UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 26, 2013

Mr. David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2 - FINAL ACCIDENT SEQUENCE PRECURSOR ANALYSIS RESULTS (TAC NOS. ME9802 AND ME9803)

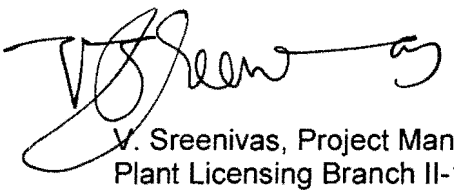
Dear Mr. Heacock:

The enclosure provides the final results of an Accident Sequence Precursor (ASP) analysis of a seismic operational events that occurred at North Anna Power Station, Unit Nos. 1 and 2 on August 23, 2011, as documented in the licensee's event reports 338/11-003, 339/11-001 and inspection reports 50-338/11-11, 50-339/12-10.

The U.S. Nuclear Regulatory Commission (NRC) established the ASP Program in 1979 in response to the Risk Assessment Review Group Report (see NUREG/CR-0400, dated September 1978). The ASP Program systematically evaluates U.S. nuclear power plant operating experience to identify, document, and rank the operating events most likely to lead to inadequate core cooling and severe core damage (precursors). As described in the NRC Regulatory Issue Summary (RIS) 2006-24, "Revised Review and Transmittal Process for Accident Sequence Precursor Analyses," the Office of Nuclear Regulatory Research implemented several process changes to the ASP Program. In accordance with the RIS, this event has a conditional core damage probability greater than or equal to 1×10^{-4}; therefore, a formal licensee review was requested. The final analysis was prepared based on the NRC staff's review and evaluation of your comments on the preliminary analysis.

The enclosure containing the final analysis report is being provided for your information. If you have any questions, please contact me at (301) 415-2597.

Sincerely,



V. Sreenivas, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure:
Final Precursor Analysis Summary

cc w/ encl: Distribution via Listserv

ASP Analysis

Accident Sequence Precursor Program – Office of Nuclear Regulatory Research

North Anna, Units 1 & 2	Earthquake Causes Reactor Trip with a Loss of Offsite Power and Subsequent Failure of a Unit 2 Emergency Diesel Generator	
Event Date: 08/23/2011	**LERs:** 338/11-003, 339/11-001 **IRs:** 50-338/11-11, 50-339/12-10	**Unit 1 CCDP =** 2×10^{-4} **Unit 2 CCDP =** 4×10^{-5}

EVENT SUMMARY

Brief Event Description. On August 23, 2011, at 1:51 p.m., the site experienced a Magnitude 5.8 earthquake on the Richter scale with an epicenter approximately 11 miles southwest of the plant.[1] Both reactor trip breakers opened on negative flux rate approximately 11 seconds after the event. Sudden pressure relay actuations were experienced on the reserve station service transformers (RSSTs) approximately 12 seconds after the event, leading to a loss of offsite power (LOOP) event. Approximately 20 seconds after the event, all four emergency diesel generators (EDGs) and the station blackout (SBO) diesel generator started automatically. The four EDGs automatically aligned to their respective safety bus. At 2:40 p.m., EDG 2H was tripped in the control room due to a coolant leak. Approximately 38 minutes later, the SBO diesel generator was aligned to Bus 2H. At 10:58 p.m., offsite power was restored to the four safety buses. Both units were safely shutdown and stabilized under hot shutdown conditions.

Additional information is provided in References 1–5.

Key Event Details. The following event details are significant to the modeling of this event analysis:

- The earthquake led to a reactor trip and LOOP event.
- Approximately 49 minutes after the LOOP occurred, EDG 2H was tripped due to coolant leak. The SBO diesel generator was manually aligned to Safety Bus 2H. The gasket was replaced, the leak repaired, and EDG 2H was declared operable following post maintenance testing at 2311 hours on August 25, 2011.
- Offsite power was restored to all four safety buses approximately 9 hours after the LOOP occurred.
- The Unit 1 turbine-driven auxiliary feedwater (TDAFW) pump was undergoing surveillance testing when the Unit 1 reactor trip occurred. Approximately 33 minutes later, the TDAFW pump was manually realigned and capable of injecting water into Steam Generator (SG) A.

[1] The earthquake exceeded (on average) the North Anna Design Bases Earthquake (DBE) spectral accelerations in the more damaging frequency range of 2–10 hertz by about 12% in one horizontal orientation and 21% in the vertical orientation. The North Anna DBE ground spectra for rock and soil founded structures are anchored to 0.12g and 0.18g peak ground accelerations (PGA) respectively in the horizontal direction (Reference 1).

- The earthquake did not damage any of structures, systems, and/or components (SSCs). However, there was an increased failure potential of SSCs due to the earthquake occurrence.

ANALYSIS RESULTS

Conditional Core Damage Probability. The calculated conditional core damage probability (CCDP) for Units 1 and 2 are 2.1×10^{-4} and 4.1×10^{-5}, respectively.

The Accident Sequence Precursor (ASP) Program acceptance threshold is a CCDP of 1×10^{-6} or the CCDP equivalent of an uncomplicated reactor trip with a non-recoverable loss of secondary plant systems (e.g., feedwater and condensate), whichever is greater. This CCDP equivalent for North Anna Units 1 and 2 is 7×10^{-7}.

Dominant Sequence. The dominant accident sequence, Loss of Offsite Power Switchyard Related (LOOPSC) Sequence 17-69 contributes 85% (Unit 1) and 65% (Unit 2) of the total seismic induced LOOP event CCDP. Additional sequences that contribute greater than 1% of the total internal events CCDP are provided in Appendix A.

The dominant sequence is shown graphically in Figures B-1 and B-2 in Appendix B. The events and important component failures in LOOPSC Sequence 17-69 are:

- Switchyard-related LOOP occurs,
- Reactor scram succeeds,
- Emergency power fails,
- SBO diesel generator was connected to Bus 2H,
- Auxiliary feedwater (AFW) fails,
- Operators fail to restore offsite power within 1 hour, and
- Operators fail to recover an EDG within 1 hour.

Analysis Results. Appendix A includes tables that provide the following:

- Summary of conditional event changes, including base and change case probabilities/ frequencies.
- Event tree dominant results.
- Dominant sequences (including CCDPs).
- Sequence logic for all dominant sequences.
- Referenced fault trees (including definitions).
- Cutset report for each dominant sequence.

MODELING ASSUMPTIONS

Analysis Type. The Revision 8.17 of the North Anna SPAR model was used for the analysis of this initiating event.

Analysis Rules. The ASP program uses Significance Determination Process (SDP) results for degraded conditions when available. A licensee performance deficiency (PD) was identified in connection with coolant leak of EDG 2H. The PD involves the licensee failure to establish and maintain adequate maintenance procedures for the EDGs. Specifically, the procedure for installation of the jacket water cooling inlet jumper gasket did not provide adequate guidance,

which resulted in the failure of the EDG 2H to perform its safety function on August 23, 2011. The SDP assessment of risk of this PD was finalized on May 11, 2012 (Reference 5); resulting in a WHITE finding (i.e., low-to-moderate safety significance). However, the ASP Program performs independent analysis for events involving reactor trips. In addition, any SSC that was determined to be degraded, failed, or unavailable due to test/maintenance during the event is factored into the ASP initiating event analysis (regardless of whether the failures or degradations are due to licensee PD).

Modeling Assumptions. The following key modeling assumptions and parameter estimations were made for this initiating event analysis:

Unit 1

- The event was modeled as a dual-unit, switchyard-related LOOP.
  - The probability of IE-LOOPSC *(Loss of Offsite Power Switchyard-Related Initiating Event)* was set to 1.0; all other initiating event frequencies were set to zero.
  - Basic Events DUAL-UNIT-LOOP (*Probability that a LOOP is a Dual Unit LOOP*) and OEP-VCF-LP-SITESC (*Site LOOP– Switchyard-Related)* were set to TRUE.

- The offsite power could not be recovered within three hours.[2]
  - Basic Events OEP-XHE-XL-NR01HSC (*Operator Fails to Recover Offsite Power in 1 Hour*), OEP-XHE-XL-NR02HSC (*Operator Fails to Recover Offsite Power in 2 Hours*), and OEP-XHE-XL-NR03HSC (*Operator Fails to Recover Offsite Power in 3 Hours*) were set to TRUE.

- Sequence-specific HRA calculations were performed (see Appendix C):
  - Basic event OEP-XHE-XL-NR04HSC (*Operator Fails to Recover Offsite Power in 4 Hours*) was set to 5×10^{-3}.
  - Basic event DCP-XHE-XA-STRIP (*Operators Fail to Strip DC Loads in 1 Hour*) was set to 1×10^{-2}.
  - Basic event EPS-XHE-XM-AAC (*Operators Fail to Start and Align SBO Diesel Generator to Bus 2H*) was set to 2.0×10^{-2}.
  - Basic event AFW-XHE-XM-CNTRL (*Operators Fail to Control TDAFW pump*) was set to 5.0×10^{-1}.

- If operators fail to strip dc loads within 1 hour, the station batteries will deplete in 2 hours. Since, offsite power was not restored to the switchyard until approximately 3 hours; no credit for offsite power recovery prior to battery depletion was given. However, the TDAFW pump was capable of providing flow to the SGs if the batteries had depleted (if the operators successful realigned the pump to the SGs after testing). Therefore, additional time to SG dry-out and core uncovery allows for additional time for offsite power recovery to the safety busses.[3]

[2] On August 23rd at 5:23 p.m., a RSST was returned to service, operators subsequently realigned offsite power to Safety Bus 2J (17 minutes later) and Safety Bus1H (25 minutes later).

[3] The time to SG dry-out and core damage was estimated to be approximately 10 hours regardless if operators successfully control TDAFW pump flow until the emergency condensate storage tank is empty or the operators fail to control the flow and overfill the SGs.

  - Basic event OEP-XHE-XL-NR06H2SC (*Operator Fails to Recover Offsite Power in 6 Hours, Given Failure at 2 Hours),* OEP-XHE-XL-NR07H2SC (*Operator Fails to Recover Offsite Power in 7 Hours, Given Failure at 2 Hours*), OEP-XHE-XL-NR09H2SC (*Operator Fails to Recover Offsite Power in 9 Hours, Given Failure at 2 Hours*), and OEP-XHE-XL-NR10H2SC (*Operator Fails to Recover Offsite Power in 10 Hours, Given Failure at 2 Hours*) were set to 5×10^{-3}. See Appendix C for additional details.

- Since offsite power recovery was credited prior to battery depletion for sequences that operators successfully stripped dc loads within 1 hour and thereby extending the battery depletion time to 4 hours. No additional credit was given for later recovery of offsite power for these sequences.
  - Basic event OEP-XHE-XL-NR06H4SC (*Operator Fails to Recover Offsite Power in 6 Hours, Given Failure at 4 Hours),* OEP-XHE-XL-NR07H4SC (*Operator Fails to Recover Offsite Power in 7 Hours, Given Failure at 4 Hours*), OEP-XHE-XL-NR09H4SC (*Operator Fails to Recover Offsite Power in 9 Hours, Given Failure at 4 Hours*), and OEP-XHE-XL-NR10H4SC (*Operator Fails to Recover Offsite Power in 10 Hours, Given Failure at 4 Hours*) were set to TRUE.

- The Unit 1 TDAFW pump was undergoing surveillance testing and was not immediately available when the event occurred. However, operators could stop the test and restart the system, and align TDAFW pump flow to a SG.
  - The definition for basic event AFW-TDP-TM-TDP2 (*AFW Turbine Pump Unavailable due to Test and Maintenance*) was modified for this analysis. The event was modified to include both (1) the probability that the TDAFW pump was undergoing surveillance testing upon initiation of the LOOP and (2) non-recovery probability of operators to reset the pump and align it to feed a steam generator. The probability of (1) is 1.0 because the TDAFW pump was undergoing surveillance testing at the onset of the event. The probability of (2) was determined to be 2×10^{-2} (see Appendix C); therefore, the basic event AFW-TDP-TM-TDP was set to 2×10^{-2}.

- Operators tripped EDG 2H due to a coolant leak. EDG 2H was recovered approximately 6 hours after it was secured due to the coolant leak; therefore, no recovery credit for its recovery was credited prior to battery depletion. However, recovery credit for the EDG is provided in applicable sequences that the TDAFW pump provides feed to the SGs after battery depletion.
  - Basic Event EPS-DGN-FR-DG2H *(EDG 2H Fails to Run*) was set to TRUE.

- The offsite power was recovered to all four safety buses approximately nine hours after the reactor trip and LOOP occurred; therefore, the default EDG and turbine-driven AFW pump mission times were changed to reflect the actual time offsite power was restored to the safety buses. Since the overall fail-to-run is made up of two separate factors, the mission times for these factors were set to the following: ZT-DGN-FR-E = 1 hour and ZT-TDP-FR-E = 1 hour (base case values) and ZT-DGN-FR-L = 8 hours and ZT-TDP-FR-L= 8 hours.

- Operators manually aligned the SBO diesel generator to Bus 2H when EDG 2H was tripped due to a coolant leak.

– Basic Event EPS-PROB-AAC-UNIT1 (*Probability SBO Diesel Generator Used to Save Unit 1*) was set to FALSE and Basic Event EPS-PROB-AAC-UNIT2 (*Probability SBO Diesel Generator Used to Save Unit 2*) was set to TRUE.

Unit 2[4]

- The event was modeled as a dual-unit, switchyard-related LOOP.
  – The probability of IE-LOOPSC *(Loss of Offsite Power Switchyard-Related Initiating Event)* was set to 1.0; all other initiating event probabilities were set to zero.
  – DUAL-UNIT-LOOP (*Probability that a LOOP is a Dual Unit LOOP*) and OEP-VCF-LP-SITESC (*Site LOOP– Switchyard-Related)* were set to TRUE.

- The offsite power could not be recovered within three hours.
  – Basic Events OEP-XHE-XL-NR01HSC (*Operator Fails to Recover Offsite Power in 1 Hour*), OEP-XHE-XL-NR02HSC (*Operator Fails to Recover Offsite Power in 2 Hours*), and OEP-XHE-XL-NR03HSC (*Operator Fails to Recover Offsite Power in 3 Hours*) were set to TRUE.

- Sequence-specific HRA calculations were performed (see Appendix C):
  – Basic event OEP-XHE-XL-NR04HSC (*Operator Fails to Recover Offsite Power in 4 Hours*) was set to 5×10^{-3}.
  – Basic event DCP-XHE-XA-STRIP (*Operators Fail to Strip DC Loads in 1 Hour*) is set to 1×10^{-2}.
  – Basic event EPS-XHE-XM-AAC (*Operators Fail to Start and Align SBO Diesel Generator to Bus 2H*) was set to 2×10^{-2}.
  – Basic event AFW-XHE-XM-CNTRL (*Operators Fail to Control TDAFW pump*) was set to 5.0×10^{-1}.

- If operators fail to strip dc loads within 1 hour, the station batteries will deplete in 2 hours. Since, offsite power was not restored to the switchyard until approximately 3 hours; no credit for offsite power recovery prior to battery depletion was given. However, the TDAFW pump was capable of providing flow to the SGs if the batteries had depleted. Therefore, additional time to SG dry-out and core uncovery allows for additional time for offsite power recovery to the safety busses.
  – Basic event OEP-XHE-XL-NR06H2SC, OEP-XHE-XL-NR07H2SC, OEP-XHE-XL-NR09H2SC, and OEP-XHE-XL-NR10H2SC were set to 5×10^{-3}. See Appendix C for additional details.

- Since offsite power recovery was credited prior to battery depletion for sequences that operators successfully stripped dc loads within 1 hour and thereby extending the battery depletion time to 4 hours. No additional credit was given for later recovery of offsite power for these sequences.

[4] The Unit 1 SPAR model was used to analyze the Unit 2 risk; therefore, in some cases, Unit 1 basic events are used to represent Unit 2 components.

  - Basic event OEP-XHE-XL-NR06H4SC, OEP-XHE-XL-NR07H4SC, OEP-XHE-XL-NR09H4SC, and OEP-XHE-XL-NR10H4SC were set to TRUE.

- Operators tripped EDG 2H due to a coolant leak. EDG 2H was recovered approximately 6 hours after it was secured due to the coolant leak; therefore, no recovery credit for its recovery was credited prior to battery depletion. However, recovery credit for the EDG is provided in applicable sequences that the TDAFW pump provides feed to the SGs after battery depletion.
  - Basic Event EPS-DGN-FR-DG1H *(EDG 1H Fails to Run*) was set to TRUE.

- The offsite power was recovered to all four safety buses approximately nine hours after the reactor trip and LOOP occurred; therefore, the default EDG and turbine-driven AFW pump mission times were changed to reflect the actual time offsite power was restored to the safety buses. Since the overall fail-to-run is made up of two separate factors, the mission times for these factors were set to the following: ZT-DGN-FR-E = 1 hour and ZT-TDP-FR-E = 1 hour (base case values) and ZT-DGN-FR-L = 8 hours and ZT-TDP-FR-L= 8 hours.

- Operator manually aligned the SBO diesel generator to Bus 2H when EDG 2H was tripped due to a coolant leak.
  - Basic Event EPS-PROB-AAC-UNIT1 (*Probability SBO Diesel Generator Used to Save Unit 1*) was set to TRUE and Basic Event EPS-PROB-AAC-UNIT2 (*Probability SBO Diesel Generator Used to Save Unit 2*) was set to FALSE.

Seismic Impact on Risk. Based on U.S. Geological Survey data, the best estimate of the Peak Ground Acceleration (PGA) for the August 23, 2010 earthquake at the North Anna site is 0.2g (Reference 1). The range for Seismic Initiator Bin 1 is 0.05g–0.28g (References 6 and 7); therefore, Seismic Initiator Bin-1 component fragilities and failure probabilities were selected for this analysis. Since the earthquake caused a LOOP initiating event, no other seismically-induced initiating events (e.g., loss-of-coolant accidents) were evaluated in this analysis. In addition, only the seismic failure probabilities for key components to mitigate a seismically-induced LOOP initiating event were included.

Based on generic component fragilities (References 6 and 7), the following seismic failure probabilities were calculated given the earthquake that occurred at the North Anna site on August 23rd.[5]

Basic Event	Component Description	Probability of Failure for a Bin-1 Earthquake
EQ-SWS-FA	Intake Structure	9.2E-7
EQ-AC1H1-FA	480V 1H1 Emergency Bus	2.5E-5
EQ-AC1J1-FA	480V 1J1 Emergency Bus	2.5E-5
EQ-EDG1H-FA	EDG 1H	1.5E-7
EQ-EDG1J-FA	EDG 1J	1.5E-7
EQ-EDG2H-FA	EDG 2H	1.5E-7
EQ-EDG2J-FA	EDG 2J	1.5E-7

[5] These seismic failure probabilities were added to their applicable fault trees as basic events (the revised fault trees are provided in Appendix B):

Basic Event	Component Description	Probability of Failure for a Bin-1 Earthquake
EQ-AFW-TDP-FA	Turbine-Driven AFW Pump	2.6E-5
EQ-ECST-FA	Emergency Condensate Storage Tank	3.5E-7
EQ-BDC-1-I	DC Bus 1-I Failed due to Earthquake	2.5E-6
EQ-BDC-1-II	DC Bus 1-II Failed due to Earthquake	2.5E-6
EQ-BDC-1-III	DC Bus 1-III Failed due to Earthquake	2.5E-6
EQ-BDC-2-I	DC Bus 2-I Failed due to Earthquake	2.5E-6
EQ-BDC-2-III	DC Bus 2-III Failed due to Earthquake	2.5E-6
EQ-BCH-CHR-I	Battery Charger I Failed due to Earthquake	8.1E-4
EQ-BCH-CHR-II	Battery Charger II Failed due to Earthquake	8.1E-4
EQ-BCH-CHR-III	Battery Charger III Failed due to Earthquake	8.1E-4

Without the seismic fragility considerations, the event CCDPs are 2.1×10^{-4} and 4.1×10^{-5} for Units 1 and 2, respectively, which is about 1% lower than the risk calculated considering these fragilities. While this is not a complete seismic analysis using plant-specific fragilities, it is reasonable to conclude the earthquake at North Anna did not significantly reduce the ability of the plant to respond to and mitigate the initiating event.

Sensitivity Studies. The modeling of the SBO diesel generator is an important assumption on the CCDPs for both units in the analysis of this dual unit LOOP event. During the event, EDG 2H failed and the SBO diesel generator was aligned to supply power to Bus 2H. This analysis models the SBO diesel generator being modeled as aligned to only Unit 2.

The following table shows the sensitivity analysis of changing the probabilities of the alignment of the SBO diesel generator between the two units. The individual unit CCDPs increased when the probability of the SBO diesel generator alignment decreased (i.e., the unit event risk increases as the likelihood of that unit having the SBO diesel generator available decreases).[6]

Probability of SBO Diesel Generator Alignment	CCDP (Unit 1)	CCDP (Unit 2)	CCDP (Both Units)
Unit 1, P = 0.0, Unit 2, P = 1.0	2.1E-04	4.1E-05	2.5E-04
Unit 1, P = 0.2, Unit 2, P = 0.8	1.8E-04	6.5E-05	2.4E-04
Unit 1, P = 0.4, Unit 2, P = 0.6	1.4E-04	9.0E-05	2.3E-04
Unit 1, P = 0.6, Unit 2, P = 0.4	9.7E-05	1.1E-04	2.1E-04
Unit 1, P = 0.8, Unit 2, P = 0.2	5.7E-05	1.4E-04	2.0E-04
Unit 1, P = 1.0, Unit 2, P = 0.0	1.7E-05	1.6E-04	1.8E-04

REFERENCES

1. U.S. Nuclear Regulatory Commission, “Management Directive 8.3 11-012, Decision Documentation for Reactive Inspection,” August 24, 2011 (ML112410546).

2. Virginia Electric and Power Company, “LER 338/11-003, Dual Unit Reactor Trip and ESF Actuations during Seismic Event with a Loss of Offsite Power,” October 20, 2011 (ML11299A018).

[6] The Unit 1 CCDP is more sensitive to alignment probability of the SBO due to the Unit 1 TDAFW pump being in surveillance testing at the time of the LOOP (and therefore a higher than nominal unavailability due to operator recovery).

3. Virginia Electric and Power Company, “LER 339/11-001, Inoperable Emergency Diesel Generator Due to Coolant Leak,” November 23, 2011 (ML11340A034).

4. U.S. Nuclear Regulatory Commission, “Augmented Inspection Report 50-338/11-11, North Anna Power Station-NRC Integrated Inspection,” October 31, 2011 (ML113040031).

5. U.S. Nuclear Regulatory Commission, “Inspection Report 50-338/12-10, North Anna Final Significance Determination of a WHITE Finding, Notice of Violation, and Assessment Follow-Up Letter,” May 11, 2012 (ML12136A115).

6. U.S. Nuclear Regulatory Commission, “Seismic Fragility Tables,” October 2011 (ML071220070).

7. S. Khericha, et al, “Development of Simplified Probabilistic Risk Assessment Model for Seismic Initiating Event”, Eleventh International Probabilistic Safety Assessment and Management and European Safety and Reliability Association Conference, Helsinki, Finland, will be published on June 25–29, 2012 (ML12018A034).

8. Idaho National Laboratory, NUREG/CR-6883, “The SPAR-H Human Reliability Analysis Method,” August 2005 (ML051950061).

9. Idaho National Laboratory, “INL/EXT-10-18533, SPAR-H Step-by-Step Guidance,” May 2011 (ML112060305).

Appendix A: Analysis Results

Unit 1

Summary of Conditional Event Changes

Event	Description	Cond. Value	Nominal Value
AFW-TDP-TM-TDP2	AFW TURBINE PUMP UNAVAILALBLE DUE TO T/M	2.00E-2	5.39E-3
AFW-XHE-XM-CNTRL	OPERATOR FAILS TO CONTROL AFW TDP	5.00E-1	3.00E-1
DCP-XHE-XA-STRIP	OPERATORS STRIPS DC LOADS WITHIN 1 HOUR	1.00E-2	2.20E-1
DUAL-UNIT-LOOP	PROBABILITY THAT A LOOP IS A DUAL UNIT LOOP	TRUE	5.82E-1
EPS-DGN-FR-DG2H	DIESEL GENERATOR 2H FAILS TO RUN	TRUE	2.84E-2
EPS-PROB-AAC-UNIT1	PROBABILITY AAC DIESEL USED TO SAVE UNIT 1	FALSE	5.00E-1
EPS-PROB-AAC-UNIT2	PROBABILITY AAC DIESEL USED TO SAVE UNIT 2	TRUE	5.00E-1
EPS-XHE-XM-AAC	FAILURE TO START AND ALIGN THE AAC (SBO) DIESEL GENERATOR	2.00E-2	1.00E-1
IE-LOOPSC[a]	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-CENTERED)	1.00E+0	1.04E-2
OEP-VCF-LP-SITESC	SITE LOOP (SWITCHYARD-RELATED)	TRUE	2.11E-1
OEP-XHE-XL-NR01HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	TRUE	4.02E-1
OEP-XHE-XL-NR02HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS	TRUE	2.24E-1
OEP-XHE-XL-NR03HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 3 HOURS	TRUE	1.45E-1
OEP-XHE-XL-NR04HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	5.00E-3	1.02E-1
OEP-XHE-XL-NR06H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 6 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	2.62E-1
OEP-XHE-XL-NR06H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 6 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	5.73E-1
OEP-XHE-XL-NR07H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 7 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	2.08E-1
OEP-XHE-XL-NR07H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 7 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	4.55E-1
OEP-XHE-XL-NR09H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 9 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	1.39E-1
OEP-XHE-XL-NR09H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 9 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	3.04E-1
OEP-XHE-XL-NR10H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 10 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	1.17E-1
OEP-XHE-XL-NR10H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 10 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	2.55E-1
ZT-DGN-FR-L[b]	DIESEL GENERATOR FAILS TO RUN	8.73E-3	2.47E-2
ZT-TDP-FR-L[b]	TURBINE DRIVEN PUMP FAILS TO RUN	5.60E-4	3.52E-2
EPS-DGN-FR-DGAAC[b]	ALTERNATE AC DIESEL FAILS TO RUN	1.25E-2	2.84E-2
EPS-DGN-CF-FRU12[b]	CCF OF UNIT 1 & 2 DIESEL GENERATORS TO RUN	6.01E-3	2.22E-4
EPS-DGN-FR-DG1H[b]	DIESEL GENERATOR 1H FAILS TO RUN	1.25E-2	2.84E-2
EPS-DGN-FR-DG1J[b]	DIESEL GENERATOR 1J FAILS TO RUN	1.25E-2	2.84E-2
AFW-TDP-FR-TDP2[b]	AFW TURBINE DRIVEN PUMP FAILS TO RUN	4.97E-3	3.95E-2
EPS-DGN-FR-DG2J[b]	DIESEL GENERATOR 2J FAILS TO RUN	1.25E-2	2.84E-2

a. All other initiating event probabilities were set to zero.
b. The conditional probability values for these events were automatically calculated in SAPHIRE due to other basic event probability modifications.

Implied Event Changes as per RASP Guidance

Event	Description	Cond. Value	Nominal Value
EPS-DGN-FS-DG2H	DIESEL GENERATOR 2H FAILS TO START	FALSE	2.89E-3
EPS-DGN-TM-DG2H	UNIT 2 EDG 2H UNAVAILABLE DUE TO T& M	TRUE	1.43E-2
EPS-DGN-CF-FSU12	CCF OF UNIT 1 & 2 DIESELGENERATORS TO START	1.75E-5	1.77E-5

Dominant Sequence Results

Only items contributing at least 1.0% to the total CCDP are displayed.

Event Tree	Sequence	CCDP	% Contribution	Description
LOOPSC	17-69	1.75E-4	85.0%	/RPS-L, EPS, AFW-B, OPR-01H, DGR-01H
LOOPSC	17-21	1.22E-5	5.9%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, BP1, BP2, OPR-02H, DGR-02H
LOOPSC	17-66	3.71E-6	1.8%	/RPS-L, EPS, /AFW-B, PORV-B, OPR-01H, DGR-01H
Total		**2.06E-4**	**100%**	

Referenced Fault Trees

Fault Tree	Description
AFW-B	AUXILIARY FEEDWATER
BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING)
BP2	RCP SEAL STAGE 2 INTEGRITY
DGR-01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR
DGR-02H	DIESEL GENERATOR RECOVERY IN 2 HRS
EPS	EMERGENCY POWER
OPR-01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR
OPR-02H	OFFSITE POWER RECOVERY IN 2 HRS
PORV-B	NORTH ANNA 1 & 2 PWR A1 PORVS/SRVS DURING SBO

Cutset Report - LOOPSC 17-69

#	CCDP	Total %	Cutset
	1.75E-4	100	Displaying 1414 of 1414 Cut Sets.
1	1.05E-4	59.8	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H
2	3.40E-5	19.4	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H
3	2.61E-5	14.9	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H
4	5.24E-6	2.99	IE-LOOPSC,AFW-XHE-XR-FW543,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H
5	2.62E-6	1.5	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H

Cutset Report - LOOPSC 17-21

#	CCDP	Total %	Cutset
	1.22E-5	100	Displaying 241 of 241 Cutsets.
1	1.20E-5	98.6	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2

Cutset Report - LOOPSC 17-66

#	CCDP	Total %	Cutset
	3.71E-6	100	Displaying 335 of 335 Cutsets.
1	1.83E-6	49.3	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
2	1.83E-6	49.3	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C

Referenced Events

Name	Description	Probability

Name	Description	Probability
AFW-TDP-FR-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO RUN	5.0E-03
AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.5E-03
AFW-TDP-TM-TDP2	AFW TURBINE PUMP UNAVAILALBLE DUE TO TM	2.0E-02
AFW-XHE-XR-FW543	1-FW-543 RECIRCULATION VALVE TO ECST LEFT OPEN	1.0E-03
EPS-DGN-CF-FRU12	CCF OF UNIT 1 & 2 DIESEL GENERATORS TO RUN	5.8E-03
EPS-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER EDG IN 1 HOUR	8.7E-01
EPS-XHE-XL-NR02H	OPERATOR FAILS TO RECOVER EDG IN 2 HOURS	8.0E-01
IE-LOOPSC	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-RELATED)	1.0E+00
PPR-MOV-FC-1535	PORV 1 (AOV-1455C) BLOCK VALVE (1535) FAILS TO CLOSE	9.6E-04
PPR-MOV-FC-1536	PORV 2 (AOV-1456) BLOCK VALVE (1536) FAILS TO CLOSE	9.6E-04
PPR-SRV-CO-SBO	PORVS/SRVS OPEN DURING SBO	3.7E-01
RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING) FAILS	1.25E-02
RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING) FAILS	2.0E-01

Unit 2

Summary of Conditional Event Changes

Event	Description	Cond. Value	Nominal Value
AFW-XHE-XM-CNTRL	OPERATOR FAILS TO CONTROL AFW TDP	5.00E-1	3.00E-1
DCP-XHE-XA-STRIP	OPERATORS STRIPS DC LOADS WITHIN 1 HOUR	1.00E-2	2.20E-1
DUAL-UNIT-LOOP	PROBABILITY THAT A LOOP IS A DUAL UNIT LOOP	TRUE	5.82E-1
EPS-DGN-FR-DG1H	DIESEL GENERATOR 1H FAILS TO RUN	TRUE	2.84E-2
EPS-PROB-AAC-UNIT1	PROBABILITY AAC DIESEL USED TO SAVE UNIT 1	FALSE	5.00E-1
EPS-PROB-AAC-UNIT2	PROBABILITY AAC DIESEL USED TO SAVE UNIT 2	TRUE	5.00E-1
EPS-XHE-XM-AAC	FAILURE TO START AND ALIGN THE AAC (SBO) DIESEL GENERATOR	2.00E-2	1.00E-1
IE-LOOPSC[a]	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-CENTERED)	1.00E+0	1.04E-2
OEP-VCF-LP-SITESC	SITE LOOP (SWITCHYARD-RELATED)	TRUE	2.11E-1
OEP-XHE-XL-NR01HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR	TRUE	4.02E-1
OEP-XHE-XL-NR02HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS	TRUE	2.24E-1
OEP-XHE-XL-NR03HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 3 HOURS	TRUE	1.45E-1
OEP-XHE-XL-NR04HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS	5.00E-3	1.02E-1
OEP-XHE-XL-NR06H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 6 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	2.62E-1
OEP-XHE-XL-NR06H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 6 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	5.73E-1
OEP-XHE-XL-NR07H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 7 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	2.08E-1
OEP-XHE-XL-NR07H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 7 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	4.55E-1
OEP-XHE-XL-NR09H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 9 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	1.39E-1
OEP-XHE-XL-NR09H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 9 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	3.04E-1
OEP-XHE-XL-NR10H2SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 10 HOURS GIVEN FAILURE IN 2 HOURS	5.00E-3	1.17E-1
OEP-XHE-XL-NR10H4SC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 10 HOURS GIVEN FAILURE IN 4 HOURS	TRUE	2.55E-1
ZT-DGN-FR-L[b]	DIESEL GENERATOR FAILS TO RUN	8.73E-3	2.47E-2
ZT-TDP-FR-L[b]	TURBINE DRIVEN PUMP FAILS TO RUN	5.60E-4	3.52E-2
EPS-DGN-FR-DGAAC[b]	ALTERNATE AC DIESEL FAILS TO RUN	1.25E-2	2.84E-2
EPS-DGN-CF-FRU12[b]	CCF OF UNIT 1 & 2 DIESEL GENERATORS TO RUN	6.01E-3	2.22E-4
EPS-DGN-FR-DG1H[b]	DIESEL GENERATOR 1H FAILS TO RUN	1.25E-2	2.84E-2
EPS-DGN-FR-DG1J[b]	DIESEL GENERATOR 1J FAILS TO RUN	1.25E-2	2.84E-2
AFW-TDP-FR-TDP2[b]	AFW TURBINE DRIVEN PUMP FAILS TO RUN	4.97E-3	3.95E-2
EPS-DGN-FR-DG2J[b]	DIESEL GENERATOR 2J FAILS TO RUN	1.25E-2	2.84E-2

a. All other initiating event frequencies were set to zero.
b. The conditional probability values for these events were automatically calculated in SAPHIRE due to other basic event probability modifications.

Implied Event Changes as per RASP Guidance

Event	Description	Cond. Value	Nominal Value
EPS-DGN-FS-DG2H	DIESEL GENERATOR 2H FAILS TO START	FALSE	2.89E-3
EPS-DGN-TM-DG2H	UNIT 2 EDG 2H UNAVAILABLE DUE TO T& M	TRUE	1.43E-2
EPS-DGN-CF-FSU12	CCF OF UNIT 1 & 2 DIESELGENERATORS TO START	1.75E-5	1.77E-5

Dominant Sequence Results

Only items contributing at least 1.0% to the total CCDP are displayed.

Event Tree	Sequence	CCDP	% Contribution	Description
LOOPSC	17-69	2.64E-5	64.5%	/RPS-L, EPS, AFW-B, OPR-01H, DGR-01H
LOOPSC	17-21	3.59E-6	8.8%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, BP1, BP2, OPR-02H, DGR-02H
LOOPSC	16	1.84E-6	4.5%	/RPS-L, /EPS, AFW-L, FAB-L
LOOPSC	02-06	1.61E-6	3.9%	/RPS-L, /EPS, /AFW, /PORV, LOSC-L, /RSD, /BP1, BP2, OPR-02H, HPI-SIL
LOOPSC	02-05	1.56E-6	3.8%	/RPS-L, /EPS, /AFW, /PORV, LOSC-L, /RSD, /BP1, BP2, OPR-02H, /HPI-SIL, RSS-SIL
LOOPSC	17-66	1.09E-6	2.7%	/RPS-L, EPS, /AFW-B, PORV-B, OPR-01H, DGR-01H
LOOPSC	17-03-08	7.03E-7	1.7%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, /DC-STRIP, OPR-04H, DGR-04H, /AFW-MAN, CST-REFILL-LT1, SG-DEP-LT, PWR-REC-10H4
LOOPSC	17-03-12	7.03E-7	1.7%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, /DC-STRIP, OPR-04H, DGR-04H, AFW-MAN, SG-DEP-LT1, PWR-REC-10H4
LOOPSC	02-04	6.72E-7	1.6%	/RPS-L, /EPS, /AFW, /PORV, LOSC-L, /RSD, /BP1, BP2, OPR-02H, /HPI-SIL, /RSS-SIL, HPR-SIL
Total		**4.10E-5**	**100%**	

Referenced Fault Trees

Fault Tree	Description
AFW-B	AUXILIARY FEEDWATER
AFW-L	AUXILIARY FEEDWATER DURING LOOP
AFW-MAN	MANUAL CONTROL AFW
BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING)
BP2	RCP SEAL STAGE 2 INTEGRITY
CST-REFILL-LT1	CONDENSATE STORAGE TANK REFILL LONG-TERM
DGR-01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR
DGR-02H	DIESEL GENERATOR RECOVERY IN 2 HRS
DGR-04H	DIESEL GENERATOR RECOVERY (IN 4 HR)
EPS	EMERGENCY POWER
FAB-L	FEED AND BLEED DURING LOOP
HPI-SIL	HIGH PRESSURE INJECTION
HPR-SIL	HIGH PRESSURE RECIRC
LOSC-L	RCP SEALS SURVIVE LOOP
OPR-01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR
OPR-02H	OFFSITE POWER RECOVERY IN 2 HRS
OPR-04H	OFFSITE POWER RECOVERY (IN 4 HR)
PORV-B	NORTH ANNA 1 & 2 PWR A1 PORVS/SRVS DURING SBO
PWR-REC-10H4	LATE POWER RECOVERY (10 HR)
RSS-SIL	RECIRC SPRAY
SG-DEP-LT	DEPRESSURIZE SGS
SG-DEP-LT1	DEPRESSURIZE SGS (DEPENDENT)

Cut Set Report - LOOPSC 17-69

#	CCDP	Total %	Cut Set
	2.64E-5	100	Displaying 1047 of 1047 Cut Sets.
1	1.62E-6	6.14	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
2	1.41E-6	5.34	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
3	1.24E-6	4.71	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
4	1.17E-6	4.43	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
5	1.08E-6	4.09	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
6	1.01E-6	3.83	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
7	1.01E-6	3.83	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H
8	8.80E-7	3.33	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
9	8.40E-7	3.18	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
10	7.75E-7	2.93	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
11	7.75E-7	2.93	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H
12	7.30E-7	2.76	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
13	6.80E-7	2.57	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
14	6.74E-7	2.55	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
15	5.65E-7	2.14	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
16	5.21E-7	1.97	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
17	4.88E-7	1.85	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
18	4.24E-7	1.61	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
19	4.05E-7	1.53	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
20	3.74E-7	1.42	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H
21	3.52E-7	1.33	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
22	3.27E-7	1.24	IE-LOOPSC,AFW-TDP-FS-TDP2,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
23	3.25E-7	1.23	IE-LOOPSC,AFW-TDP-FR-TDP2,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H
24	2.72E-7	1.03	IE-LOOPSC,AFW-TDP-TM-TDP2,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC
25	2.71E-7	1.02	IE-LOOPSC,ACP-CRB-CC-15D3,AFW-TDP-FS-TDP2,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC

Cut Set Report - LOOPSC 17-21

#	CCDP	Total %	Cut Set
	3.59E-6	100	Displaying 185 of 185 Cut Sets.
1	5.74E-7	16	IE-LOOPSC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2

2	4.99E-7	13.9	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
3	3.58E-7	9.98	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
4	3.58E-7	9.98	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
5	3.11E-7	8.67	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
6	2.41E-7	6.71	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
7	1.73E-7	4.81	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
8	1.50E-7	4.18	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
9	1.16E-7	3.22	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
10	9.57E-8	2.67	IE-LOOPSC,ACP-CRB-CC-15D3,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
11	8.30E-8	2.31	IE-LOOPSC,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
12	8.30E-8	2.31	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
13	7.21E-8	2.01	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
14	7.21E-8	2.01	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
15	7.05E-8	1.96	IE-LOOPSC,EPS-SEQ-FO-1J,EPS-XHE-XL-NR02H,EPS-XHE-XM-AAC,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
16	6.87E-8	1.91	IE-LOOPSC,ACP-CRB-CC-15D3,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
17	5.97E-8	1.66	IE-LOOPSC,ACP-CRB-CC-15D3,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
18	5.05E-8	1.41	IE-LOOPSC,EPS-DGN-TM-DGAAC,EPS-SEQ-FO-1J,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2
19	4.39E-8	1.22	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-SEQ-FO-1J,EPS-XHE-XL-NR02H,RCS-MDP-LK-BP1,RCS-MDP-LK-BP2

Cut Set Report - LOOPSC 16

#	CCDP	Total %	Cut Set
	1.84E-6	100	Displaying 2246 of 2246 Cut Sets.
1	2.00E-7	10.9	IE-LOOPSC,AFW-CKV-CO-LEAKAGE,HPI-XHE-XM-BLEED2
2	2.00E-7	10.9	IE-LOOPSC,AFW-CKV-CO-LEAKAGE,HPI-XHE-XM-FB
3	1.49E-7	8.12	IE-LOOPSC,AFW-PMP-CF-ALL,HPI-XHE-XM-BLEED2
4	1.49E-7	8.12	IE-LOOPSC,AFW-PMP-CF-ALL,HPI-XHE-XM-FB
5	1.07E-7	5.81	IE-LOOPSC,AFW-XHE-XM-REC1ED8,PPR-SRV-CF-PRVS
6	1.00E-7	5.44	IE-LOOPSC,AFW-XHE-XM-REC1ED8,HPI-XHE-XM-FB,HPI-XHE-XM-RECBLEED
7	1.00E-7	5.44	IE-LOOPSC,AFW-XHE-XM-REC1ED8,HPI-XHE-XM-BLEED2,HPI-XHE-XM-RECBLEED
8	3.54E-8	1.92	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-XHE-XM-AAC,PPR-SRV-CC-1456
9	2.54E-8	1.38	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-DGN-TM-DGAAC,PPR-SRV-CC-1456
10	2.21E-8	1.2	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-DGN-FR-DGAAC,PPR-SRV-CC-1456
11	1.94E-8	1.05	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-XHE-XM-AAC,HPI-MDP-TM-1B,HPI-TRNA-RUN
12	1.88E-8	1.02	IE-LOOPSC,AFW-XHE-XM-REC1ED8,EPS-XHE-XM-AAC,HPI-MDP-TM-ABC,HPI-TRNA-RUN

Cut Set Report - LOOPSC 02-06

#	CCDP	Total %	Cut Set
	1.61E-6	100	Displaying 2679 of 2679 Cut Sets.
1	1.07E-7	6.66	IE-LOOPSC,EPS-DGN-TM-DG2H,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
2	9.34E-8	5.79	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
3	6.70E-8	4.15	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-DGN-TM-DGAAC,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
4	6.70E-8	4.15	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG2H,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
5	5.82E-8	3.61	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-DGN-FR-DGAAC,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
6	3.89E-8	2.41	IE-LOOPSC,EPS-DGN-TM-DG2H,EPS-XHE-XM-AAC,HPI-MDP-FS-1B,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
7	3.38E-8	2.1	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-XHE-XM-AAC,HPI-MDP-FS-1B,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
8	2.43E-8	1.5	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG2H,HPI-MDP-FS-1B,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
9	2.43E-8	1.5	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-DGN-TM-DGAAC,HPI-MDP-FS-1B,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
10	2.24E-8	1.39	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-MOV-CF-1115BD,RCS-MDP-LK-BP2
11	2.17E-8	1.34	IE-LOOPSC,EPS-DGN-FS-DG2H,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-MDP-TM-ABC,HPI-TRNA-RUN,RCS-MDP-LK-BP2
12	2.11E-8	1.31	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-DGN-FR-DGAAC,HPI-MDP-FS-1B,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
13	2.10E-8	1.3	IE-LOOPSC,EPS-DGN-TM-DG2H,EPS-XHE-XM-AAC,HVC-PND-OC-103-12,RCS-MDP-LK-BP2
14	1.88E-8	1.17	IE-LOOPSC,EPS-DGN-TM-DG2H,HPI-MDP-CF-STRTABC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
15	1.83E-8	1.13	IE-LOOPSC,EPS-DGN-FR-DG2H,EPS-XHE-XM-AAC,HVC-PND-OC-103-12,RCS-MDP-LK-BP2
16	1.64E-8	1.01	IE-LOOPSC,EPS-DGN-FR-DG2H,HPI-MDP-CF-STRTABC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2

Cut Set Report - LOOPSC 02-05

#	CCDP	Total %	Cut Set
	1.56E-6	100	Displaying 968 of 968 Cut Sets.
1	1.56E-7	10	IE-LOOPSC,EPS-DGN-TM-DG2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
2	1.36E-7	8.72	IE-LOOPSC,EPS-DGN-FR-DG2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
3	9.73E-8	6.26	IE-LOOPSC,EPS-DGN-FR-DG2J,EPS-DGN-TM-DGAAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
4	9.73E-8	6.26	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
5	9.16E-8	5.89	IE-LOOPSC,EQ-SWS-FA,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2
6	8.46E-8	5.44	IE-LOOPSC,EPS-DGN-FR-DG2J,EPS-DGN-FR-DGAAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
7	8.45E-8	5.43	IE-LOOPSC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-MDP-CF-ALLFS
8	6.01E-8	3.87	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-SMP-PG-NL,RCS-MDP-LK-BP2
9	3.14E-8	2.02	IE-LOOPSC,EPS-DGN-FS-DG2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
10	2.26E-8	1.45	IE-LOOPSC,EPS-DGN-FS-DG2J,EPS-DGN-TM-DGAAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
11	2.26E-8	1.45	IE-LOOPSC,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
12	2.25E-8	1.44	IE-LOOPSC,EPS-DGN-TM-DG2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B72

13	1.96E-8	1.26	IE-LOOPSC,EPS-DGN-FR-DG2J,EPS-DGN-FS-DGAAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
14	1.96E-8	1.26	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
15	1.95E-8	1.26	IE-LOOPSC,EPS-DGN-FR-DG2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B72
16	1.91E-8	1.23	IE-LOOPSC,EPS-SEQ-FO-2J,EPS-XHE-XM-AAC,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
17	1.87E-8	1.2	IE-LOOPSC,ACP-CRB-OO-05M2,EPS-DGN-TM-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
18	1.87E-8	1.2	IE-LOOPSC,ACP-CRB-OO-15F5,EPS-DGN-TM-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
19	1.87E-8	1.2	IE-LOOPSC,ACP-CRB-CC-15F1,EPS-DGN-TM-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
20	1.62E-8	1.04	IE-LOOPSC,ACP-CRB-OO-15F5,EPS-DGN-FR-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
21	1.62E-8	1.04	IE-LOOPSC,ACP-CRB-OO-05M2,EPS-DGN-FR-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
22	1.62E-8	1.04	IE-LOOPSC,ACP-CRB-CC-15F1,EPS-DGN-FR-DG2J,/HPI-MDP-TM-1B,HPI-TRNA-RUN,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
23	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-OO-05L3,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-A168
24	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-OO-05L2,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-A168
25	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-CC-15D1,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-A168
26	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-CO-05L3,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-A168
27	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-CC-15F1,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
28	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-OO-05M3,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-A168
29	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-OO-15F5,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-B168
30	1.57E-8	1.01	IE-LOOPSC,ACP-CRB-OO-05M2,EPS-DGN-CF-FRU12,RCS-MDP-LK-BP2,SWS-HDR-TM-B168

Cut Set Report - LOOPSC 17-66

#	CCDP	Total %	Cut Set
	1.09E-6	100	Displaying 273 of 273 Cut Sets.
1	8.71E-8	8	IE-LOOPSC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
2	8.71E-8	8	IE-LOOPSC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
3	7.57E-8	6.95	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
4	7.57E-8	6.95	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
5	5.43E-8	4.99	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
6	5.43E-8	4.99	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
7	5.43E-8	4.99	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
8	5.43E-8	4.99	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
9	4.72E-8	4.33	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
10	4.72E-8	4.33	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C

11	3.65E-8	3.35	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
12	3.65E-8	3.35	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
13	2.62E-8	2.41	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
14	2.62E-8	2.41	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
15	2.28E-8	2.09	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
16	2.28E-8	2.09	IE-LOOPSC,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
17	1.76E-8	1.61	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
18	1.76E-8	1.61	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
19	1.45E-8	1.33	IE-LOOPSC,ACP-CRB-CC-15D3,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
20	1.45E-8	1.33	IE-LOOPSC,ACP-CRB-CC-15D3,EPS-XHE-XL-NR01H,EPS-XHE-XM-AAC,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
21	1.26E-8	1.16	IE-LOOPSC,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
22	1.26E-8	1.16	IE-LOOPSC,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
23	1.26E-8	1.16	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
24	1.26E-8	1.16	IE-LOOPSC,EPS-DGN-FS-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
25	1.09E-8	1	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
26	1.09E-8	1	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1536,PPR-SRV-CO-SBO,PPR-SRV-OO-1456
27	1.09E-8	1	IE-LOOPSC,EPS-DGN-FR-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C
28	1.09E-8	1	IE-LOOPSC,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR01H,/PPR-MOV-FC-1535,PPR-SRV-CO-SBO,PPR-SRV-OO-1455C

Cut Set Report - LOOPSC 17-03-08

#	CCDP	Total %	Cut Set
	7.03E-7	100	Displaying 173 of 173 Cut Sets.
1	7.64E-8	10.9	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
2	6.64E-8	9.45	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
3	5.83E-8	8.29	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
4	4.82E-8	6.86	IE-LOOPSC,ACP-CRB-CC-15D3,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
5	4.76E-8	6.78	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
6	4.14E-8	5.89	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
7	3.63E-8	5.17	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2

8	3.55E-8	5.05	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-SEQ-FO-1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
9	3.20E-8	4.56	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
10	3.12E-8	4.44	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
11	3.01E-8	4.28	IE-LOOPSC,ACP-CRB-CC-15D3,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
12	2.30E-8	3.27	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
13	2.24E-8	3.19	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
14	2.21E-8	3.15	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-SEQ-FO-1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
15	2.00E-8	2.84	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
16	1.95E-8	2.77	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
17	1.10E-8	1.57	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
18	1.10E-8	1.57	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
19	9.60E-9	1.37	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
20	9.14E-9	1.3	IE-LOOPSC,ACP-CRB-CC-15D3,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
21	8.42E-9	1.2	IE-LOOPSC,/AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2

Cut Set Report - LOOPSC 17-03-12

#	CCDP	Total %	Cut Set
	7.03E-7	100	Displaying 173 of 173 Cut Sets.
1	7.64E-8	10.9	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
2	6.64E-8	9.45	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
3	5.83E-8	8.29	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
4	4.82E-8	6.86	IE-LOOPSC,ACP-CRB-CC-15D3,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
5	4.76E-8	6.78	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2

6	4.14E-8	5.89	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
7	3.63E-8	5.17	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-DGN-FS-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
8	3.55E-8	5.05	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-SEQ-FO-1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
9	3.20E-8	4.56	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
10	3.12E-8	4.44	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,EPS-XHE-XM-AAC,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
11	3.01E-8	4.28	IE-LOOPSC,ACP-CRB-CC-15D3,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
12	2.30E-8	3.27	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
13	2.24E-8	3.19	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
14	2.21E-8	3.15	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DGAAC,EPS-SEQ-FO-1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2
15	2.00E-8	2.84	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-CF-FRU12,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC0,/RCS-MDP-LK-BP2
16	1.95E-8	2.77	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FR-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC2,/RCS-MDP-LK-BP2
17	1.10E-8	1.57	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DGAAC,EPS-DGN-TM-DG1J,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
18	1.10E-8	1.57	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
19	9.60E-9	1.37	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FR-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
20	9.14E-9	1.3	IE-LOOPSC,ACP-CRB-CC-15D3,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-TM-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,OEP-XHE-XX-NR04HSC1,/RCS-MDP-LK-BP2
21	8.42E-9	1.2	IE-LOOPSC,AFW-XHE-XM-CNTRL,/DCP-XHE-XA-STRIP,EPS-DGN-FS-DG1J,EPS-DGN-FS-DGAAC,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR10H4,OEP-XHE-XL-NR04HSC,/RCS-MDP-LK-BP2

Cut Set Report - LOOPSC 02-04

#	CCDP	Total %	Cut Set
	6.72E-7	100	Displaying 2174 of 2174 Cut Sets.
1	1.42E-8	2.12	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-CF-FSAB,RCS-MDP-LK-BP2
2	1.42E-8	2.12	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-CF-FSAB,RCS-MDP-LK-BP2
3	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MOV-CF-1860AB,RCS-MDP-LK-BP2
4	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MOV-CF-1863AB,RCS-MDP-LK-BP2

5	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MOV-CF-1860AB,RCS-MDP-LK-BP2
6	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MOV-CF-1863AB,RCS-MDP-LK-BP2
7	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-MOV-CF-1863AB,HPI-TRNA-RUN,RCS-MDP-LK-BP2
8	1.12E-8	1.66	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-MOV-CF-1863AB,HPI-TRNB-RUN,RCS-MDP-LK-BP2
9	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05M3,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
10	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05L2,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
11	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CO-05L3,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
12	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-15F5,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
13	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05M2,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
14	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05M3,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
15	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05L2,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
16	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CO-05L3,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
17	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-15F5,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
18	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05M2,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
19	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05L3,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
20	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CC-15F1,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
21	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CC-15D1,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
22	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-OO-05L3,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
23	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CC-15F1,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1B,RCS-MDP-LK-BP2
24	1.02E-8	1.52	IE-LOOPSC,ACP-CRB-CC-15D1,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-TM-1A,RCS-MDP-LK-BP2
25	7.61E-9	1.13	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNB-RUN,LPI-MDP-CF-FRAB,RCS-MDP-LK-BP2
26	7.61E-9	1.13	IE-LOOPSC,EPS-DGN-CF-FRU12,HPI-TRNA-RUN,LPI-MDP-CF-FRAB,RCS-MDP-LK-BP2

Referenced Events

Name	Description	Probability
ACP-CRB-CC-15D3	BREAKER 15D3 FAILS TO OPEN	2.39E-03
ACP-CRB-CC-15F1	1-EP-BKR-15F1 ON 4160 V BUS 1F FAILS TO OPEN	2.39E-03
ACP-CRB-OO-05L1	0-AAC-BKR-05L1 ON 4160 V BUS 0L FAILS TO CLOSE	2.4E-03
ACP-CRB-OO-05L2	0-AAC-BKR-05L2 ON 4160 V BUS 0L FAILS TO CLOSE	2.4E-03
ACP-CRB-OO-05L3	0-AAC-BKR-05L3 ON 4160 V BUS 0L FAILS TO CLOSE	2.4E-03
ACP-CRB-OO-05M2	0-AAC-BKR-05M2 ON 4160 V BUS 0M FAILS TO CLOSE	2.4E-03
ACP-CRB-OO-05M3	0-AAC-BKR-05M3 ON 4160 V BUS 0M FAILS TO CLOSE	2.4E-03
ACP-CRB-OO-15F5	0-AAC-BKR-15F5 ON 4160 V BUS 0M FAILS TO CLOSE	2.4E-03
AFW-CKV-CO-LEAKAGE	SG CKVS 1-FW-68, 100, & 132 LEAK CAUSE STEAM BINDING	1.0E-05
AFW-TDP-FR-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO RUN	5.0E-03
AFW-TDP-FS-TDP2	AFW TURBINE DRIVEN PUMP FAILS TO START	6.5E-03

Name	Description	Probability
AFW-TDP-TM-TDP2	AFW TURBINE PUMP UNAVAILALBLE DUE TO TM	5.4E-03
AFW-XHE-XM-CNTRL	OPERATOR FAILS TO CONTROL AFW TDP	5.0E-01
AFW-XHE-XM-REC1ED8	1-AP-22 5 LOSS OF EMERGENCY CST	5.0E-04
DCP-XHE-XA-STRIP	OPERATORS STRIPS DC LOADS WITHIN 1 HOUR	2.0E-02
EPS-DGN-CF-FRU12	CCF OF UNIT 1 & 2 DIESEL GENERATORS TO RUN	5.8E-03
EPS-DGN-FR-DG1J	DIESEL GENERATOR 1J FAILS TO RUN	1.3E-02
EPS-DGN-FR-DG2H	DIESEL GENERATOR 2H FAILS TO RUN	1.3E-02
EPS-DGN-FR-DG2J	DIESEL GENERATOR 2J FAILS TO RUN	1.3E-02
EPS-DGN-FR-DGAAC	SBO DIESEL FAILS TO RUN	1.3E-02
EPS-DGN-FS-DG1J	DIESEL GENERATOR 1J FAILS TO START	2.9E-03
EPS-DGN-FS-DG2H	DIESEL GENERATOR 2H FAILS TO START	2.9E-03
EPS-DGN-FS-DG2J	DIESEL GENERATOR 2J FAILS TO START	2.9E-03
EPS-DGN-FS-DGAAC	SBO DIESEL GENERATOR FAILS TO START	2.9E-03
EPS-DGN-TM-DG1J	DIESEL GENERATOR 1J UNAVAILABLE DUE TO TM	1.4E-02
EPS-DGN-TM-DG2H	UNIT 2 EDG 2H UNAVAILABLE DUE TO TM	1.4E-02
EPS-DGN-TM-DG2J	DIESEL GENERATOR 2J UNAVAILABLE DUE TO TM	1.4E-02
EPS-DGN-TM-DGAAC	SBO DIESEL UNAVAILABLE DUE TO TM	1.4E-02
EPS-SEQ-CF-ALL	CCF OF BUS 1H , 1J, 2H & 2J LOAD SEQUENCERS	5.9E-06
EPS-SEQ-FO-1J	BUS 1J LOAD SEQUENCER FAILS	1.7E-03
EPS-SEQ-FO-2J	BUS 2J LOAD SEQUENCER FAILS	1.7E-03
EPS-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER EDG IN 1 HOUR	8.7E-01
EPS-XHE-XL-NR02H	OPERATOR FAILS TO RECOVER EDG IN 2 HOURS	8.0E-01
EPS-XHE-XL-NR03H	OPERATOR FAILS TO RECOVER EDG IN 3 HOURS	7.5E-01
EPS-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER EDG IN 4 HOURS	7.0E-01
EPS-XHE-XM-AAC	FAILURE TO START AND ALIGN THE SBO DIESEL	5.0E-03
EPS-XHE-XM-REC1HF7	FAILURE TO X-TIE ALT POWER SOURCE FROM 1B BUS	2.0E-02
EQ-SWS-FA	SW INTAKE STRUCTURE FAILED DUE TO EARTHQUAKE	9.2E-07
HPI-CKV-OO-SI47	HPI/RWST CHECK VALVE SI-47 FAILS TO CLOSE	2.4E-04
HPI-MDP-CF-STRTABC	CCF OF HPI PUMPS A, B & CTO START	1.3E-05
HPI-MDP-FS-1B	HPI MDP TRAIN 1B FAILURE TO START	1.4E-03
HPI-MDP-TM-1B	HPI MDP 1B UNAVAILABLE DUE TO TM	3.9E-03
HPI-MDP-TM-ABC	HPI MDPs 1A, 1B, OR 1C (2-OF-3) UNAVAILABLE DUE TO TM	3.8E-03
HPI-MOV-CF-1115BD	CCF OF SUCTION MOVS	1.9E-05
HPI-MOV-CF-1863AB	CCF OF LPI/HPI MOV 1-CH-MOV-1863A&B TO OPEN	1.9E-05
HPI-SMP-PG-NL	CONTAINMENT RECIRC SUMP PLUGS - NON LOCA	5.0E-05
HPI-TRNA-RUN	HPI TRAIN A OPERATING	5.0E-01
HPI-TRNB-RUN	HPI TRAIN B OPERATING	5.0E-01
HPI-XHE-XM-BLEED2	1-FR-H 1 LOSS OF HEAT SINK STEP 15 OPEN TWO PORVS	2.0E-02
HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	2.0E-02
HPI-XHE-XM-RECBLEED	FAIL TO RECOVER BLEED LATE	1.0E-02
HVC-PND-OC-103-12	1-HV-AOD-103-1/2 SPURIOUSLY CLOSED DURING MISSION	3.7E-04
IE-LOOPSC	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-RELATED)	1.0E+00
LPI-MDP-CF-FRAB	1-SI-P-1A & B FAILS TO RUN COMMON CAUSE FAULTS	1.2E-05
LPI-MDP-CF-FSAB	1-SI-P-1A & B FAILS TO START COMMON CAUSE FAULTS	2.6E-05
LPI-MDP-TM-1A	LPI MDP TRAIN 1A UNAVAILABLE DUE TO TM	7.1E-03
LPI-MDP-TM-1B	LPI MDP TRAIN 1B UNAVAILABLE DUE TO TM	7.1E-03
LPI-MOV-CF-1860AB	COMMON CAUSE FAILURE OF SUMP ISOL VALVES	1.9E-05
LPI-MOV-CF-1863AB	COMMON CAUSE FAILURE OF X-TIE MOVs 1863A/B TO HPR	1.85E-05

Name	Description	Probability
OEP-XHE-XL-NR04HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS (SWITCHYARD)	1.0E-01
OEP-XHE-XX-NR04HSC0	CONVOLUTION FACTOR FOR CCF-OPR (4HR-SC AVAIL)	2.6E-01
OEP-XHE-XX-NR04HSC1	CONVOLUTION FACTOR FOR 1FTR-OPR (4HR-SC AVAIL)	2.6E-01
OEP-XHE-XX-NR04HSC2	CONVOLUTION FACTOR FOR 2FTR-OPR (4HR-SC AVAIL)	1.2E-01
PPR-MOV-FC-1535	PORV 1 (AOV-1455C) BLOCK VALVE (1535) FAILS TO CLOSE	9.6E-04
PPR-MOV-FC-1536	PORV 2 (AOV-1456) BLOCK VALVE (1536) FAILS TO CLOSE	9.6E-04
PPR-SRV-OO-1455C	PORV 1 (AOV-1455C) FAILS TO OPEN ON DEMAND	3.5E-03
PPR-SRV-CC-1456	PORV 2 (AOV-1456) FAILS TO OPEN ON DEMAND	3.5E-03
PPR-SRV-CF-PRVS	CCF OF PORVS (1456 & 1455C) TO OPEN	2.1E-04
PPR-SRV-CO-L	PORVS/SRVS OPEN DURING LOOP	1.5E-01
PPR-SRV-CO-SBO	PORVS/SRVS OPEN DURING SBO	3.7E-01
RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING) FAILS	1.3E-02
RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING) FAILS	2.0E-01
SWS-HDR-TM-A168	SW HDR A IN MAINTENANCE 168 HR ACTION (IN PSA)	5.5E-03
SWS-HDR-TM-B168	SW HDR B IN MAINTENANCE 168 HR ACTION (IN PSA)	5.5E-03
SWS-HDR-TM-B72	SW HDR B IN MAINTENANCE 72 HR ACTION (IN PSA)	7.9E-04
SWS-MDP-CF-ALLFS	COMMON CAUSE FAILURE OF SWS MPDs TO START	8.5E-07

Appendix B: Key Event Trees and Modified Fault Trees

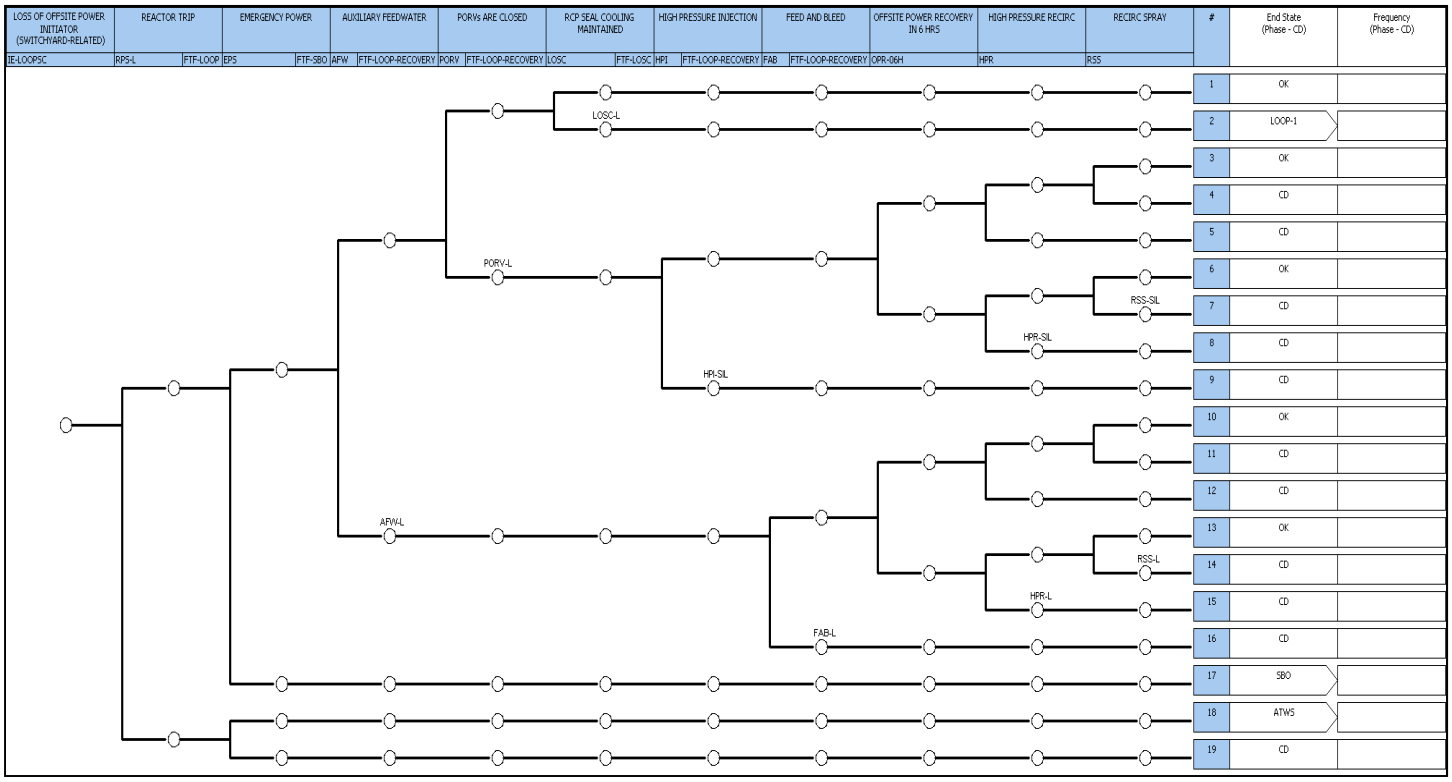


Figure B-1. North Anna, Units 1 and 2 LOOP (Switchyard-Centered) Event Tree.

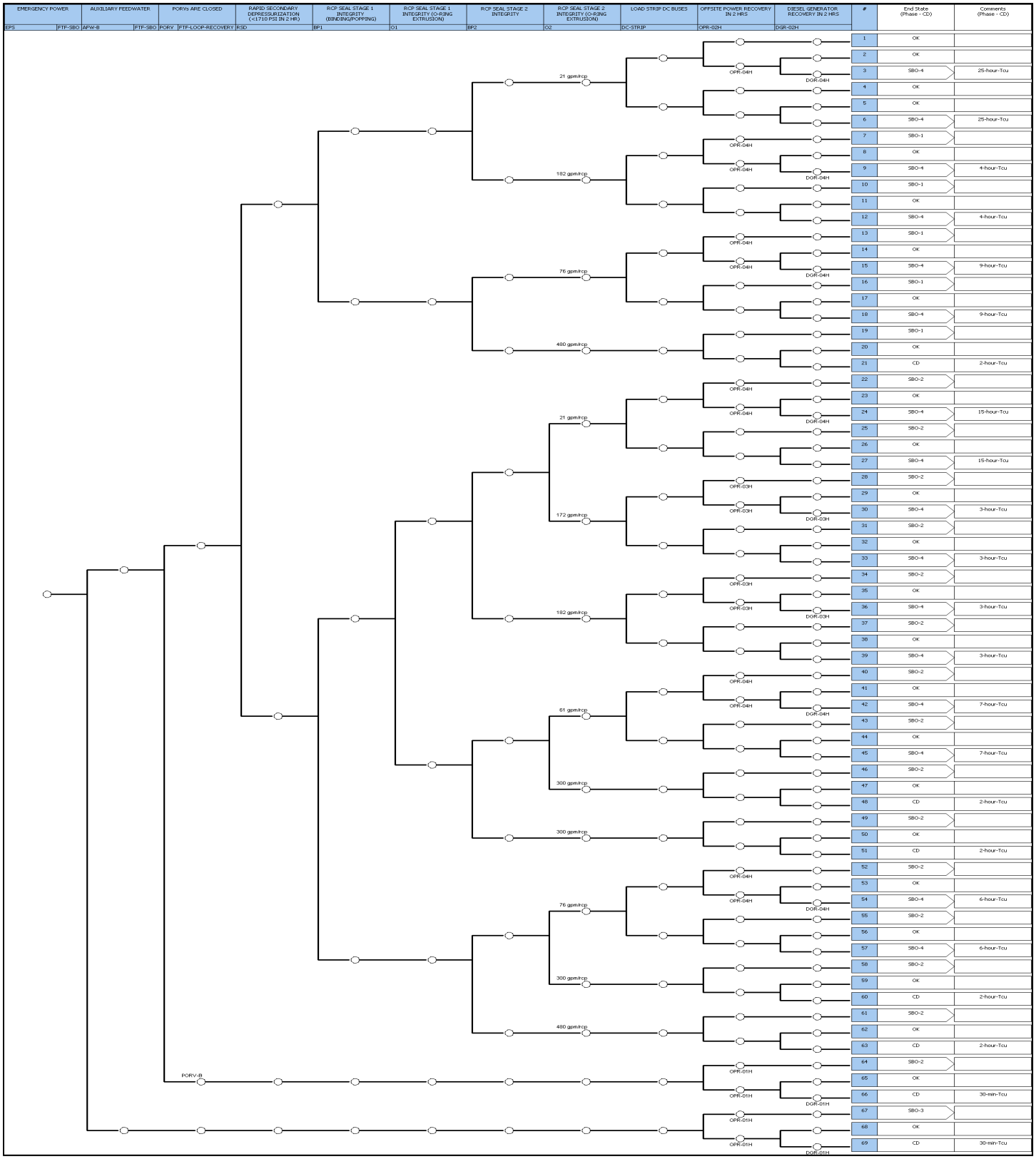


Figure B-2. North Anna, Units 1 and 2 SBO Event Tree.

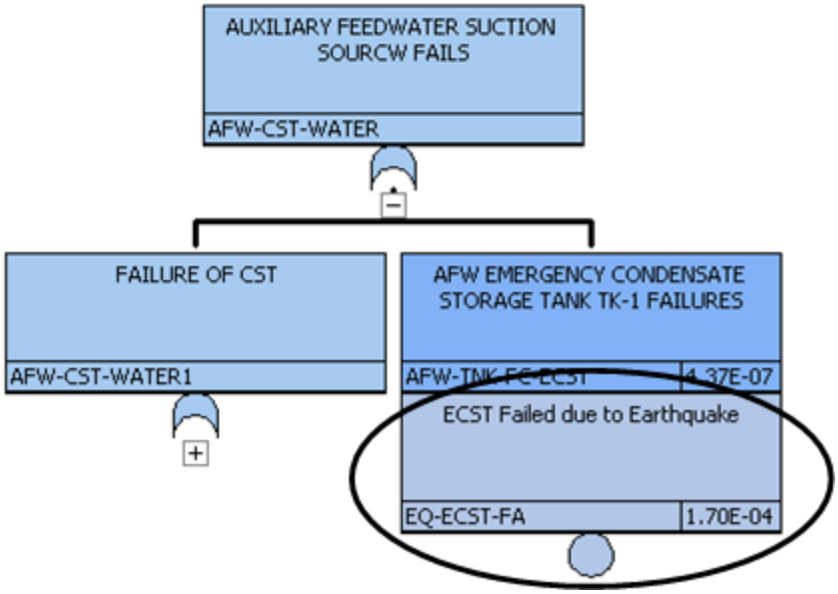


Figure B-3. North Anna, Unit 1 AFW-CST-WATER Fault Tree.

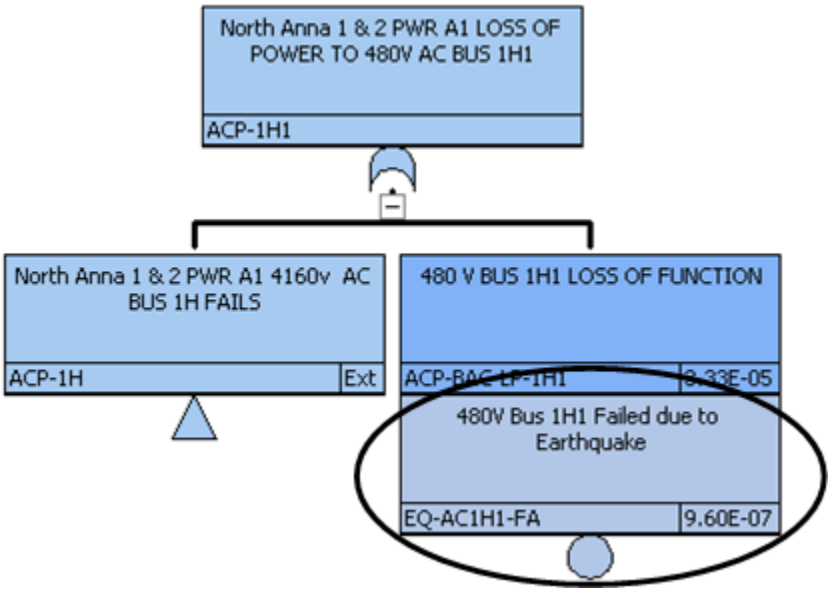


Figure B-4. North Anna, Unit 1 ACP-1H1 Fault Tree.

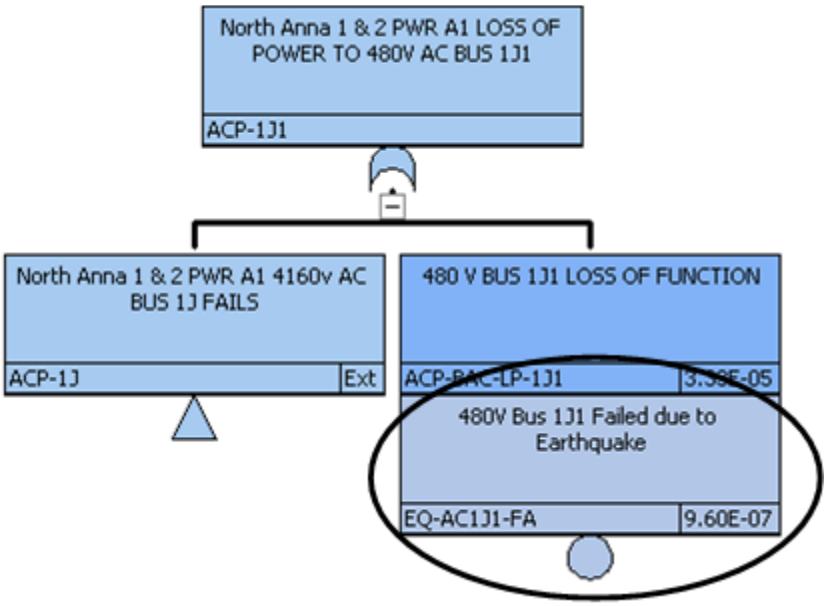


Figure B-5. North Anna, Unit 1 ACP-1J1 Fault Tree.

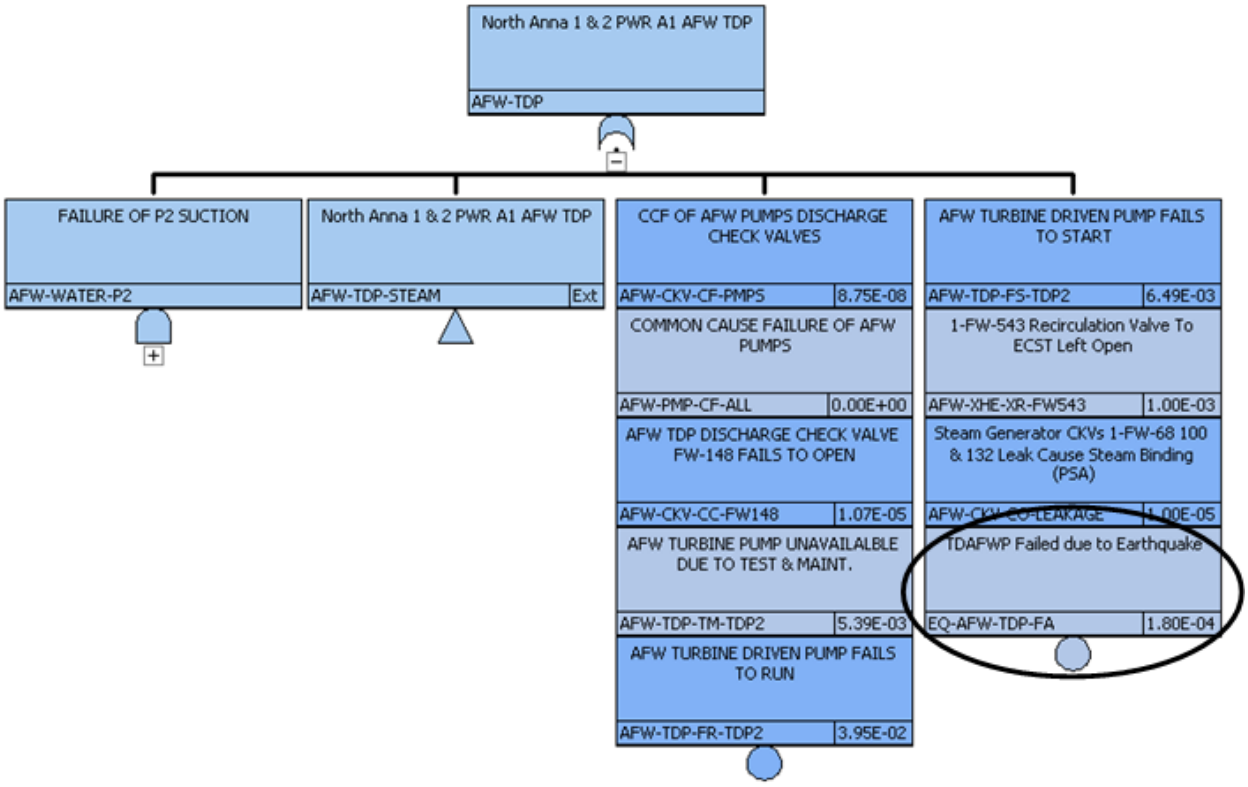


Figure B-6. North Anna, Unit 1 AFW-TDP Fault Tree.

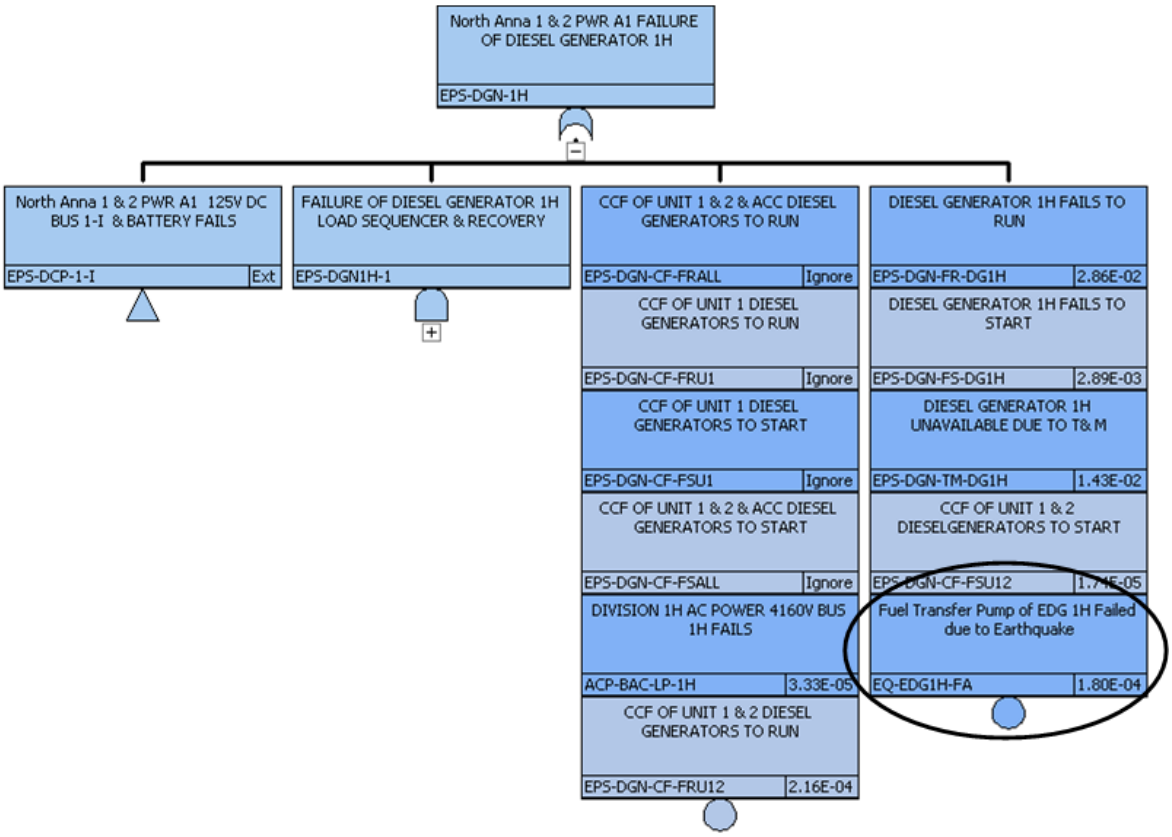


Figure B-7. North Anna, Unit 1 EPS-DGN-1H Fault Tree.

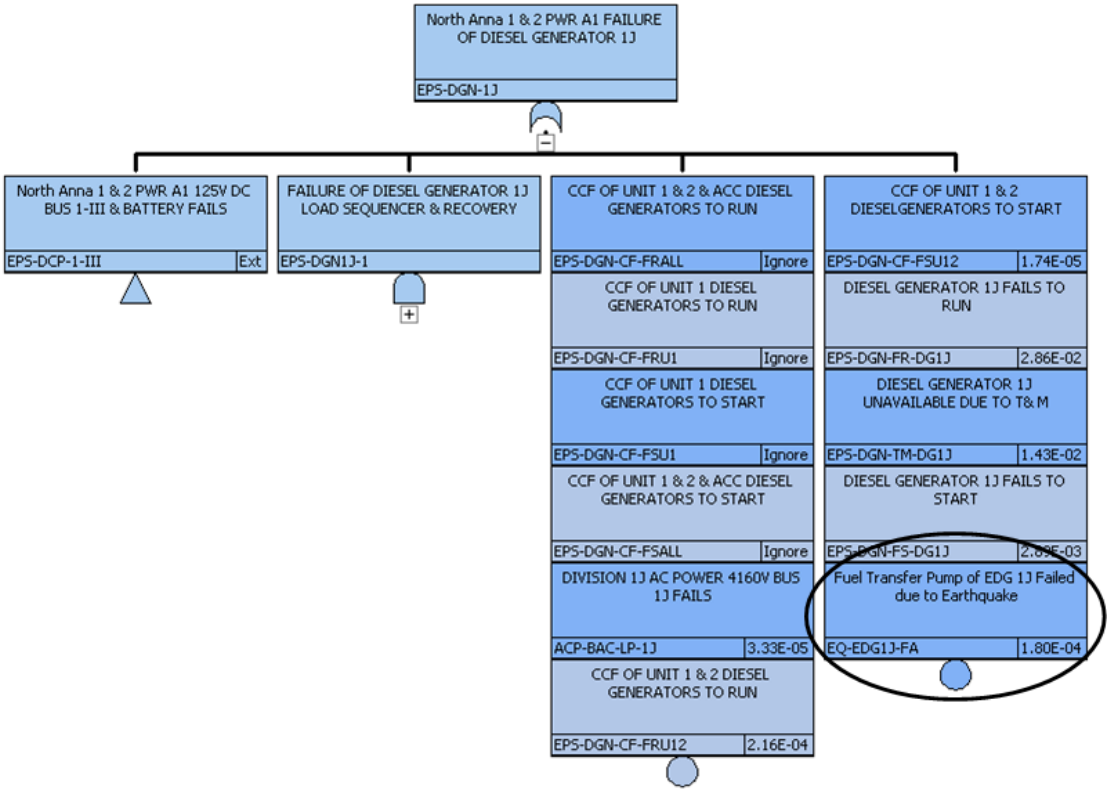


Figure B-8. North Anna, Unit 1 EPS-DGN-1J Fault Tree.

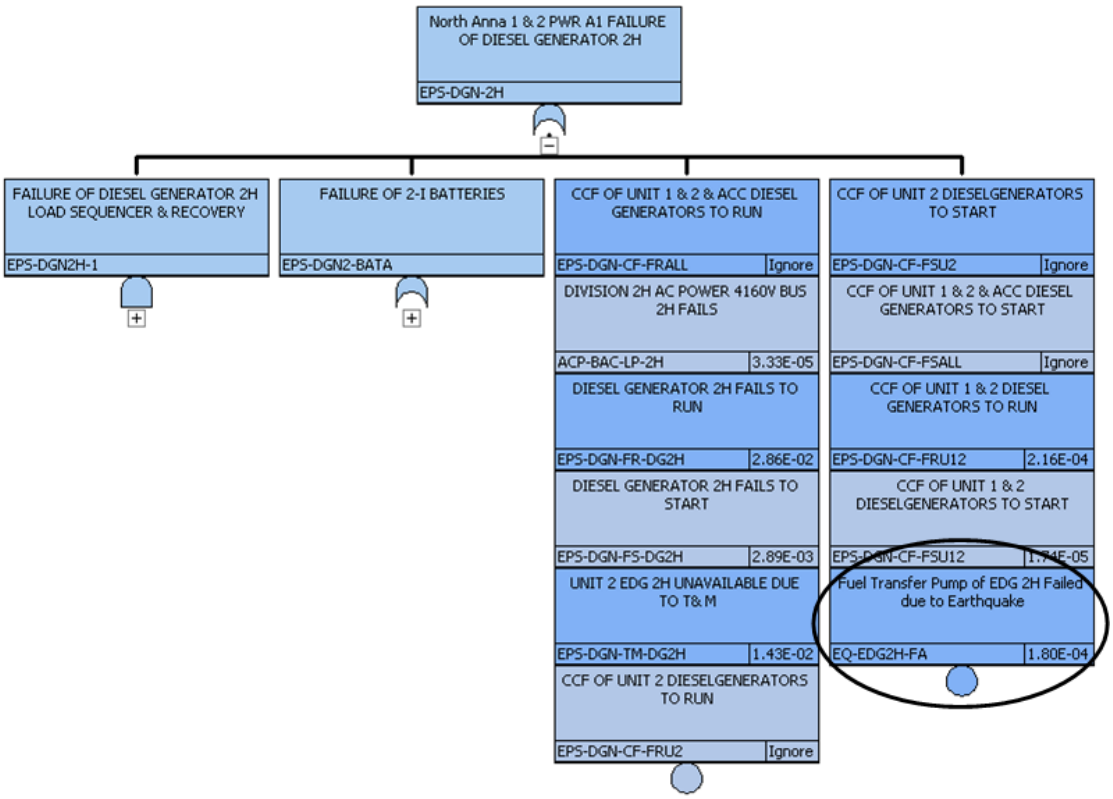


Figure B-9. North Anna, Unit 1 EPS-DGN-2H Fault Tree.

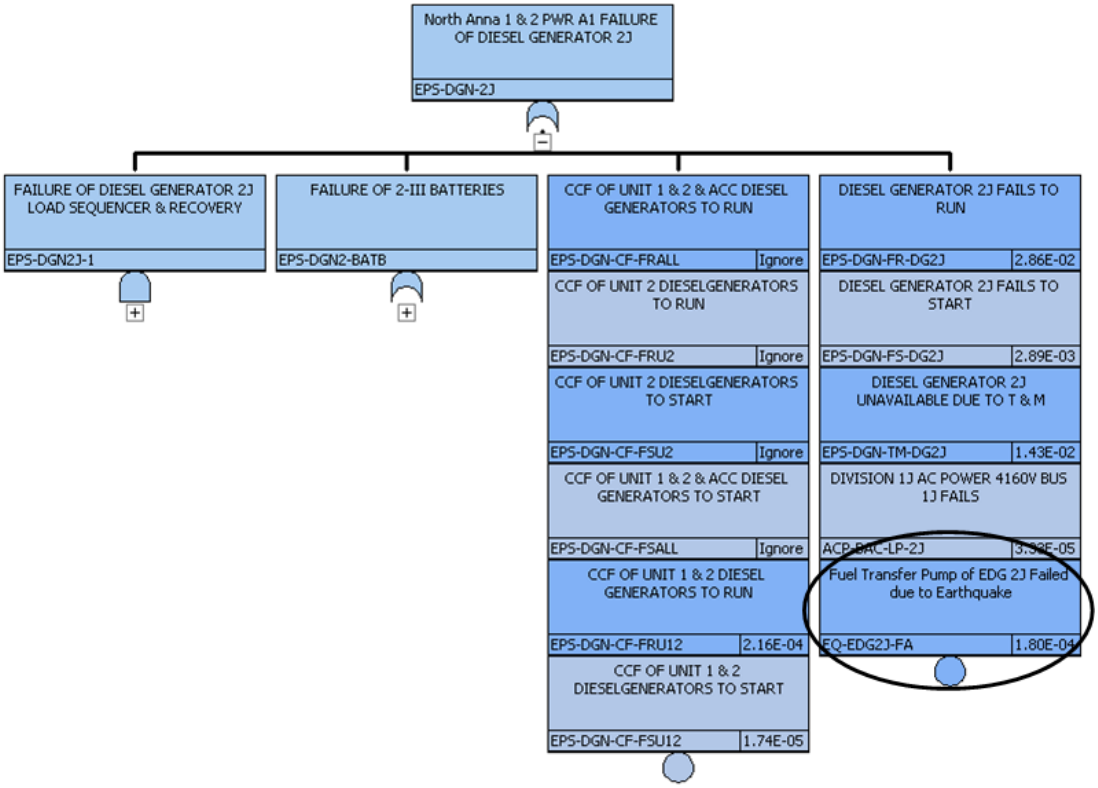


Figure B-10. North Anna, Unit 1 EPS-DGN-2J Fault Tree.

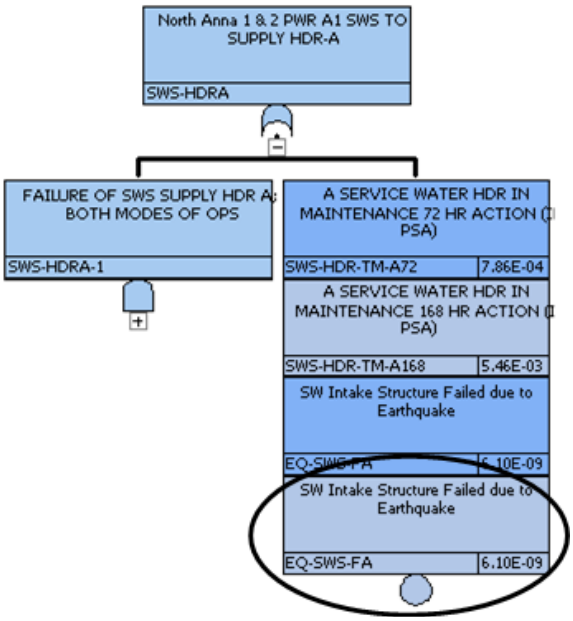


Figure B-11. North Anna, Unit 1 SWS-HDRA Fault Tree.

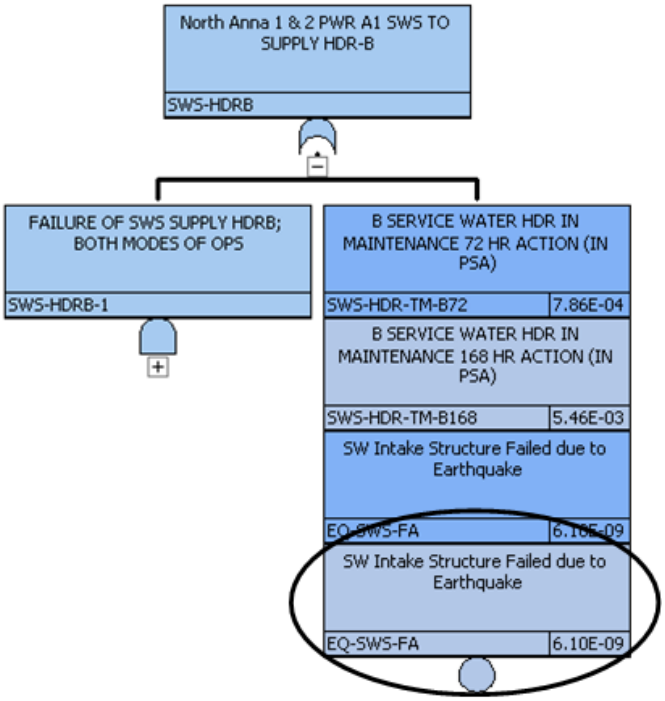


Figure B-12. North Anna, Unit 1 SWS-HDRB Fault Tree.

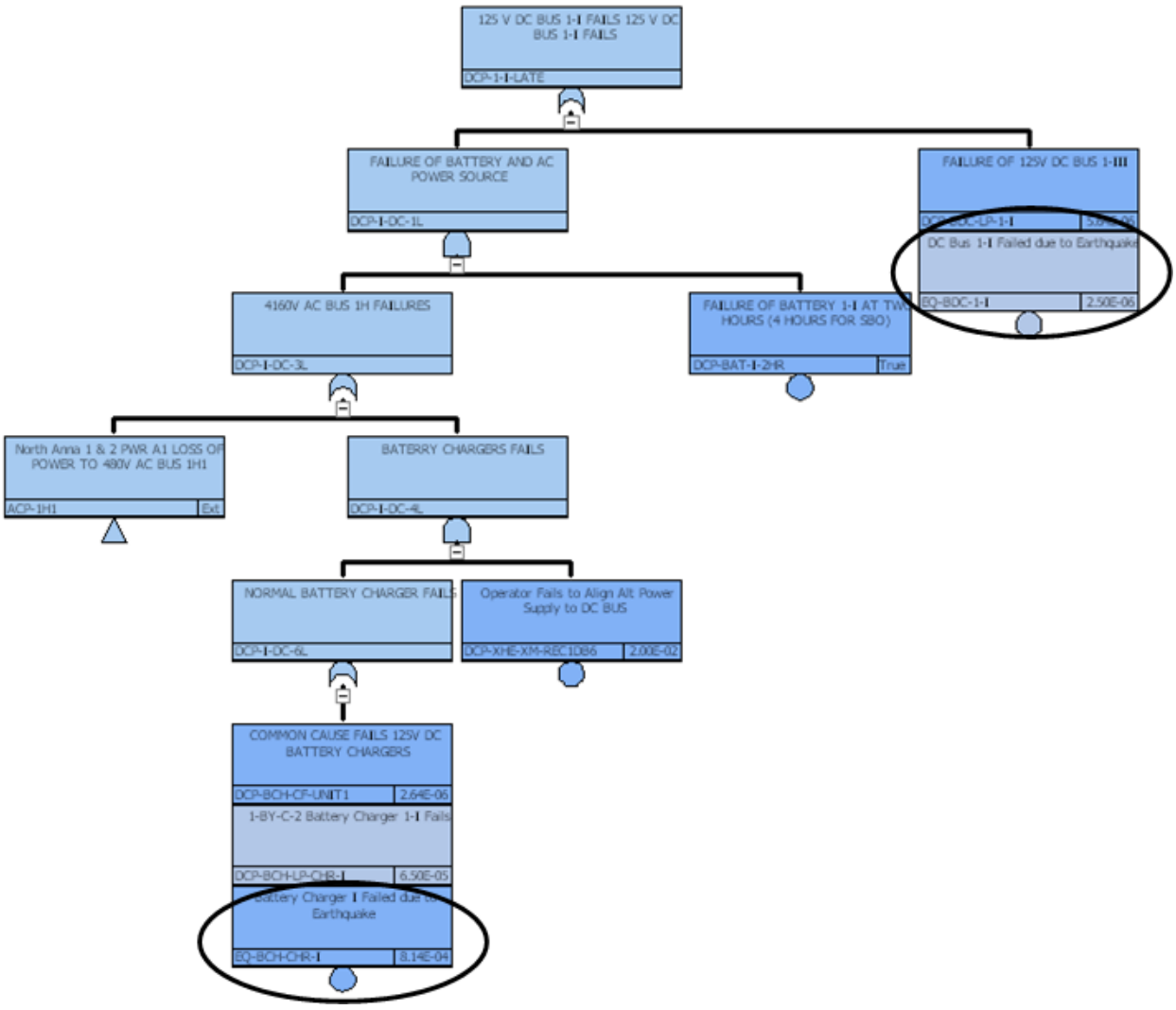


Figure B-13. North Anna, Unit 1 DCP-1-I-LATE Fault Tree.

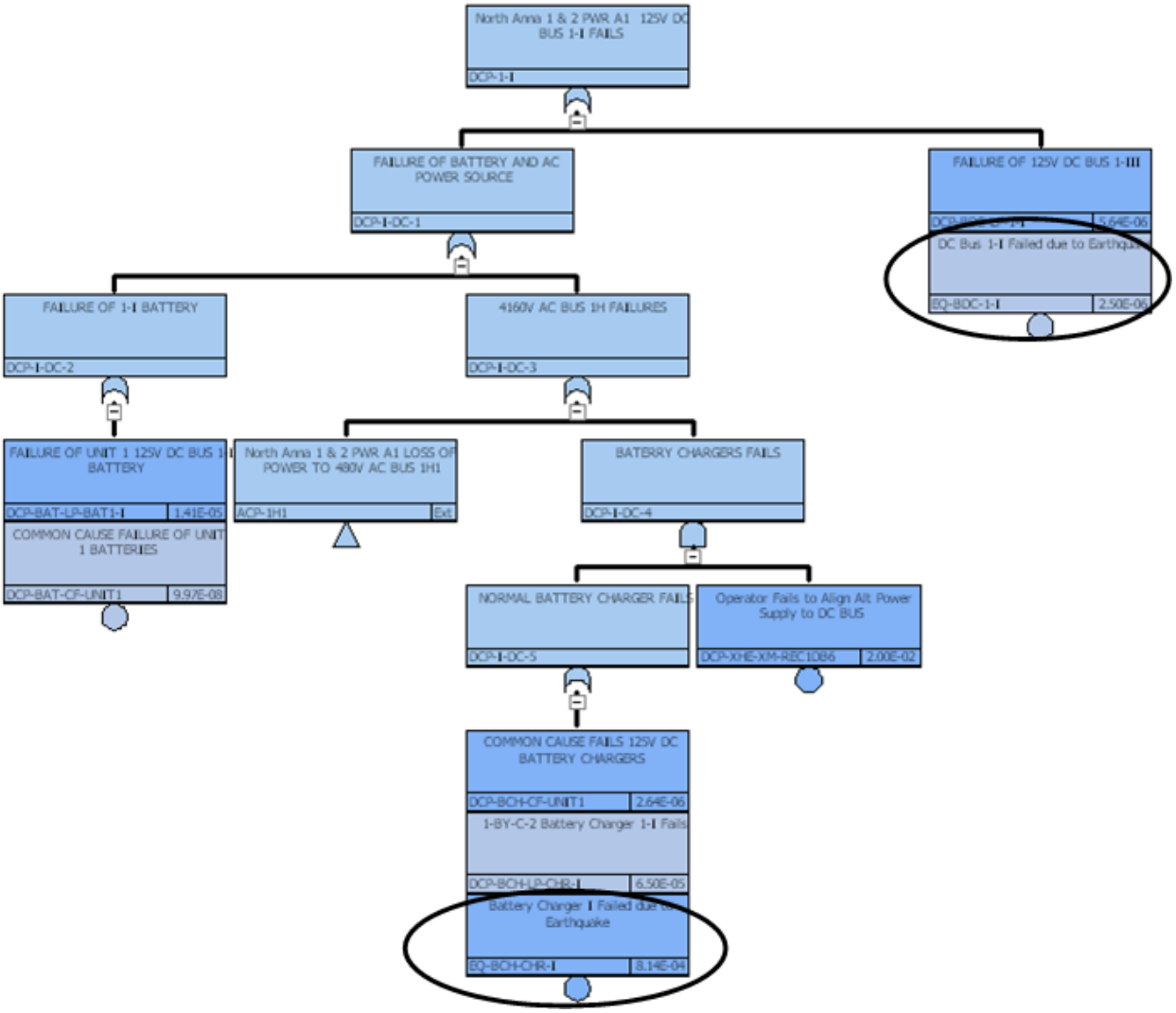


Figure B-14. North Anna, Unit 1 DCP-1-I Fault Tree.

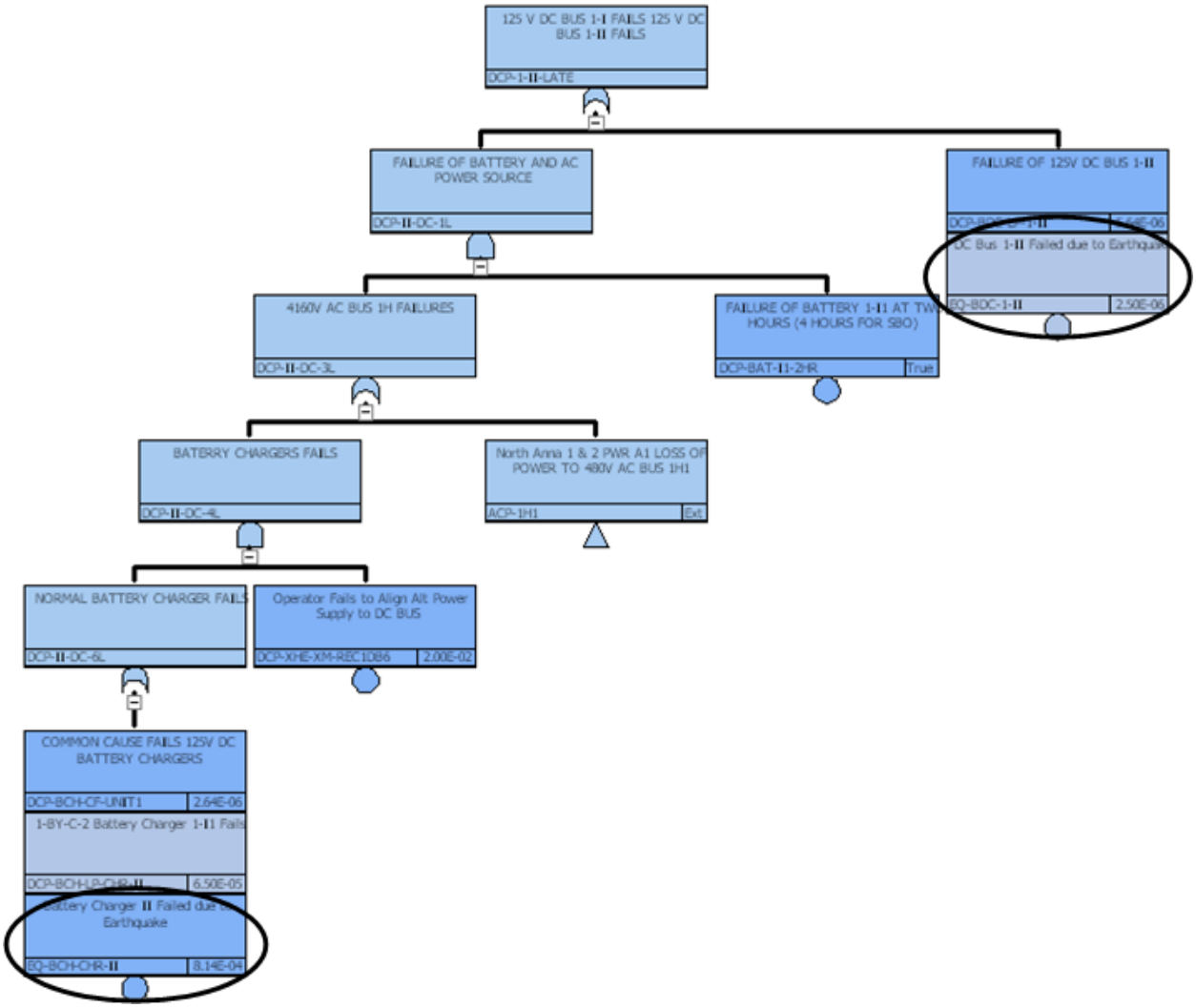


Figure B-15. North Anna, Unit 1 DCP-1-II-LATE Fault Tree.

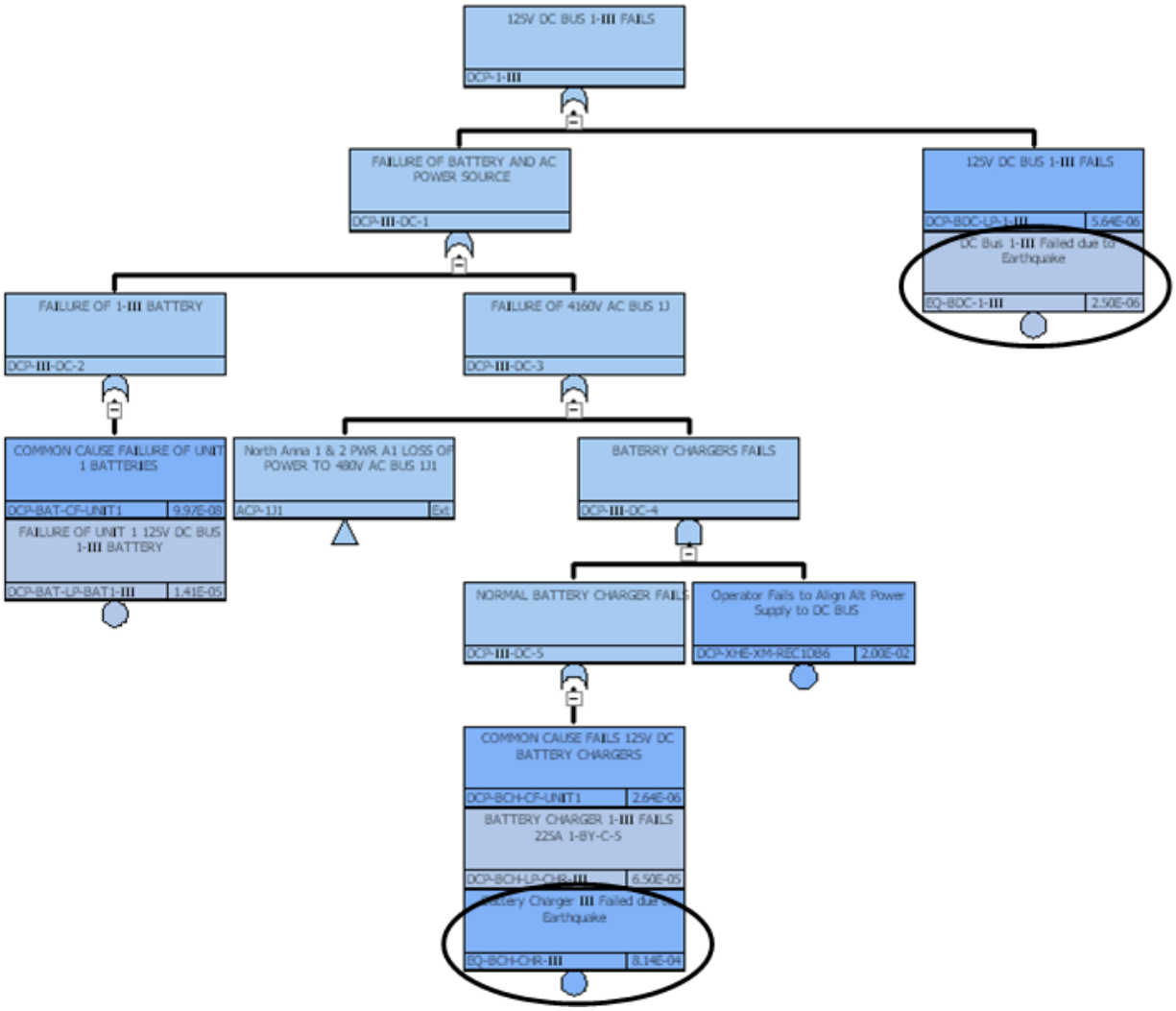


Figure B-16. North Anna, Unit 1 DCP-1-III Fault Tree.

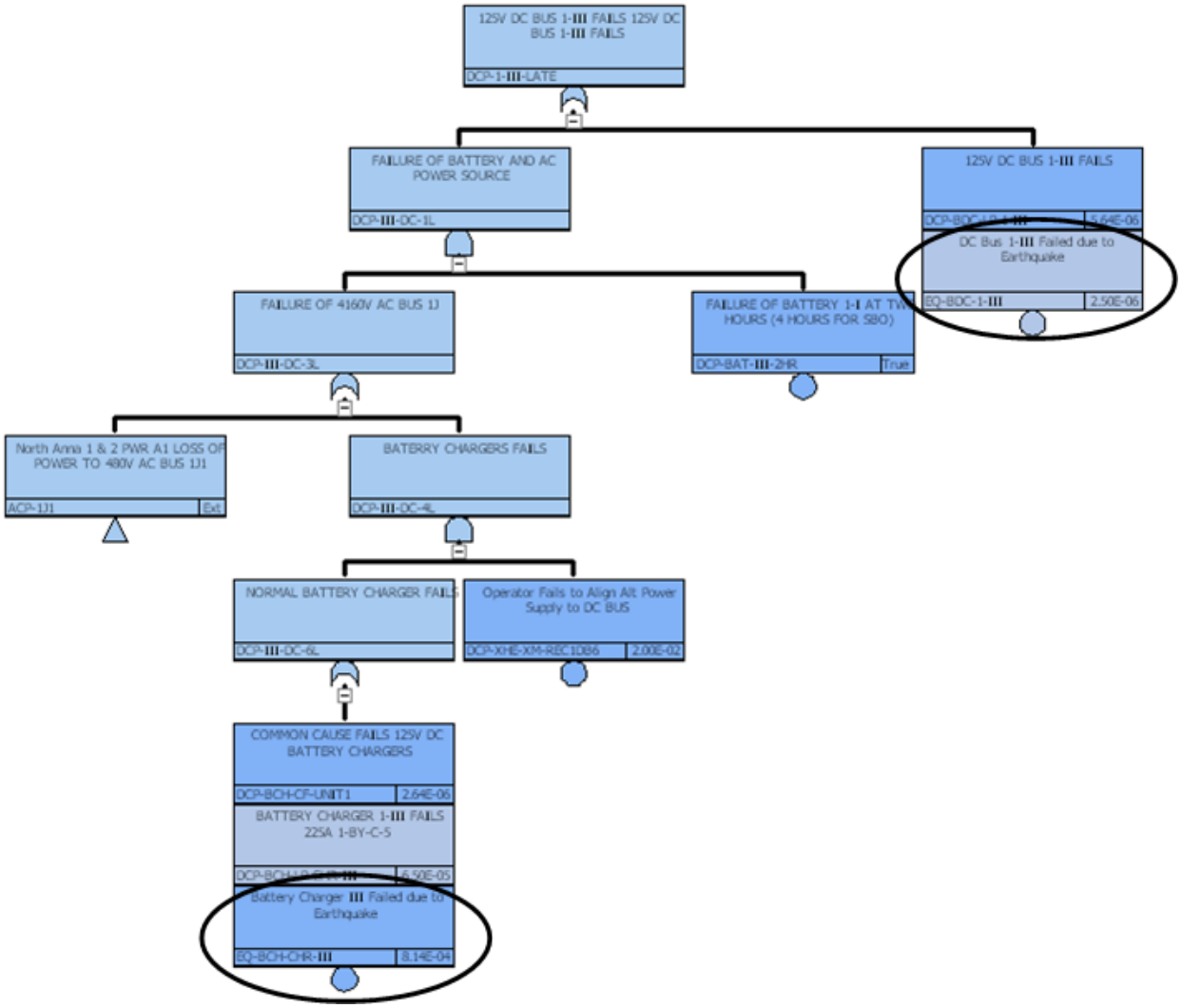


Figure B-17. North Anna, Unit 1 DCP-1-III-LATE Fault Tree.

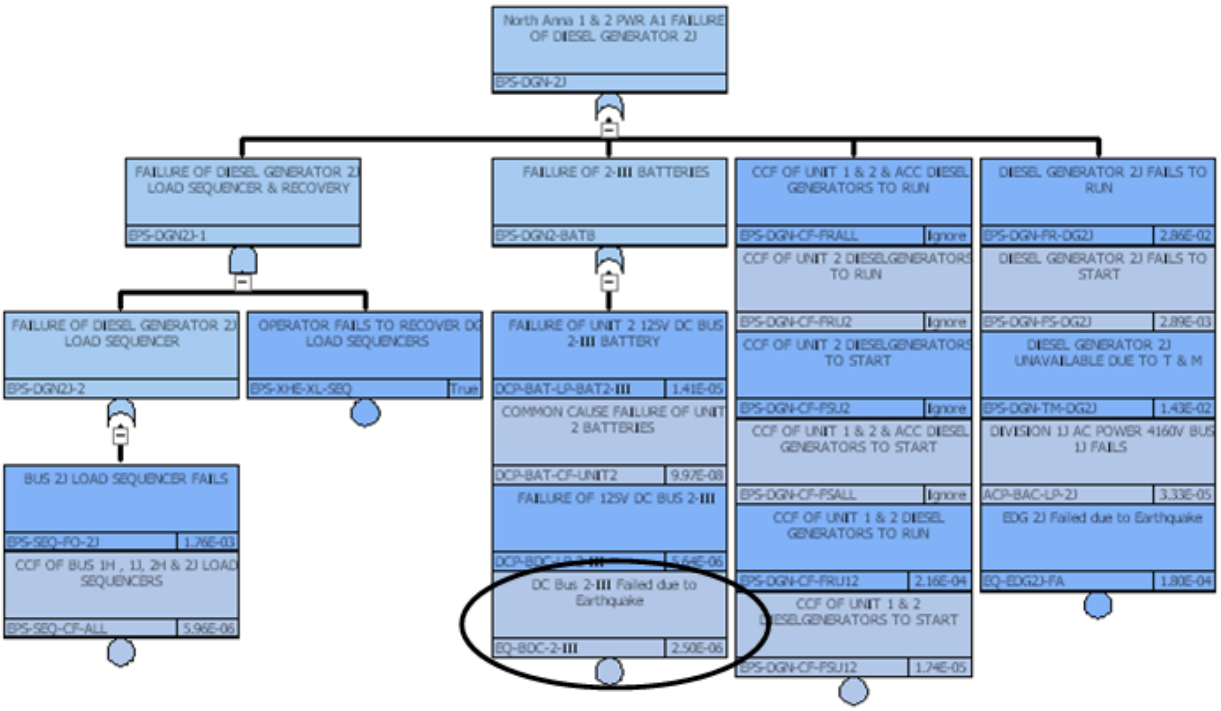


Figure B-18. North Anna, Unit 1 EPS-DGN-2J Fault Tree.

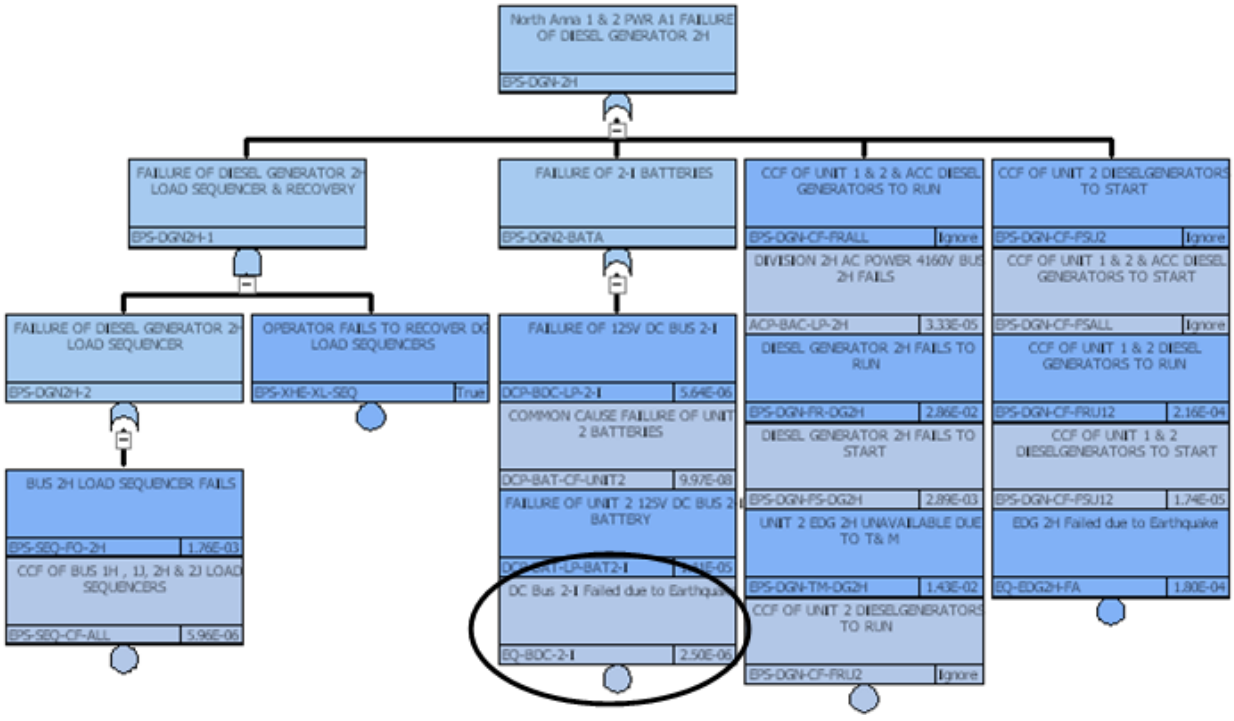


Figure B-19. North Anna, Unit 1 EPS-DGN-2H Fault Tree.

Appendix C: Human Failure Event Quantification

In this analysis, the failure probabilities of six human failure events (HFEs) were evaluated using SPAR-H Human Reliability Analysis Method (Reference 8). These HFEs were quantified in the context of the event that occurred (i.e., the LOOP caused by the earthquake), additional event details such as degradation or unavailability of SSCs (e.g., EDG 2H failure due to coolant leak, Unit 1 TDAFW pump undergoing surveillance testing), operator performance during the event (e.g., successful recovery of offsite power), and the postulated accident sequences. Details of their evaluation, along with a brief background of the SPAR-H method are provided below.

SPAR-H Background. The SPAR-H Method considers the following three factors:

- Probability of failure to diagnose the need for action,
- Probability of failure to successfully perform the desired action, and
- Dependency on other operator actions involved in the specific sequence of interest.

The probability of failure to perform the diagnosis or action component of a HFE is the product of a nominal failure probability (1×10^{-2} for diagnosis or 1×10^{-3} for action) and the following eight performance shaping factors (PSFs):

- Available Time
- Stress
- Complexity
- Experience/Training
- Procedures
- Ergonomics
- Fitness for Duty
- Work Processes

Dependency. Dependency between HFEs was evaluated by reviewing the cutsets. Based on clarified SPAR-H guidance (Reference 9), having multiple HFEs within the same cutset does not automatically constitute dependency and intervening successes are not necessary to break dependency. Unless two HFEs are strongly related (often sequential steps in a procedure), there is probably no dependence (due to the boundaries between HFEs and not sharing subtasks between HFEs). Additionally, dependency is implicitly accounted for by adjusting the PSFs for same deficiency (e.g., stress, complexity) in multiple HFEs. No dependency was identified for any HFE for this analysis.

Analysis HFEs. The following operator actions were evaluated for this analysis; including the calculation of the human error probability (HEP) for each HFE.

1. OEP-XHE-XL-NR04HSC (*Operator Fails to Recover Offsite Power in 4 Hours*)

HFE Definition– Operators fail to restore offsite power to a safety bus within 4 hours (i.e., prior to battery depletion) during a postulated SBO.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. The recovery of offsite power was not possible until after 3 hours. During a postulated loss of all ac (alternate-current) power, and if operators were successful in stripping unnecessary dc loads within one hour, operators could recover offsite power to a safety bus within 4 hours.

Operator Action Success Criteria– Stop DC Turbine Oil Pump and DC Air Side Seal Oil Pump within one hour and restore offsite power to a safety bus within 4 hours.

Cues– No unit safety busses are energized.

Procedural Guidance– Step 35, AP-10, "*Loss of Electrical Power.*"

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The nominal action component of the HEP is 0.001. No event information is available to warrant a change in the action PSFs for this HEP.

PSF	Multiplier	Notes
Time Available	0.1	The available time for this action from the beginning of LOOP is four hours (i.e., the battery depletion time given successful stripping of dc loads within one hour). The recovery of offsite power was not possible until approximately 3 hours after the LOOP occurred; therefore, 1 hour was available for operators to recover power to a safety bus during a postulated SBO. Since the action time required to recover power to a safety bus is minimal (< 5 minutes), the available time for diagnosis is approximately 55 minutes. Therefore, available time for this HFE is assigned as *Extra Time* (i.e., ×0.1; time available is 1 to 2 times nominal and > 30 minute).
Stress	2	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO.
Complexity	2	The PSF for diagnosis complexity is assigned a value of *Moderately Complex* (i.e., ×2) because operators would have to deal with multiple equipment unavailabilities and the concurrent actions/multiple procedures.
Procedures	1	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	1	No event information available to warrant a change from nominal for this HFE.
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.

PSF Composite	**0.40**
Diagnosis HEP	**4E-3**
Action HEP	**1.E-3**
Adjusted Total HEP	**5E-3**

2. **OEP-XHE-XL-NR06H2SC (*Operators Fail to Recover Offsite Power in 6 Hours, Given Failure at 2 Hours*), OEP-XHE-XL-NR07H2SC (*Operators Fail to Recover Offsite Power in 7 Hours, Given Failure at 2 Hours*), OEP-XHE-XL-NR09H2SC (*Operators Fail to Recover Offsite Power in 9 Hours, Given Failure at 2 Hours*), and OEP-XHE-XL-NR10H2SC (*Operators Fail to Recover Offsite Power in 10 Hours, Given Failure at 2 Hours*)**
   HFE Definition– Operators fail to restore offsite power to a safety bus, given TDAFW pump flow to a SG after battery depletion, prior to SG dry-out and core uncovery during a postulated SBO.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. The recovery of offsite power was not possible until after 3 hours. During a postulated loss of all ac (alternate-current) power, and if operators fail to strip unnecessary dc loads within one hour, the batteries would deplete in 2 hours. However, operators could recover offsite power later given TDAFW pump flow to a SG after battery depletion.

Operator Action Success Criteria– Restore offsite power to a safety bus prior to SG dry-out and core uncovery.

Cues– No unit safety busses are energized.

Procedural Guidance– Step 35, AP-10, "*Loss of Electrical Power.*"

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The nominal action component of the HEP is 0.001. No event information is available to warrant a change in the action PSFs for this HEP.

PSF	Multiplier	Notes
Time Available	0.1	The available time for this action from the beginning of LOOP is a minimum of 6 hours. The recovery of offsite power was not possible until approximately 3 hours after the LOOP occurred; therefore, a minimum of 3 hours was available for operators to recover power to a safety bus during a postulated SBO. Since the action time required to recover power to a safety bus is minimal (< 5 minutes), the available time for diagnosis is would be a minimum of almost 3 hours. Therefore, available time for this HFE is assigned as *Extra Time* (i.e., ×0.1; time available is 1 to 2 times nominal and > 30 minute).
Stress	2	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO.
Complexity	2	The PSF for diagnosis complexity is assigned a value of *Moderately Complex* (i.e., ×2) because operators would have to deal with multiple equipment unavailabilities and the concurrent actions/multiple procedures.
Procedures	1	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	1	No event information available to warrant a change from nominal for this HFE.
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.
PSF Composite	**0.40**	
Diagnosis HEP	**4E-3**	
Action HEP	**1.E-3**	
Adjusted Total HEP	**5E-3**	

3. DCP-XHE-XA-STRIP (*Operators Fail To Strip DC Loads in 1 Hour*)

HFE Definition– Operators fail to strip applicable dc loads within one hour.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. Operators need to strip the unnecessary dc loads within 1 hour during a postulated loss of all ac power to extend the life of the batteries to 4 hours.

Operator Action Success Criteria– Stop DC Turbine Oil Pump and DC Air Side Seal Oil Pump within one hour given a loss of all ac power.

Cues– No unit safety busses are energized.

Procedural Guidance– Step 20, ECA-0.0, "*Loss of All AC Power.*"

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The action component of the HEP is negligible (i.e., the action probability is expected to be at least one order of magnitude less than the diagnosis probability).

PSF	Multiplier	Notes
Time Available	1	The available time for this HFE from the onset of SBO is one hour. The operators would need minimal time (< 1 minute) to stop the DC Turbine Oil Pump and to stop DC Air Side Seal Oil Pump. However, there are 19 steps in ECA-0.0 before this action. Operators may need up to 40 minutes to perform Steps 1–19; Therefore, the time available for diagnosis was assigned as *Nominal* (i.e., ×1).
Stress	2	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO.
Complexity	1	No event information available to warrant a change from nominal for this HFE.
Procedures	0.5	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	1	No event information available to warrant a change from nominal for this HFE.
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.
PSF Composite	**1.0**	
Diagnosis HEP	**1E-2**	
Adjusted Total HEP	**1E-2**	

4. EPS-XHE-XM-AAC (*Operators Fail To Start and Align SBO Diesel Generator to Bus 2H*)

HFE Definition– Operators fail to start and align the SBO diesel generator to Bus 2H.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. EDG 2H failed to run and operators would need to start and align the SBO diesel generator to Bus 2H within a minimum of one hour (depending on the sequence).

Operator Action Success Criteria– Start and align the SBO diesel generator to Bus 2H within a minimum of one hour.

Cues– Bus 2H is not energized.

Procedural Guidance– Step 12, ECA-0.0, "*Loss of All AC Power.*"

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The action component of the HEP is negligible (i.e., the action probability is expected to be at least one order of magnitude less than the diagnosis probability).

PSF	Multiplier	Notes
Time Available	1	The available time for this HFE from the onset of SBO is a minimum of one hour. Operators would take approximately 10 minutes to work through AP-10, "*Loss of Electrical Power*" and 30 minutes to actually align the SBO to a given emergency bus per 0-OP-6.4, "*Operation of the SBO Diesel (SBO Event)*". The available time for diagnosis is approximately 20 minutes. Therefore, the time available for diagnosis was assigned as *Nominal* (i.e., ×1).
Stress	2	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO.
Complexity	2	The PSF for diagnosis complexity is assigned a value of *Moderately Complex* (i.e., ×2) because operators would have to deal with multiple equipment unavailabilities and the concurrent actions/ multiple procedures.
Procedures	0.5	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	1	No event information available to warrant a change from nominal for this HFE.
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.
PSF Composite	**2**	
Diagnosis HEP	**2E-2**	
Adjusted Total HEP	**2E-2**	

5. AFW-TDP-TM-TDP2 (*AFW Turbine Pump Unavailable due to Test and Maintenance*)

HFE Definition– Operators fail to manually realign the TDAFW pump (from testing) to feed a SG before dry out. This definition is a modification from the standard HFE definition for this basic event. The HFE implicitly includes that the TDAFW pump was in testing at the onset of the LOOP initiating event.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. EDG 2H failed to run. AFW TDP is in surveillance test. Operators would need to stop the test and to reset and re-initiate the AFW TDP to feed a SG.
Operator Action Success Criteria– Reset and re-initiate the AFW TDP before the S/G dry out (approximately 40 minutes).

Cues– AFW flow rate is less than 340 gpm.

Procedural Guidance– Step 8, ECA-0.0, "*Loss of All AC Power.*"

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The action component of the HEP is negligible (i.e., the action probability is expected to be at least one order of magnitude less than the diagnosis probability).

PSF	Multiplier	Notes
Time Available	1	The available time for this HFE is around 40 minutes (time to dry out the S/G). Since the action time required to stop the surveillance test, re-set, and re-align the AFW TDP is around 20 minutes, the available time for diagnosis is approximately 20 minutes. Therefore, the time available for diagnosis was assigned as *Nominal* (i.e., ×1).
Stress	2	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO.
Complexity	2	The PSF for diagnosis complexity is assigned a value of *Moderately Complex* (i.e., ×2) because operators would have to deal with multiple equipment unavailabilities and the concurrent actions/ multiple procedures.
Procedures	0.5	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	1	No event information available to warrant a change from nominal for this HFE.
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.
PSF Composite	**2**	
Diagnosis HEP	**2E-2**	
Adjusted Total HEP	**2E-2**	

6. AFW-XHE-XM-CNTRL (*OPERATOR FAILS TO CONTROL AFW TDP*)

HFE Definition– Operators fail to manually control TDAFW pump flow rate (outside the control room) after battery depletion to maintain the adequate SG level.

Description and Event Context– The earthquake caused multiple transformers to lock out due to activation of the sudden pressure relays resulting in the loss of offsite power. EDG 2H failed to run. If operator cannot restore the ac power prior to battery depletion which leads to battery depletion and subsequent losses of dc power and SG level indication.

Operator Action Success Criteria– Control the TDAFW pump flow manually (outside the control room) to maintain adequate SG level without.

Cues– Losses of dc power and SG level indication.

Procedural Guidance– None.

Diagnosis/Action– This HFE contains sufficient diagnosis activities. The action component of the HEP is negligible (i.e., the action probability is expected to be at least one order of magnitude less than the diagnosis probability).

PSF	Multiplier	Notes
Time Available	1	Time was determined not to be a performance driver for this HFE; therefore, the available time was assigned as *Nominal* (i.e., ×1).
Stress	1	Stress was determined not to be a performance driver for this HFE; therefore, Stress was assigned as *Nominal* (i.e., ×1).
Complexity	1	Complexity was determined not to be a performance driver for this HFE; therefore, the Complexity was assigned as *Nominal* (i.e., ×1).
Procedures	1	No event information available to warrant a change from nominal for this HFE.
Experience/Training	1	No event information available to warrant a change from nominal for this HFE.
Ergonomics/HMI	50	The loss of SG level indication was determined to be the key performance driver for this HFE; therefore, the Ergonomics/ HMI was assigned as *Missing/Misleading* (i.e., ×50).
Fitness for Duty	1	No event information available to warrant a change from nominal for this HFE.
Work Processes	1	No event information available to warrant a change from nominal for this HFE.
PSF Composite	**50**	
Diagnosis HEP	**0.5**	
Adjusted Total HEP	**0.5**	

The enclosure containing the final analysis report is being provided for your information. If you have any questions, please contact me at (301) 415-2597.

Sincerely,

/RA/

V. Sreenivas, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

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NAME	VSreenivas	SFigueroa	RPascarelli	VSreenivas
DATE	02/13/13	02/15/13	02/21/13	02/26/13

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