

September 14, 2004

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 FINAL ASP ANALYSES

This memorandum provides the results of six Accident Sequence Precursor (ASP) analyses of operational events or conditions which occurred at various plants during fiscal years 2001, 2002, and 2003. These are being issued as final analyses.

As stated in SECY-03-0049 (dated 31 March 2003), there have been delays in issuing these analyses due to the ASP program's focus on several more complex and potentially risk important events. We have developed, and are currently implementing, a plan for the completion of the backlog of ASP analyses. Consistent with our plan, ASP analyses will be issued as final for 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. We have discussed these analyses with staff from NRR and the Regions and have incorporated their comments.

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 (Roy Mathew).

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

- Potential common mode failure of all auxiliary feedwater pumps at Point Beach 1, 2 in October 2002 (LER 266/02-003). The ASP analysis calculated a mean change in core damage probability (Δ CDP) of 6.0×10^{-5} for Unit 1 and 3.6×10^{-4} for Unit 2.
- The essential service water pump and the auxiliary feedwater pumps were inoperable at Callaway in December 2001 (LER 483/02-001). The ASP analysis calculated a mean Δ CDP of 1.2×10^{-5} .
- Unreliable breakers for four safety-related systems at Columbia Generating Station in February 2002. (LER 397/02-001). The ASP analysis calculated a mean Δ CDP of 6.1×10^{-6} .

- Inoperable power-operated relief valve bleed path at Braidwood 1 in April 2002 (LER 456/02-002-001). The ASP analysis calculated a mean Δ CDP of 4×10^{-6} .
- Failure to provide fixed fire suppression in a fire area which could result in an auxiliary feedwater pump lube oil fire at Kewaunee in October 2002 (Inspection Report 50-305/02-06) The ASP analysis determined the Δ CDP to be 1×10^{-5} .
- Inoperable swing emergency diesel generator at Surry 1 & 2 in April 2001. (LER 280/01-001) The ASP analyses determined for Unit 1 a Δ CDP of 3.0×10^{-6} , and for Unit 2 a Δ CDP of 6.0×10^{-6} .

Sensitive information. The detailed ASP analyses are classified as “SENSITIVE - NOT FOR PUBLIC DISCLOSURE.” This classification is based on the guidance provided by the EDO in the memorandum to the Commission (dated 4 April 2002), concerning the release of information to the public that could provide significant assistance to support an act of terrorism. In particular, Criteria 1 was determined to be applied to ASP analysis reports:

Plant-specific information, generated by NRC, our licensees, or our contractors, that would clearly aid in planning an assault on a facility. An example might be drawings depicting the location of certain safety equipment within plant buildings. Examples may include portions of Final Safety Analysis Reports (FSARs), Individual Plant Examination (IPE) material, and other risk and facility vulnerability information.

This classification could change in the future based on revised Agency guidance and office (NRR and RES) procedures in response to the Staff Requirements Memorandum, “Staff Requirements - COMSECY-02-0015 - Withholding Sensitive Homeland Security Information From the Public,” dated 4 April 2002. Future changes in the transmittal of ASP analyses will be coordinated with the NRR ASP Program liaison. Attachment 1 is provided to summarize the ASP analyses without disclosing any plant-specific risk and facility vulnerability information. The detailed ASP analyses, referenced in the Attachment, are sensitive and cannot be released to the public.

If you have any questions about the individual analyses, 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

- Inoperable power-operated relief valve bleed path at Braidwood 1 in April 2002 (LER 456/02-002-001). The ASP analysis calculated a mean Δ CDP of 4×10^{-6} .
- Failure to provide fixed fire suppression in a fire area which could result in an auxiliary feedwater pump lube oil fire at Kewaunee in October 2002 (Inspection Report 50-305/02-06) The ASP analysis determined the Δ CDP to be 1×10^{-5} .
- Inoperable swing emergency diesel generator at Surry 1 & 2 in April 2001. (LER 280/01-001) The ASP analyses determined for Unit 1 a Δ CDP of 3.0×10^{-6} , and for Unit 2 a Δ CDP of 6.0×10^{-6} .

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Attachment:
Summaries of Final ASP Analyses

***See previous concurrence**

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SUBJECT: TRANSMITTAL OF FINAL ASP ANALYSES

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SUMMARIES OF FINAL ASP ANALYSES

Potential Common Mode Failure of All Auxiliary Feedwater Pumps Due to Clogging of Recirculation Orifices, Point Beach 1 & 2 (October 2002) The condition was reported by LER 266/02-003, dated 22 October 2002, and documented in NRC Inspection Report No. 50-266/02-015 and 50-301/02-015, dated 2 April 2003.

Condition summary: This condition assessment evaluates a design deficiency involving the flow-restricting orifices in the auxiliary feedwater (AFW) pumps' recirculation lines. Due to a design deficiency, the orifices are vulnerable to debris plugging when the AFW pumps' suction supply is switched to its safety-related water supply, the service water system. Blocked flow in the AFW pumps' recirculation lines, combined with inadequacies in plant emergency operating procedures, could potentially lead to pump deadhead conditions and a common mode, nonrecoverable, failure of the pumps.

Results: The results of the final analysis indicate that this condition is a precursor with an increase in core damage probability (ΔCDP) of 6.0×10^{-5} for Unit 1 and 3.6×10^{-4} for Unit 2.

SDP/ASP comparison: The risk significance associated with this condition was a YELLOW finding under the significance determination process (SDP) for Unit 1 and a RED finding for Unit 2. The quantitative results and the dominant contributors of the ASP analysis are similar to those in the SDP analysis.

The ASP analysis can be found at ML042360145. If you have any questions about the analysis, please contact Eli Goldfeiz (415-5539).

Foreign object renders the B essential service water pump inoperable and failure of the auxiliary feedwater pump due to foreign material in the condensate tank at Callaway. (December 2001) This is the ASP analysis of operational conditions documented in LER 483/02-001, dated 3 December 2001, LER 483/01-002, dated 14 February 2001, and Inspection Report 50-483/01-06, dated 16 January 2002.

Condition summary: During 2001, two conditions occurred at the Callaway nuclear power plant involving foreign material that affected safety-related equipment. In February 2001, a foreign object (tygon tubing) rendered the essential service water (ESW) pump inoperable for 132 hours. In December 2001, foreign material from the condensate storage tank (CST) caused failure of the motor-driven AFW pump. The condition, a degraded floating diaphragm in the CST, had existed for a period exceeding one year. Additionally, a component cooling water (CCW) pump was inoperable for 21 days due to improper maintenance. Because the time period for the AFW pump event envelopes the ESW pump event, as well as a CCW pump event, a single assessment was performed for all three conditions. In addition, for comparison with the SDP results for single events, separate analyses were performed for these three conditions.

Results: The point estimate increase in the Δ CDP for the integrated events (AFW, ESW, and CCW) was 1.2×10^{-5} . Since the ASP program acceptance threshold is 1×10^{-6} , this condition is a precursor. For the AFW pump event only, the Δ CDP was 6.5×10^{-6} . For the ESW pump event only the Δ CDP was 4.0×10^{-6} . And, for the CCW pump event only the Δ CDP was 1.6×10^{-7} .

SDP/ASP comparison. The result of the SDP analysis was a WHITE finding for the AFW pump event and for the ESW pump event, when analyzed separately. The SDP finding for the CCW pump event was GREEN. The results for the three separate ASP analyses were similar to the SDP analysis results.

The ASP analysis can be found at ML042360162. If you have any questions about the analysis, please contact Gary DeMoss (415-6225).

Unreliable Breakers for four safety-related systems at Columbia Generating Station (February 2002) This condition is documented in LER 397/02-001, with an event date of 14 February 2002.

Condition summary: The licensee replaced 16 circuit breakers that had an active safety function to reposition and remain in the closed position on demand. The existing circuit breakers were equipped with a mechanism operated cell (MOC) switch that was retained when the replacement was made. However, the MOC switches were not recalibrated, resulting in intermittent failure to assure a full closure of the new circuit breaker upon demand (failure-to-close). This condition affected the circuit breakers of four safe shutdown systems (Emergency Diesel Generator output breakers, Standby Service Water system pump breakers, Residual Heat Removal system pump breakers, and Low Pressure Core Spray system pump breaker) for a duration of approximately 7 months (5216 hours).

Results: The ASP analysis of this condition resulted in a mean Δ CDP of 6.1×10^{-6} . Since the ASP program acceptance threshold is 1×10^{-6} , this condition is a precursor.

SDP/ASP comparison: The risk significance associated with these conditions have been analyzed under the SDP as well. The SDP phase 3 analysis determined that the increase in the combined internal and external events core damage frequency (CDF), using the seismic frequency surrogate method for external events, was between a lower bound of 1.33×10^{-6} per year and an upper bound of 3.16×10^{-6} per year, resulting in a WHITE finding. For the internal events portion, the SDP accepted the licensee's PRA model that calculated a CDF increase of approximately 1.24×10^{-6} per year.

The ASP analysis can be found at ML042360175. If you have any questions about the analysis, please contact Erul Chelliah (415-6186).

Inoperable PORV Bleed Path Due to Leaking Accumulator Check Valves at Braidwood 1 (April 2002) This condition is documented in LER 456/02-002-001, with an event date of 16 April 2002.

Condition Summary: This condition involved four leaking instrument air accumulator check valves. There are two check valves associated with each accumulator, and a single accumulator associated with each of the two Pressurizer pilot operated relief valves (PORVs). These four check valves would have been incapable of maintaining instrument air pressure in the PORV instrument air accumulators, in the event of a loss of instrument air to the containment. This condition, which would have rendered the PORVs inoperable in the fail to open mode, existed for one year.

Results: This condition assessment resulted in an increase in ΔCDP of 4×10^{-6} for Braidwood 1. Since the ASP program acceptance threshold is 1×10^{-6} , this condition is a precursor.

SDP/ASP Comparison: The risk significance associated with the above operating condition has been analyzed under the SDP for Braidwood. The Phase 3 SDP evaluation estimated a ΔCDF of 7×10^{-6} for internal events. This is consistent with the ASP results.

The ASP analysis can be found at ML042360186. If you have any questions about the analysis, please contact Erul Chelliah (415-6186).

Failure to provide a fixed fire suppression system in a fire area which could result in an Auxiliary Feedwater Pump lube oil fire at Kewaunee (October 2002). This condition is documented in Inspection Report 50-305/02-06, with an inspection date of 30 October 2002.

Condition Summary: Inspection report 50-305/02-06 described the failure to provide a fixed fire suppression system in fire area TU-95B which could result in a postulated fire that would originate in the motor-driven auxiliary feedwater pump B (AFWMDPB) and rapidly propagate throughout the fire area causing loss of control cables in both safe shutdown trains. The turbine-driven auxiliary feedwater pump C (AFWTDPC) cable would also be affected by the postulated fire, causing loss of function, with no recovery.

Results: The ASP analysis performed a condition assessment which resulted in a ΔCDP of 1.0×10^{-5} . Since the ASP program acceptance threshold is 1×10^{-6} , this condition is a precursor.

SDP/ASP comparison: The SDP results and the final ASP results were similar. The SDP analysis indicated a ΔCDF of 9.75×10^{-6} per year, with a resulting WHITE finding. The ASP analysis reflects the incorporation of comments provided by NRR reviewers on the draft issue of this analysis.

The ASP analysis can be found at ML042360193. If you have any questions about the analysis, please contact Gary DeMoss (415-6225).

Inoperable Swing Emergency Diesel Generator at Surry 1, 2 (April 2001). This event was documented in licensee event report (LER) 280/01-001, event date 23 April 2001.

Condition Summary: On 23 April 2001, the number 3 emergency diesel generator (#3 EDG) lube oil sampling showed an increase in silver content and the EDG was taken out of service. An inspection of the EDG found three cylinders with excessive wear on the piston wrist pin and

wrist pin bearing. At the time of discovery, both units were in mode 1 with reactors at 100% power. Subsequent investigation into the cause concluded that it was unlikely that the EDG could have operated for its 24 hour mission time. The ASP analysis performed a condition assessment for a condition duration of 201 days.

Results: The Unit 1 point estimate importance is an increase of 3×10^{-6} over the nominal CDP for the 201 days when the EDG was not available. The Unit 2 point estimate importance is an increase of 6×10^{-6} over the nominal CDP for the 201 days when the EDG was not available. The Unit 2 Δ CDP is greater than that for Unit 1 because the station blackout diesel does not back up the #3 EDG for safety bus 2J. Since the ASP program acceptance threshold is 1×10^{-6} , this condition is a precursor.

SDP/ASP Comparison: The results of the SDP analysis were similar to those in the ASP analysis. The result of the SDP analysis was a WHITE finding for each unit, with an estimated increase in core damage frequency from internal events of 5×10^{-6} . The ASP analysis reflects the incorporation of comments provided by NRR reviewers on the draft issue of this analysis.

The ASP analysis can be found at ML042360199. If you have any questions about the analysis, please contact Eli Goldfeiz (415-5539).

