground-fault occurred on Phase ‘C’ of a 230 kV transmission line in northwest Phoenix, Arizona, between the ‘West Wing’ and ‘Liberty’ substations located approximately 47 miles from the Palo Verde Nuclear Generating Station (PVNGS). A failure in the protective relaying resulted in the ground fault not isolating from the local grid for approximately 38 seconds. This uninterrupted fault cascaded into the protective tripping of a number of 230 kV and 500 kV transmission lines, a nearly concurrent trip of all three PVNGS units and the loss of six additional generation units nearby within approximately 30 seconds of fault initiation. All three units were safely shutdown and stabilized under hot shutdown conditions. However, two complications were experienced during event: (1) the Unit 2 emergency diesel generator (EDG) ‘A’ failed to load and (2) two breakers failed to close during recovering offsite power to Units 1 and 3.

Results: The ASP analysis of this condition resulted in conditional core damage probabilities (CCDPs) of 4×10^{-5} for Unit 2 and 9×10^{-6} for Units 1 & 3. Since the ASP program acceptance threshold is 1×10^{-6} , this condition is classified as a precursor. The failure of a Unit 2 EDG is the reason for difference in CCDPs of Unit 1 & 3 with CCDP of Unit 2.

SDP/ASP comparison: The Significance Determination Process (SDP) is not used to evaluate initiating events. However, a risk estimate for this event was calculated by the Augmented Inspection Team (AIT). The final conditional core damage probabilities (CCDPs) for this event were 4×10^{-5} (Unit 2) and 9×10^{-6} (Units 1 & 3). The Office of Nuclear Regulatory Research (RES) worked with the AIT and used the same assumptions and modeling techniques. Therefore the Accident Sequence Precursor (ASP) analysis resulted in the same CCDPs.

Comments: NRR/DSSA and Region IV comments addressed in the analysis. The licensee chose not to comment.

The ASP analysis can be found at ML051790379. If you have any questions about the analysis, please contact Chris Hunter (415-4127).