Final Precursor Analysis

Accident Sequence Precursor Program – Office of Nuclear Regulatory Research

Wolf Creek Generating Station	Multiple Switchyard Faults Cause Reactor Trip and Subsequent Loss of Offsite Power	
Event Date: 01/13/2012	**LER:** 482/12-001 **IRs:** 50-482/12-08, 50-482/12-09, 50-482/12-10	**CCDP =** 5×10^{-4}

EVENT SUMMARY

Event Description. On January 13, 2012, at 2:02 p.m. CST, the site experienced a loss of offsite power (LOOP). The event resulted from two distinct faults. The first fault was on Phase "C" of the Main Generator Output Breaker 345-60. This fault resulted in the 345 kV East Bus differential relay protective logic to open Breakers 345-120, 345-90, 345-60, 13-48, and 69-16, which together de-energized the East Bus. As a result of the location of the fault on Phase "C" of Breaker 345-60, the main generator differential relay protective logic opened Breaker 345-50. This resulted in a main generator trip signal, and started the sequence of events to shift the source of power to most station loads from the Unit Auxiliary Transformer (UAT) to the Startup Transformer (SUT) in a sequence called a fast bus transfer. The fast bus transfer resulted in Breakers PA0211 and PA0101 opening, and Breakers PA0202 and PA0110 closing. This completed the fast bus transfer and now had the station loads aligned through the SUT.

The second fault, a phase differential, occurred on Phase "B" of the SUT and resulted in the 345 kV West Bus differential relay protective logic opening Breakers 345-40, 345-70, and 345-110, de-energizing the remaining portions of the switchyard. It also resulted in the SUT phase differential relay protective logic opening Breakers PA0110, PA0201, and PA0202. The sequence of events to this point all occurred in approximately 12 cycles (about 0.2 seconds) resulting in Wolf Creek experiencing a LOOP condition. Emergency Diesel Generators A and B automatically started and powered their respective safety buses approximately eight seconds after the start of the event. At 2:15 p.m., the shift manager declared a Notification of Unusual Event based on the expectation that the LOOP would last longer than 15 minutes. At 4:45 p.m., the 345 kV East Bus was reenergized from the La Cygne line by closing Breaker 345-120, restoring offsite power to the Train A safety-related components (Bus NB01). At 5:09 p.m., the Notification of Unusual Event was terminated.

On January 15th, operators restored offsite power to Bus NB02 by closing the Alternate Feeder Breaker NB0212 to power Train B from Train A once in Mode 5 and EDG B was secured. Electrical repairs were not completed until February 4th, when the SUT was returned to service and damaged wires and a bus potential transformer for Breakers PA0201 and PA0110 were replaced and the breakers were returned to service. See References 1–3 for further details.

Sequence of Key Events. The following table provides a sequence of key events:

January 13, 2012	The plant is at one hundred percent rated thermal power, with no plant evolutions in progress, transmission switching, or adverse weather

	conditions; pressurizer PORV Block Valve BB-8000A is closed due to PCV-455A leakage.
14:02	Main Generator Output Breaker 345-60 on Phase "C" develops a fault leading to a main generator transformer lockout. East Bus 345-120 Breakers 345-120, 345-90, and 345-60 open; therefore, de-energizing the 345 kV East Bus. A Unit Trip Signal is received; the main turbine trips. Main Generator Output Breaker 345-50 breaker opens and Transformer No. 7 Breaker 13-48opens, removing power to Train A Safety Bus. Fast bus transfer of non-vital buses from UAT to SUT begins, Breakers PA0211 and PA0101 open, and Breakers PA0202 and PA0110 Close completing the fast transfer. SUT protective relay trips on Phase "B" differential causing 345 kV West Bus differential lockout. West Bus Breakers 345-40, 345-110, and 345-70 open; therefore, de-energizing the 345 kV West Bus. Breakers PA0202, PA0110, PA0201 open isolating the SUT from the Train B Safety Bus. Reactor Main Trip Breaker B opens and the reactor trips due to turbine trip and reactor power greater than 50 percent. The plant is in Mode 3. Breakers NB0112 and NB0209 open, therefore, offsite power is completely disconnected from both safety buses. Instrument air pressure starts to decrease due to loss of power to the air compressors. Letdown isolates due to loss of power. SG atmospheric dump valve (ADV) A opens.
14:03	Motor-driven fire pump and the jockey fire pump are without power as a result of the LOOP. A temporary diesel-driven fire pump is drained to prevent freezing and does not start automatically on loss of power (normal diesel-driven fire pump would have started automatically). Loops 2 and 3 supply valves to turbine-driven AFW opens. SG ADV B, C, and D open. EDGs A and B are running; Output Breakers NB0111 and NB0211 close, re-energizing both safety buses. Steam dump valves cycle open and close until the instrument air header is depleted. SG ADV B closes.
14:04	SG ADVs A, C, and D close.
14:08	Charging flow starts to increase due to loss of instrument air to containment.
14:09	Main steam isolation valves are manually closed to arrest the cooldown.
14:10	Instrument air containment isolation valve is closed.
14:12	Commenced EMG ES-02, "Reactor Trip Response."
14:13	Completed EMG E-0, "Reactor Trip or Safety Injection." Charging flow reaches maximum rate as a result of loss of instrument air to containment. With no letdown and maximum charging, the pressurizer begins to fill and reactor coolant system pressure starts to increase.
14:15	Notification of Unusual Event is declared due to a LOOP expected to last longer than 15 minutes.
14:16	Source range nuclear instruments have energized.
14:19	Pressurizer PORV PCV-456A begins to cycle open and closed.

14:28	Instrument air compressors are restarted; instrument air pressure returning to normal. Charging flow returns to normal.
14:34	Pressurizer PORV PCV-456A reseats for the final time; the valve cycled 23 times during the 15-minute period.
14:35	Letdown restored to service; reactor coolant system pressure is maintained below pressurizer PORV setpoint for remainder of event.
14:37	Site watch reported Breaker 345-60 has visible damage.
14:47	Fire protection informed to commence fire impairments for LOOP.
15:00	Fire protection discussed with control room that the station did not have fire water system available. Reestablishing fire water was not a priority for operations at this time.
15:01	Natural circulation flow verified per EMG ES-02, “Reactor Trip Response, Attachment A.”
15:02	One hour continuous fire watch compensatory measures were not established.
15:30	Restored spent fuel pool cooling.
15:50	Completed EMG ES-02, “Reactor Trip Response.”
15:51	Commenced EMG ES-04, “Natural Circulation Cooldown.”
16:45	Senior reactor operator reviewing post-trip review trends identifies possible water leak inside containment; suspect essential service water based on containment parameters. 345 kV East Bus re-energized from La Cygne line by closing Breaker 345-120. The air disconnects for Breaker 345-60 were opened first.
16:56	Shift manager directed the site watch to rack out the motor-driven fire pump breaker. Site watch made several attempts to prime and start the temporary diesel-driven fire pump.
17:00	Closed Transformer No. 7 Breaker 13-48 to energize Train A Safety Bus from offsite source.
17:09	Exited the Notification of Unusual Event.

Additional Event Information. The following event details are provided as additional information about the event. This additional information was not factored in the modeling of this analysis due to the negligible risk impact. See References 2 and 3 for further details.

- The turbine-driven auxiliary feedwater pump (AFW) pump experienced an inadvertent actuation of the over-speed trip mechanism while the operators were shutting it down after it had operated continuously for 12.5 hours. Inspectors determined that inadequate preventive maintenance caused of the mechanical over-speed trip was inadequate engagement between the head lever and tappet nut on the turbine control mechanism. The potential of the turbine-driven AFW pump to trip due to this deficiency is limited to seismic, or other jarring events; therefore, the reliability of pump was not changed for this analysis.

- In addition to the over-speed trip upon pump shutdown, the turbine-driven AFW pump was run for several hours with flow dynamics inconsistent with its long-term operation.

Inspectors concluded that the pump bearings were neither damaged nor experienced any detectable wear. The operation of the pump outside of its normal operating condition was considered an equipment qualification issue that might affect its long-term operation, but it was not a factor in response for this event.

- A generator field ground alarm was received for EDG B; the generator had been operating for 22.5 hours when the alarm came in and continued to operate normally for another 18 hours until it was no longer needed. Since, the diesel fulfilled its mission time; no changes to the EDG reliability were made for this analysis.

- Two hours and 43 minutes into the event, a senior reactor operator reviewing post trip review trends identified a possible water leak inside containment. It was later determined that the water leak was about 5 gpm from the essential service water (ESW) system piping at Reactor Containment Air Cooler C. Inspectors concluded that the leak in the ESW system was too small to challenge the function of the system (even if the leak had not been as quickly isolated during the event). The team concluded that the pipe pitting corrosion experienced during recent history was unlikely to produce leaks of a size that could challenge the system function based on historical problems and non-destructive examination results for system piping.

- The count rate on source range nuclear instrument NI-31 began to increase when post-trip reactor power was decreasing as expected on NI-32 (this occurred with all rods inserted and the reactor shutdown). The licensee had previous experience that showed that, as reactor cavity temperature increased upon a loss of reactor cavity cooling (in this case as a result of the LOOP), the count rate on NI-31 would increase. This resulted in having only one reliable source range nuclear instrument remaining operable until reactor cavity temperatures decreased during the plant cooldown, which took about seven hours. However, the licensee can monitor and credit the Gamma Metrics detectors in addition to the source range nuclear instruments and was able to comply with Technical Specifications under these conditions.

- Temporary modifications were performed to restore power to chemistry and health physics equipment to support reactor coolant chemistry sampling. Additional temporary modifications were performed to power other non-vital loads, such as auxiliary building sump pumps and emergency diesel generator air compressors. These modifications were not required to safely shutdown the plant.

- The licensee performed an emergency hydrogen purge of the main generator to prevent dangerous hydrogen leakage because the battery powering the seal oil pumps was being depleted; and later they had a tractor trailer of CO_2 delivered to purge the hydrogen from the main generator, since the installed CO_2 system had not been functional since 2008.

Simplified Electrical Drawing. Figure 1 provides a simplified drawing of the electrical distribution systems for Wolf Creek Generating Station.

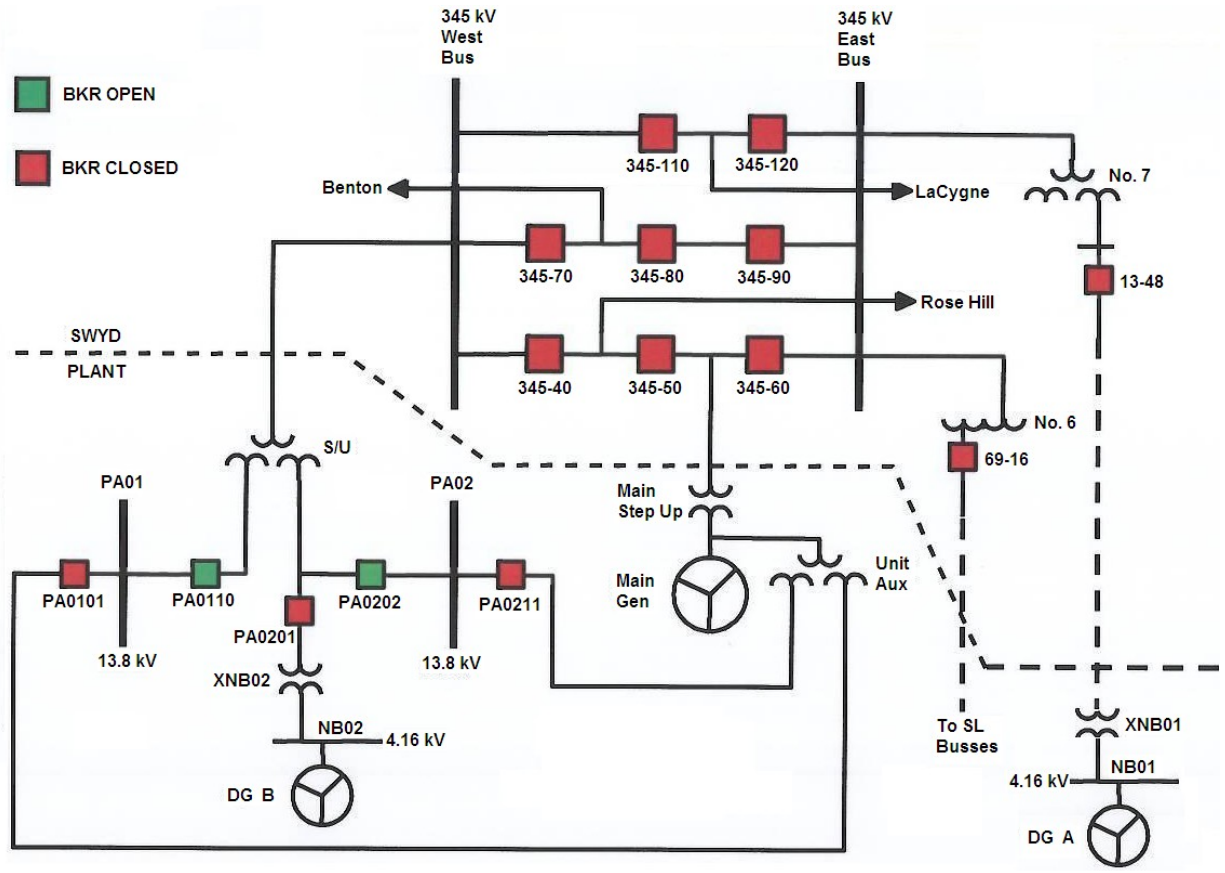

Figure 1. Simplified Electrical Drawing for Wolf Creek Generating Station.

MODELING ASSUMPTIONS

Analysis Type. The Wolf Creek Generating Station Station Standardized Plant Analysis Risk (SPAR) model created in April 2012 was used for this event analysis. This event was modeled as a switchyard-related LOOP initiating event.

Analysis Rules. The ASP program uses Significance Determination Process results for degraded conditions when available. A licensee performance deficiency (PD) was identified in connection with the S/U Transformer fault. The PD involved the licensee failure to identify that electrical maintenance contractors had failed to install insulating sleeves on two wires that affected the differential current protection circuit. This affected safety-related equipment on January 13, 2012, when the startup transformer experienced a spurious trip and lockout during a plant trip because the two un-insulated wires touched and provided a false high phase differential signal to the protective relaying circuit. The protective lockout caused a prolonged loss of offsite power to Train B equipment. The SDP assessment of risk of this PD was finalized on September 13, 2012 (References 2–4); resulting in a YELLOW finding (i.e., substantial 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).

Key Modeling Assumptions. The following modeling assumptions were determined to be vital to this event analysis:

- This analysis models the January 13, 2012 reactor trip at Wolf Creek Generating Station as a switchyard-related LOOP initiating event.

- Recovery of offsite power within 1 hour was assumed to fail. For recovery durations of 2 hours or more, credit for operators potentially restoring offsite power is given. See Recovery Analysis for additional details.

- Due to the loss of instrument air causing letdown isolation and increase in charging flow, Pressurizer Power-Operated Relief Valve (PORV) PCV-456A cycled open and closed 23 times.
  - The other PORV (PCV-455A) was isolated via its block valve due to excessive leakage.

- Due to the LOOP, power for the motor-driven fire pump was unavailable. The design of the system is such that the installed diesel-driven fire pump would have started in response to the LOOP; however, it had been out-of-service since September 13, 2011, when it had catastrophically failed during its monthly functionality test. As a compensatory measure, a temporary diesel-driven fire pump had been installed in accordance with the plant fire protection impairment program. At the time of the LOOP the pump suction, pump case, minimum flow line, discharge manifold, and pump discharge lines for the temporary pump had been drained to prevent freezing. During the event response it took operators over 9 hours to successfully start the pump to provide fire water. Therefore, during a postulated station blackout (SBO), fire water would be unavailable to supply alternate cooling to the lube oil coolers for the safety injection pumps and centrifugal charging pump.

Basic Event Probability Changes. The following initiating event frequencies and basic event probabilities were modified for this event analysis:

- The switchyard-related LOOP initiating event probability (*IE-LOOPSC*) was set 1.0 to represent the operational event that occurred at Wolf Creek Generating Station on January 13, 2012. All other initiating events probabilities were set to zero.

- The basic event ACP-TFM-FC-XMR01 (*Failure of 345-13.8 kV Startup Transformer XMR01*) was set to TRUE because of the Phase “B” fault on the SUT during the event.

- There were 23 open/close cycles of PORV PCV-456A to limit pressure after the reactor and turbine trips. Therefore, the basic events PPR-SRV-CO-L (*PORVs Open during Loop*) and PPR-SRV-CO-SBO (*PORVs Open during SBO*) were set to TRUE. In addition, the failure probability for basic event PPR-SRV-OO-456A (*PORV 456A FAILS to Reclose After Opening*) was changed to 2.2×10^{-3} via binomial expansion to account for the increased probability that the valve could stick open.

- The basic event PPR-MOV-FC-HV8000A (*PORV 455A Block Valve HV8000A Closed during Power*) was set to TRUE because the valve was closed during the event.

- The basic event FWS-EDP-TM-FP01PB (*Diesel-Driven Fire Water Pump FP01PB Unavailable Due to Test and/or Maintenance*) was set to TRUE to account for unavailability of this pump during the event. No additional modeling of the temporary diesel-drive fire

water pump was included in this analysis because of the long time it took operators to prime and start the pump during the event.

- The default diesel generator mission times were changed to reflect the actual time offsite power was restored to the first vital bus (approximately 3 hours). 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 (base case value) and ZT-DGN-FR-L = 2 hours.

Recovery Analysis. The time required to restore offsite power to plant emergency equipment is a significant factor in modeling the CCDP given a LOOP. The LOOP/SBO modeling within the SPAR models include various sequence-specific power recovery factors that are based on the time available to recover offsite power to prevent core damage. For a sequence involving failure of all of the cooling sources (e.g., postulated SBO with a failure of turbine-driven AFW pump), approximately one hour would be available to recover offsite power to avoid core damage. Sequences involving successful early inventory control and decay heat removal, but failure of long-term decay heat removal, would give operators several hours to recover offsite power prior to core damage.

In this analysis, offsite power recovery probabilities are based on:

- Known information about when power was restored to the switchyard and the first safety bus,
- A determination on whether offsite power could have been restored sooner given a postulated SBO, and
- Estimated probabilities of failing to realign power to an emergency bus given offsite power was (or could have been) restored to the switchyard.

Offsite power was restored to the first safety bus (Train A Safety Bus) two hours and 58 minutes after the LOOP occurred. Inspectors concluded that operator could have restored power sooner in the event of a blackout condition; however, due to complications associated with restoring offsite power to the switchyard (i.e., re-aligning power to the East Bus from the La Cygne Line) recovery of offsite power to a safety bus within 1 hour was assumed to fail. Therefore, the recovery action OEP-XHE-XL-N01H (*Operator Fails to Recover Offsite Power in 1 Hour*) was set to TRUE for this analysis. Credit was given for offsite power recovery for applicable times greater than one hour.

The SPAR-H Human Reliability Analysis Method (References 5 and 6) was used to estimate non-recovery probabilities as a function of time following restoration of offsite power to the switchyard.[1]

Tables 1 and 2 provide the key qualitative information for this recovery and the performance shaping factor (PSFs) adjustments required for the quantification of offsite power recovery events for times greater than 1 hour using SPAR-H.

[1] The dominant contributor to failure to recover offsite power to plant safety-related loads in this analysis is operators failing to restore proper breaker line-ups. Hardware failures are assumed to be negligible (due to their much lower failure probabilities) in this recovery analysis.

Table 1. Key Qualitative Information for Offsite Power Recovery after 1 Hour.

Definition	The definition for overall recovery is the operators' failure to align the La Cygne line to the East Bus and close breaker to re-energize the Train A Safety Bus in 2 to 8 hours (depending on the sequence).
Description and Event Context	Depending on postulated failures of the EDGs, reactor coolant pump (RCP) seals (due to unavailability of seal injection/cooling), the availability of the turbine-driven AFW pump, and the time until the station batteries are depleted, operators would have between 2–8 hours to re-energize prior to core uncovery.
Operator Action Success Criteria	For successful recovery, operators would have to open the air disconnects for Breaker 345-60, and close Breaker 345-120 to energize the East Bus from La Cygne line. Operators would then have to close Transformer No. 7 Breaker 13-48 to energize the Train A Safety Bus. The time available for operators to perform this action would be a minimum of 2 hours (given the failure of RCP seals).
Nominal Cues	Loss of voltage on both safety buses: • No voltage indicated on safety buses. • Deenergized safety equipment (e.g., EDGs, CCW, and charging).
Procedural Guidance	Operators used OFN NB-035, "Loss of Offsite Power Restoration," and SYS NB-320, "De-energizing and Energizing ESF Transformers," to restore power to the Train A Safety Bus.
Diagnosis/Action	This recovery action contains diagnosis and action activities.

Table 2. SPAR-H Evaluation for Offsite Power Recovery after 1 Hour.

PSF	Multiplier Diagnosis / Action	Notes
Time Available	0.01 / 1	Complications involving restoring power to the Train A Safety Bus would prevent the restoration (diagnosis and action) of power within an hour. For recovery actions with 2 hours or more available, approximately 1 hour (at a minimum) would be available to perform the actions required to re-energize a safety bus prior to core uncovery. Therefore, the diagnosis PSF for available time is assigned as *Expansive Time* (i.e., ×0.01; time available is >2 times nominal and >30 minutes). Sufficient time exists to perform the action component of the offsite power recovery; therefore, the action PSF for available time is set to *Nominal*. See Reference 6 for guidance on apportioning time between the diagnosis and action components of an HFE.
Stress	2 / 1	The PSF for diagnosis stress is assigned a value of *High Stress* (i.e., ×2) due to the postulated SBO and that core damage will occur if operators fail to restore power to a safety bus. The PSF for action stress was not determined to be a performance driver for this HFE; and therefore, was assigned a value of *Nominal* (i.e., ×1).

PSF	Multiplier Diagnosis / Action	Notes
Complexity	2 / 1	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 during a LOOP and postulated SBO. The PSF for action complexity was not determined to be a performance driver for this HFE; and therefore, was assigned a value of *Nominal* (i.e., ×1).
Procedures Experience/Training, Ergonomics/HMI, Fitness for Duty, Work Processes	1 /1	No event information is available to warrant a change in these PSFs (diagnosis or action) from *Nominal* for this HFE.

Offsite power recovery actions with at least two hours of available time are calculated using the following SPAR-H formula:

*Power Recovery HEP = (Product of Diagnosis PSFs * Nominal Diagnosis HEP) + (Product of Action PSFs * Nominal Action HEP)*

*= (0.04 * 0.01) + (1 * 0.001) = 1×10^{-3}*

Therefore, the human error probabilities for offsite power recovery action after 1 hour, OEP-XHE-XL-NR02HSC (*Operator Fails to Recover Offsite Power in 2 Hours*), OEP-XHE-XL-NR03HSC (*Operator Fails to Recover Offsite Power in 3 Hours*), OEP-XHE-XL-NR04HSC (*Operator Fails to Recover Offsite Power in 4 Hours*), OEP-XHE-XL-NR06HSC (*Operator Fails to Recover Offsite Power in 6 Hours*), and OEP-XHE-XL-NR08HSC (*Operator Fails to Recover Offsite Power in 8 Hours*) are calculated to be 1×10^{-3}.

ANALYSIS RESULTS

Conditional Core Damage Probability. The point estimate conditional core damage probability (CCDP) for this event is 4.7×10^{-4}.

Dominant Sequence. The dominant accident sequence is LOOPSC (*Loss of Offsite Power—Switchyard-Related*) Sequence 16-04-06 (CCDP = 2.1×10^{-4}) which contributes 44% of the total internal events 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, B-2, and B-3 in Appendix B.

The events and important component failures in LOOPSC Sequence 16-04-06 are:

- Switchyard-related LOOP occurs,
- Reactor scram succeeds,
- Emergency power fails,
- AFW succeeds,
- Power-operated relief valves successfully close (if opened),
- Rapid secondary depressurization succeeds,
- RCP seal cooling fails,

- RCP Seal 1 integrity is maintained,
- RCP Seal 2 fails,
- Operators successfully restore offsite power within 4 hours,
- High-pressure injection fails,
- Secondary side cooldown succeeds,
- Low-pressure injection succeeds, and
- Low-pressure recirculation fails.

REFERENCES

1. Wolf Creek Generating Station, Licensee Event Report 2012-001, "Failure of 345 kV Switchyard Breaker Due to Internal Fault Resulting in Reactor Trip and Coincident Loss of Offsite Power," dated April 9, 2012 (ML12080A215).

2. U.S. Nuclear Regulatory Commission, "Wolf Creek Nuclear Operating Corporation – NRC Augmented Inspection Team Report 05000482/2012008," dated April 4, 2012 (ML12095A414).

3. U.S. Nuclear Regulatory Commission, "Wolf Creek Nuclear Operating Corporation – NRC Augmented Inspection Team Follow-Up Report 05000482/2012008; Preliminary Yellow Finding," dated August 6, 2012 (ML12227A919).

4. U.S. Nuclear Regulatory Commission, "Wolf Creek Generating Station – Final Significance Determination of Yellow Finding and Notice of Violation, NRC Inspection Report 05000482/2012010," dated September 21, 2012 (ML12265A310).

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

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

Appendix A: Analysis Results

Summary of Conditional Event Changes

Event	Description	Cond. Value	Nominal Value
ACP-TFM-FC-XMR01	FAILURE OF 345-13.8 KV STARTUP XFORMER XMR01	TRUE	2.27E-5
FWS-EDP-TM-FP01PB	DIESEL DRIVEN FIRE WATER PUMP FP01PB UNAVAILABLE DUE TO T/M	TRUE	7.19E-3
IE-LOOPSC[a]	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-RELATED)	1.00E+0	1.04E-2
OEP-XHE-XL-NR01HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR (SWITCHYARD)	TRUE	4.01E-1
OEP-XHE-XL-NR02HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS (SWITCHYARD)	1.00E-3	2.24E-1
OEP-XHE-XL-NR03HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 3 HOURS (SWITCHYARD)	1.00E-3	1.45E-1
OEP-XHE-XL-NR04HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS (SWITCHYARD)	1.00E-3	1.02E-1
OEP-XHE-XL-NR08HSC	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 8 HOURS (SWITCHYARD)	1.00E-3	3.77E-2
PPR-MOV-FC-HV8000A	PORV 455A BLOCK VALVE HV8000A CLOSED DURING POWER	TRUE	3.00E-3
PPR-SRV-CO-L	PORVS/SRVS OPEN DURING LOOP	TRUE	1.48E-1
PPR-SRV-CO-SBO	PORVS/SRVS OPEN DURING SBO	TRUE	3.70E-1
PPR-SRV-OO-456A	PORV 456A FAILS TO RECLOSE AFTER OPENING	2.20E-2	9.66E-4
ZT-DGN-FR-L	DIESEL GENERATOR FAILS TO RUN	2.17E-3	2.47E-2

a. All other initiating event probabilities were set to zero.

Dominant Sequence Results

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

Event Tree	Sequence	CCDP	% Contribution	Description
LOOPSC	16-04-6	2.08E-4	44.1%	/RPS, EPS, /AFW-B, /PORV-B, /RSD-B, /BP1, BP2, /OPR-04H, HPI, /SSC, /LPI, LPR
LOOPSC	16-45	1.20E-4	25.5%	/RPS, EPS, AFW-B, OPR-01H, DGR-01H
LOOPSC	16-42	4.80E-5	10.2%	/RPS, EPS, /AFW-B, PORV-B, OPR-01H, DGR-01H
LOOPSC	15	3.14E-5	6.7%	/RPS, /EPS, AFW-L, FAB-L
LOOPSC	05	2.36E-5	5.0%	/RPS, /EPS, /AFW-L, PORV-L, /HPI-L, /OPR-02H, /SSC, RHR, HPR
LOOPSC	16-07-6	1.04E-5	2.2%	/RPS, EPS, /AFW-B, /PORV-B, /RSD-B, BP1, /BP2, /OPR-08H, HPI, /SSC, /LPI, LPR
LOOPSC	02-02-07	7.62E-6	1.6%	/RPS, /EPS, /AFW-L, /PORV-L, LOSC-L, /RSD-L, /BP1, BP2, /OPR-02H, /FW, HPI, /SSC1, /LPI, LPR
LOOPSC	16-04-2	4.96E-6	1.1%	/RPS, EPS, /AFW-B, /PORV-B, /RSD-B, /BP1, BP2, /OPR-04H, /HPI, /SSC, LPR
	Total	**4.71E-4**	**100.0%**	

Referenced Fault Trees

Fault Tree	Description
AFW-B	AUXILIARY FEEDWATER
AFW-L	WOLF CREEK AFW USING LOOP-FTF FAULT TREE FLAGS FAULT TREE
BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING)
BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING)
DGR-01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR
EPS	EMERGENCY POWER
FAB-L	FEED AND BLEED
HPI	HIGH PRESSURE INJECTION
HPR	HIGH PRESSURE RECIRC
LOSC-L	WOLF CREEK RCPSL USING LOOP-FTF FAULT TREE FLAGS
LPR	LOW PRESSURE RECIRC
OPR-01H	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR
PORV-B	WOLF CREEK PORVs/SRVs OPEN DURING STATION BLACKOUT
PORV-L	PORVs ARE CLOSED
RHR	RESIDUAL HEAT REMOVAL
SSC	SECONDARY SIDE COOLDOWN

Cutset Report - LOOPSC 16-04-06

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	2.08E-4	100	Displaying 1680 of 1680 Cutsets.
1	2.03E-5	9.77	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
2	1.55E-5	7.45	IE-LOOPSC,ESW-FAN-CF-GDFANR,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
3	7.74E-6	3.72	IE-LOOPSC,ESW-TSA-CF-01ABS,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
4	7.65E-6	3.68	IE-LOOPSC,EPS-DGN-FS-NE02,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
5	6.33E-6	3.04	IE-LOOPSC,ACP-CRB-CC-NB0209,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
6	6.06E-6	2.91	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-FAN-FR-CGD01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
7	5.59E-6	2.69	IE-LOOPSC,ESW-FAN-FR-CGD01A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
8	5.59E-6	2.69	IE-LOOPSC,ESW-FAN-FR-CGD01B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
9	5.29E-6	2.54	IE-LOOPSC,DCP-BCH-TM-BC24,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
10	4.49E-6	2.16	IE-LOOPSC,ESW-MDP-CF-START,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
11	4.44E-6	2.14	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
12	4.21E-6	2.02	IE-LOOPSC,ESW-FAN-CF-GDFANS,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
13	4.10E-6	1.97	IE-LOOPSC,ESW-MDP-TM-1B,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
14	4.10E-6	1.97	IE-LOOPSC,ESW-MDP-TM-1A,ESW-TSA-FS-FEF01B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
15	3.91E-6	1.88	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-MDP-FS-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
16	3.71E-6	1.79	IE-LOOPSC,ESW-MOV-CF-HV009192,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
17	3.60E-6	1.73	IE-LOOPSC,ESW-MDP-FS-1A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
18	3.60E-6	1.73	IE-LOOPSC,ESW-MDP-FS-1B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
19	3.46E-6	1.66	IE-LOOPSC,ESW-TSA-CF-01ABR,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
20	3.24E-6	1.56	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-FAN-FR-CGD01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
21	3.03E-6	1.46	IE-LOOPSC,ESW-MDP-CF-RUN,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
22	2.87E-6	1.38	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-XHE-XR-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
23	2.76E-6	1.33	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-MOV-CC-EFHV0091,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
24	2.65E-6	1.27	IE-LOOPSC,ESW-MDP-TM-1B,ESW-XHE-XR-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
25	2.65E-6	1.27	IE-LOOPSC,ESW-MDP-TM-1A,ESW-XHE-XR-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
26	2.55E-6	1.22	IE-LOOPSC,ESW-MDP-TM-1B,ESW-MOV-CC-EFHV0091,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
27	2.55E-6	1.22	IE-LOOPSC,ESW-MDP-TM-1A,ESW-MOV-CC-EFHV0092,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
28	2.41E-6	1.16	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-FAN-FS-CGD01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
29	2.38E-6	1.14	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
30	2.23E-6	1.07	IE-LOOPSC,ESW-FAN-FS-CGD01A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
31	2.23E-6	1.07	IE-LOOPSC,ESW-FAN-FS-CGD01B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
32	2.09E-6	1.01	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-MDP-FS-1A,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2

Cutset Report - LOOPSC 16-45

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	1.20E-4	100	Displaying 5250 of 5250 Cutsets.
1	3.79E-6	3.16	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H
2	3.79E-6	3.16	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE02,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H
3	3.60E-6	3	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-CF-NE012R,EPS-XHE-XL-NR01H
4	3.50E-6	2.92	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE02,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A
5	3.50E-6	2.92	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B
6	2.67E-6	2.22	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-XHE-XL-NR01H,ESW-FAN-CF-GDFANR
7	2.03E-6	1.69	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01,EPS-DGN-FR-NE02,EPS-XHE-XL-NR01H
8	1.53E-6	1.27	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,ESW-SYS-TM-TRAINB

#	CCDP	Total%	Cutset
9	1.43E-6	1.19	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FS-NE01,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H
10	1.43E-6	1.19	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FS-NE02,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H
11	1.33E-6	1.11	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-XHE-XL-NR01H,ESW-TSA-CF-01ABS
12	1.32E-6	1.1	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FS-NE02,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A
13	1.32E-6	1.1	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-FS-NE01,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B
14	1.24E-6	1.04	IE-LOOPSC,AFW-TDP-FR-PAL02,EPS-DGN-CF-NE012S,EPS-XHE-XL-NR01H

Cutset Report - LOOPSC 16-42

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	4.80E-5	100	Displaying 1407 of 1407 Cutsets.
1	2.11E-6	4.39	IE-LOOPSC,EPS-DGN-FR-NE02,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
2	2.11E-6	4.39	IE-LOOPSC,EPS-DGN-FR-NE01,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
3	2.00E-6	4.16	IE-LOOPSC,EPS-DGN-CF-NE012R,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
4	1.94E-6	4.05	IE-LOOPSC,EPS-DGN-FR-NE01,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
5	1.94E-6	4.05	IE-LOOPSC,EPS-DGN-FR-NE02,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
6	1.48E-6	3.08	IE-LOOPSC,EPS-XHE-XL-NR01H,ESW-FAN-CF-GDFANR,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
7	1.13E-6	2.35	IE-LOOPSC,EPS-DGN-FR-NE01,EPS-DGN-FR-NE02,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
8	8.47E-7	1.76	IE-LOOPSC,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,ESW-SYS-TM-TRAINB,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
9	7.93E-7	1.65	IE-LOOPSC,EPS-DGN-FS-NE02,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
10	7.93E-7	1.65	IE-LOOPSC,EPS-DGN-FS-NE01,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
11	7.41E-7	1.54	IE-LOOPSC,EPS-XHE-XL-NR01H,ESW-TSA-CF-01ABS,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
12	7.31E-7	1.52	IE-LOOPSC,EPS-DGN-FS-NE01,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
13	7.31E-7	1.52	IE-LOOPSC,EPS-DGN-FS-NE02,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
14	6.91E-7	1.44	IE-LOOPSC,EPS-DGN-CF-NE012S,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
15	6.56E-7	1.37	IE-LOOPSC,ACP-CRB-CC-NB0209,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
16	6.56E-7	1.37	IE-LOOPSC,ACP-CRB-CC-NB0112,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
17	6.05E-7	1.26	IE-LOOPSC,ACP-CRB-CC-NB0209,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
18	6.05E-7	1.26	IE-LOOPSC,ACP-CRB-CC-NB0112,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A

#	CCDP	Total%	Cutset
19	5.79E-7	1.21	IE-LOOPSC,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,ESW-FAN-FR-CGD01B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
20	5.79E-7	1.21	IE-LOOPSC,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H,ESW-FAN-FR-CGD01A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
21	5.48E-7	1.14	IE-LOOPSC,DCP-BCH-TM-BC24,EPS-DGN-TM-NE01,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
22	5.48E-7	1.14	IE-LOOPSC,DCP-BCH-TM-BC21,EPS-DGN-TM-NE02,EPS-XHE-XL-NR01H,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
23	5.35E-7	1.11	IE-LOOPSC,EPS-XHE-XL-NR01H,ESW-FAN-FR-CGD01A,ESW-MDP-TM-1B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
24	5.35E-7	1.11	IE-LOOPSC,EPS-XHE-XL-NR01H,ESW-FAN-FR-CGD01B,ESW-MDP-TM-1A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
25	5.06E-7	1.05	IE-LOOPSC,DCP-BCH-TM-BC24,EPS-XHE-XL-NR01H,ESW-MDP-TM-1A,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
26	5.06E-7	1.05	IE-LOOPSC,DCP-BCH-TM-BC21,EPS-XHE-XL-NR01H,ESW-MDP-TM-1B,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A

Cutset Report - LOOPSC 15

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	3.14E-5	100	Displaying 6681 of 6681 Cutsets.
1	1.47E-6	4.67	IE-LOOPSC,AFW-ACX-FR-SGF02B,AFW-TDP-FR-PAL02,EPS-DGN-TM-NE01
2	1.42E-6	4.51	IE-LOOPSC,AFW-ACX-TM-SGF02B,AFW-TDP-FR-PAL02,EPS-DGN-TM-NE01
3	1.35E-6	4.31	IE-LOOPSC,AFW-ACX-FR-SGF02B,AFW-TDP-FR-PAL02,ESW-MDP-TM-1A
4	1.31E-6	4.16	IE-LOOPSC,AFW-ACX-TM-SGF02B,AFW-TDP-FR-PAL02,ESW-MDP-TM-1A
5	1.21E-6	3.84	IE-LOOPSC,AFW-MDP-TM-PAL01B,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01
6	7.86E-7	2.5	IE-LOOPSC,AFW-ACX-FR-SGF02B,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01
7	7.59E-7	2.41	IE-LOOPSC,AFW-ACX-TM-SGF02B,AFW-TDP-FR-PAL02,EPS-DGN-FR-NE01
8	5.67E-7	1.8	IE-LOOPSC,AFW-TDP-FR-PAL02,AFW-XHE-XR-SGF02B,EPS-DGN-TM-NE01
9	5.37E-7	1.71	IE-LOOPSC,AFW-MDP-FS-PAL01B,AFW-TDP-FR-PAL02,EPS-DGN-TM-NE01
10	5.23E-7	1.66	IE-LOOPSC,AFW-TDP-FR-PAL02,AFW-XHE-XR-SGF02B,ESW-MDP-TM-1A
11	4.96E-7	1.58	IE-LOOPSC,AFW-MDP-FS-PAL01B,AFW-TDP-FR-PAL02,ESW-MDP-TM-1A
12	4.54E-7	1.44	IE-LOOPSC,AFW-MDP-TM-PAL01B,AFW-TDP-FR-PAL02,EPS-DGN-FS-NE01
13	4.54E-7	1.44	IE-LOOPSC,AFW-ACX-FS-SGF02B,AFW-TDP-FR-PAL02,EPS-DGN-TM-NE01
14	4.18E-7	1.33	IE-LOOPSC,AFW-ACX-FS-SGF02B,AFW-TDP-FR-PAL02,ESW-MDP-TM-1A
15	3.76E-7	1.2	IE-LOOPSC,ACP-CRB-CC-NB0112,AFW-MDP-TM-PAL01B,AFW-TDP-FR-PAL02
16	3.32E-7	1.06	IE-LOOPSC,AFW-MDP-TM-PAL01B,AFW-TDP-FR-PAL02,ESW-FAN-FR-CGD01A
17	3.14E-7	1	IE-LOOPSC,AFW-MDP-TM-PAL01B,AFW-TDP-FR-PAL02,DCP-BCH-TM-BC21

Cutset Report - LOOPSC 05

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	2.36E-5	100	Displaying 1921 of 1921 Cutsets.
1	8.14E-7	3.45	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-FR-SGL10A
2	7.86E-7	3.33	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-TM-SGL10A
3	7.51E-7	3.18	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-FR-SGL10A

#	CCDP	Total%	Cutset
4	6.29E-7	2.67	IE-LOOPSC,EPS-DGN-TM-NE02,HPI-XHE-XM-RECIRC,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
5	5.80E-7	2.46	IE-LOOPSC,ESW-MDP-TM-1B,HPI-XHE-XM-RECIRC,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
6	4.36E-7	1.85	IE-LOOPSC,EPS-DGN-FR-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-FR-SGL10A
7	4.21E-7	1.78	IE-LOOPSC,EPS-DGN-FR-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-TM-SGL10A
8	3.37E-7	1.43	IE-LOOPSC,EPS-DGN-FR-NE02,HPI-XHE-XM-RECIRC,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
9	3.14E-7	1.33	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-SGL10A
10	3.14E-7	1.33	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-P1A
11	3.14E-7	1.33	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-HX1A
12	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,HPI-MOV-CC-8804A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
13	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,HPI-MOV-OO-8814A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
14	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,HPI-MOV-OO-8814B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
15	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,HPI-MOV-CC-8807A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
16	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MOV-OO-8812A
17	3.03E-7	1.28	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MOV-CC-8811A
18	3.03E-7	1.28	IE-LOOPSC,CCW-MOV-CC-HV101,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
19	2.98E-7	1.26	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MDP-FS-P1A
20	2.90E-7	1.23	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-SGL10A
21	2.90E-7	1.23	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-P1A
22	2.90E-7	1.23	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-XHE-XR-HX1A
23	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,HPI-MOV-CC-8804A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
24	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,HPI-MOV-OO-8814A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
25	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,HPI-MOV-OO-8814B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
26	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,HPI-MOV-CC-8807A,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
27	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MOV-OO-8812A
28	2.79E-7	1.18	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MOV-CC-8811A

#	CCDP	Total%	Cutset
29	2.79E-7	1.18	IE-LOOPSC,CCW-MOV-CC-HV101,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A
30	2.75E-7	1.17	IE-LOOPSC,ESW-MDP-TM-1B,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-MDP-FS-P1A
31	2.52E-7	1.07	IE-LOOPSC,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR02HSC,/PPR-MOV-FC-HV8000B,PPR-SRV-OO-456A,RHR-ACX-FS-SGL10A

Cutset Report - LOOPSC 16-07-6

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	1.04E-5	100	Displaying 759 of 759 Cutsets.
1	1.02E-6	9.77	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
2	7.75E-7	7.45	IE-LOOPSC,ESW-FAN-CF-GDFANR,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
3	3.87E-7	3.72	IE-LOOPSC,ESW-TSA-CF-01ABS,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
4	3.82E-7	3.68	IE-LOOPSC,EPS-DGN-FS-NE02,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
5	3.16E-7	3.04	IE-LOOPSC,ACP-CRB-CC-NB0209,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
6	3.03E-7	2.91	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-FAN-FR-CGD01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
7	2.79E-7	2.69	IE-LOOPSC,ESW-FAN-FR-CGD01A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
8	2.79E-7	2.69	IE-LOOPSC,ESW-FAN-FR-CGD01B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
9	2.65E-7	2.54	IE-LOOPSC,DCP-BCH-TM-BC24,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
10	2.25E-7	2.16	IE-LOOPSC,ESW-MDP-CF-START,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
11	2.22E-7	2.14	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
12	2.10E-7	2.02	IE-LOOPSC,ESW-FAN-CF-GDFANS,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
13	2.05E-7	1.97	IE-LOOPSC,ESW-MDP-TM-1B,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
14	2.05E-7	1.97	IE-LOOPSC,ESW-MDP-TM-1A,ESW-TSA-FS-FEF01B,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
15	1.95E-7	1.88	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-MDP-FS-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
16	1.86E-7	1.79	IE-LOOPSC,ESW-MOV-CF-HV009192,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
17	1.80E-7	1.73	IE-LOOPSC,ESW-MDP-FS-1A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
18	1.80E-7	1.73	IE-LOOPSC,ESW-MDP-FS-1B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
19	1.73E-7	1.66	IE-LOOPSC,ESW-TSA-CF-01ABR,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
20	1.62E-7	1.56	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-FAN-FR-CGD01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
21	1.52E-7	1.46	IE-LOOPSC,ESW-MDP-CF-RUN,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
22	1.43E-7	1.38	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-XHE-XR-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
23	1.38E-7	1.33	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-MOV-CC-EFHV0091,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
24	1.32E-7	1.27	IE-LOOPSC,ESW-MDP-TM-1B,ESW-XHE-XR-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
25	1.32E-7	1.27	IE-LOOPSC,ESW-MDP-TM-1A,ESW-XHE-XR-1B,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
26	1.27E-7	1.22	IE-LOOPSC,ESW-MDP-TM-1B,ESW-MOV-CC-EFHV0091,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
27	1.27E-7	1.22	IE-LOOPSC,ESW-MDP-TM-1A,ESW-MOV-CC-EFHV0092,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
28	1.21E-7	1.16	IE-LOOPSC,EPS-DGN-TM-NE02,ESW-FAN-FS-CGD01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
29	1.19E-7	1.14	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-TSA-FS-FEF01A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
30	1.11E-7	1.07	IE-LOOPSC,ESW-FAN-FS-CGD01A,ESW-MDP-TM-1B,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
31	1.11E-7	1.07	IE-LOOPSC,ESW-FAN-FS-CGD01B,ESW-MDP-TM-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
32	1.05E-7	1.01	IE-LOOPSC,EPS-DGN-FR-NE02,ESW-MDP-FS-1A,/OEP-XHE-XL-NR08HSC,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2

Cutset Report - LOOPSC 02-02-07

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	7.62E-6	100	Displaying 582 of 582 Cutsets.
1	1.44E-6	18.8	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,EPS-DGN-TM-NE02,RCS-MDP-LK-BP2
2	1.32E-6	17.4	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-MDP-TM-1B,RCS-MDP-LK-BP2
3	7.68E-7	10.1	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,EPS-DGN-FR-NE02,RCS-MDP-LK-BP2
4	3.09E-7	4.06	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-SYS-TM-TRAINB,RCS-MDP-LK-BP2
5	2.89E-7	3.8	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,EPS-DGN-FS-NE02,RCS-MDP-LK-BP2
6	2.52E-7	3.31	IE-LOOPSC,CCW-AOV-CF-TV2930,CCW-XHE-XM-BYPASS,RCS-MDP-LK-BP2
7	2.39E-7	3.14	IE-LOOPSC,ACP-CRB-CC-NB0209,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,RCS-MDP-LK-BP2
8	2.11E-7	2.77	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-FAN-FR-CGD01B,RCS-MDP-LK-BP2
9	2.00E-7	2.63	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,DCP-BCH-TM-BC24,RCS-MDP-LK-BP2
10	1.91E-7	2.51	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-FAN-FR-CGD01A,RCS-MDP-LK-BP2
11	1.55E-7	2.03	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-TSA-FS-FEF01B,RCS-MDP-LK-BP2
12	1.40E-7	1.84	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-TSA-FS-FEF01A,RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
13	1.36E-7	1.79	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-MDP-FS-1B,RCS-MDP-LK-BP2
14	1.33E-7	1.75	IE-LOOPSC,ACP-BAC-LP-NB01,CCW-XHE-XM-ISOLATE,RCS-MDP-LK-BP2
15	1.23E-7	1.62	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-MDP-FS-1A,RCS-MDP-LK-BP2
16	1.00E-7	1.31	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-XHE-XR-1B,RCS-MDP-LK-BP2
17	9.63E-8	1.26	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-MOV-CC-EFHV0092,RCS-MDP-LK-BP2
18	9.06E-8	1.19	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-XHE-XR-1A,RCS-MDP-LK-BP2
19	8.73E-8	1.15	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-MOV-CC-EFHV0091,RCS-MDP-LK-BP2
20	8.42E-8	1.11	IE-LOOPSC,CCW-CFG-AP-TRB,CCW-XHE-XM-TRNA,ESW-FAN-FS-CGD01B,RCS-MDP-LK-BP2
21	7.63E-8	1	IE-LOOPSC,CCW-SYS-TM-TRAINB,ESW-FAN-FS-CGD01A,RCS-MDP-LK-BP2

Cutset Report - LOOPSC 16-04-02

Only items contributing at least 1% to the total are displayed.

#	CCDP	Total%	Cutset
	4.96E-6	100	Displaying 4382 of 4382 Cutsets.
1	9.55E-8	1.93	IE-LOOPSC,ACP-BAC-LP-NG03,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
2	8.81E-8	1.78	IE-LOOPSC,ACP-BAC-LP-NG03,ESW-MDP-TM-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2
3	5.70E-8	1.15	IE-LOOPSC,EPS-DGN-FR-NE02,EPS-DGN-TM-NE01,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-FR-SGL10A
4	5.70E-8	1.15	IE-LOOPSC,EPS-DGN-FR-NE01,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-FR-SGL10A
5	5.51E-8	1.11	IE-LOOPSC,EPS-DGN-FR-NE01,EPS-DGN-TM-NE02,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-TM-SGL10A
6	5.51E-8	1.11	IE-LOOPSC,EPS-DGN-FR-NE02,EPS-DGN-TM-NE01,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-TM-SGL10A
7	5.40E-8	1.09	IE-LOOPSC,EPS-DGN-CF-NE012R,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-FR-SGL10A
8	5.26E-8	1.06	IE-LOOPSC,EPS-DGN-FR-NE01,ESW-MDP-TM-1B,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-FR-SGL10A
9	5.22E-8	1.05	IE-LOOPSC,EPS-DGN-CF-NE012R,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2,RHR-ACX-TM-SGL10A
10	5.11E-8	1.03	IE-LOOPSC,ACP-BAC-LP-NG03,EPS-DGN-FR-NE02,/OEP-XHE-XL-NR04HSC,RCS-MDP-LK-BP2

Referenced Events

Event	Description	Probability
ACP-BAC-LP-NB01	4160 VAC BUS NB01 FAILS	3.33E-5
ACP-BAC-LP-NG03	480 VAC BUS NG03 FAILS	3.33E-5
ACP-CRB-CC-NB0112	ESF TRANSFORMER XNB01 BREAKER FAILS TO OPEN	2.39E-3
ACP-CRB-CC-NB0209	ESF TRANSFORMER XNB02 BREAKER FAILS TO OPEN	2.39E-3
AFW-ACX-FR-SGF02B	AFW MDP B ROOM COOLER FAILS TO RUN	2.59E-3
AFW-ACX-FS-SGF02B	AFW MDP B ROOM COOLER FAILS TO START	8.00E-4
AFW-ACX-TM-SGF02B	AFW MDP B ROOM COOLER UNAVAILABLE DUE TO T&M	2.50E-3
AFW-MDP-FS-PAL01B	AFW MOTOR-DRIVEN PUMP 1B FAILS TO START	9.47E-4

Event	Description	Probability
AFW-MDP-TM-PAL01B	AFW MDP UNAVAILABLE DUE TO TEST AND MAINTENANCE	3.98E-3
AFW-TDP-FR-PAL02	TURBINE DRIVEN FEED PUMP PAL02 FAILS TO RUN	3.95E-2
AFW-XHE-XR-SGF02B	OP FAILS TO RESTORE AFW MDP B ROOM COOLER AFTER T&M	1.00E-3
CCW-AOV-CF-TV2930	CCW HTX BYPASS CONTROL VALVES TV-29 & 30 FAIL TO CLOSE	6.30E-5
CCW-CFG-AP-TRB	FRACTION OF TIME CCW MDP 1B1AND 1D ARE INITIALLY RUNNING	5.00E-1
CCW-MOV-CC-HV101	RHR HTX EJ01A COOLING VLV EGHV101 FAILS TO OPEN	9.63E-4
CCW-SYS-TM-TRAINB	CCW TRAIN B IS IN MAINTAINANCE (PSA)	4.53E-4
CCW-XHE-XM-BYPASS	OPERATOR FAILS TO CLOSE CCW HTX BYPASS VALVE LOCALLY	2.00E-2
CCW-XHE-XM-ISOLATE	OPERATOR FAILS TO ISOLATE IDLE CCW LOOP	2.00E-2
CCW-XHE-XM-TRNA	OPERATOR FAILS TO START AND ALIGN CCW TRAIN A	1.00E-3
DCP-BCH-TM-BC21	BATTERY CHARGER BC-21 UNAVALIBLE DUE T& M	2.00E-3
DCP-BCH-TM-BC24	BATTERY CHARGER BC-24 UNAVALIBLE DUE T& M	2.00E-3
EPS-DGN-CF-NE012R	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO RUN	1.04E-4
EPS-DGN-CF-NE012S	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO START	3.61E-5
EPS-DGN-FR-NE01	DIESEL GENERATOR NE01 FAILS TO RUN	7.68E-3
EPS-DGN-FR-NE02	DIESEL GENERATOR NE02 FAILS TO RUN	7.68E-3
EPS-DGN-FS-NE01	DIESEL GENERATOR NE01 FAILS TO START	2.89E-3
EPS-DGN-FS-NE02	DIESEL GENERATOR NE02 FAILS TO START	2.89E-3
EPS-DGN-TM-NE01	DG NE01 UNAVAILABLE DUE TO TEST AND MAINTENANCE	1.43E-2
EPS-DGN-TM-NE02	DG NE02 UNAVAILABLE DUE TO TEST AND MAINTENANCE	1.43E-2
EPS-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR	8.71E-1
ESW-FAN-CF-GDFANR	ESW ROOM HVAC FANS CGD01A & 1B FAIL TO RUN	7.76E-5
ESW-FAN-CF-GDFANS	ESW ROOM HVAC FANS CGD01A & 1B FAIL TO START	2.11E-5
ESW-FAN-FR-CGD01A	ESW TRAIN A HVAC FAN CGD01A FAILS TO RUN	2.11E-3
ESW-FAN-FR-CGD01B	ESW TRAIN B HVAC FAN CGD01B FAILS TO RUN	2.11E-3
ESW-FAN-FS-CGD01A	ESW TRAIN A HVAC FAN CGD01A FAILS TO START	8.42E-4
ESW-FAN-FS-CGD01B	ESW TRAIN B HVAC FAN CGD01B FAILS TO START	8.42E-4
ESW-MDP-CF-RUN	ESW PUMPS FAIL FROM COMMON CAUSE TO RUN	1.52E-5
ESW-MDP-CF-START	ESW PUMPS FAIL FROM COMMON CAUSE TO START	2.25E-5
ESW-MDP-FS-1A	ESW TRAIN A MDP 1A FAILS TO START	1.36E-3
ESW-MDP-FS-1B	ESW TRAIN B MDP 1B FAILS TO START	1.36E-3
ESW-MDP-TM-1A	ESW TRAIN A MDP 1A UNAVAILABLE DUE TO T&M	1.32E-2
ESW-MDP-TM-1B	ESW TRAIN A MDP 1B UNAVAILABLE DUE TO T&M	1.32E-2
ESW-MOV-CC-EFHV0091	FAILURE OF ESW A TRAVELING SCREEN WASH VALVE TO OPEN	9.63E-4
ESW-MOV-CC-EFHV0092	FAILURE OF ESW B TRAVELING SCREEN WASH VALVE TO OPEN	9.63E-4
ESW-MOV-CF-HV009192	FAILURE OF ESW A & B TRAVELING SCREEN WASH VALVES TO OPEN	1.86E-5
ESW-SYS-TM-TRAINB	SWS TRAIN B UNAVAILBLE DUE TO DRAINAGE OF ESW TRAIN B (PSA)	3.09E-3

Event	Description	Probability
ESW-TSA-CF-01ABR	FAILURE OF ESW A & B TRAVELING SCREENS FEF01A & B TO RUN	1.73E-5
ESW-TSA-CF-01ABS	FAILURE OF ESW A & B TRAVELING SCREENS FEF01A & B TO START	3.87E-5
ESW-TSA-FS-FEF01A	FAILURE OF ESW A TRAVELING SCREEN TO START	1.55E-3
ESW-TSA-FS-FEF01B	FAILURE OF ESW A TRAVELING SCREEN FEF01B TO START	1.55E-3
ESW-XHE-XR-1A	OPERATOR FAILS TO RESTORE ESW MDP 1A AFTER T&M	1.00E-3
ESW-XHE-XR-1B	OPERATOR FAILS TO RESTORE ESW MDP 1B AFTER T&M	1.00E-3
HPI-MOV-CC-8804A	SI/CVC RHR HTX A MOV 8804A FAILS TO OPEN	9.63E-4
HPI-MOV-CC-8807A	FAILURE OF SUCTION MOV SI-8807A	9.63E-4
HPI-MOV-OO-8814A	SI PUMP P1A MINFLOW VALVE 8814A FAILS TO CLOSE	9.63E-4
HPI-MOV-OO-8814B	SI PUMP P1B MINFLOW VALVE 8814B FAILS TO CLOSE	9.63E-4
HPI-XHE-XM-RECIRC	OPERATOR FAILS TO START HIGH PRESSURE RECIRC	2.00E-3
IE-LOOPSC	LOSS OF OFFSITE POWER INITIATOR (SWITCHYARD-RELATED)	1.00E+0
PPR-SRV-OO-456A	PORV 456A FAILS TO RECLOSE AFTER OPENING	2.20E-2
RCS-MDP-LK-BP1	RCP SEAL STAGE 1 INTEGRITY (BINDING/POPPING OPEN) FAILS	1.25E-2
RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.00E-1
RHR-ACX-FR-SGL10A	RHR ROOM COOLER SGL10A FAILS TO RUN	2.59E-3
RHR-ACX-FS-SGL10A	RHR ROOM COOLER SGL10A FAILS TO START	8.00E-4
RHR-ACX-TM-SGL10A	RHR A ROOM COOLER SGL10A UNAVAILABLE DUE TO T&M	2.50E-3
RHR-MDP-FS-P1A	RHR PUMP P1A FAILS TO START	9.47E-4
RHR-MOV-CC-8811A	PUMP P1A SUMP SUCTN VLV 8811A FAILS TO OPEN	9.63E-4
RHR-MOV-OO-8812A	PUMP P1A RWST SUCTN VLV 8812A FAILS TO CLOSE	9.63E-4
RHR-XHE-XR-HX1A	OPERATOR FAILS TO RESTORE HTX 1A AFTER T&M	1.00E-3
RHR-XHE-XR-P1A	OPERATOR FAILS TO RESTORE TRAIN P1A AFTER T&M	1.00E-3
RHR-XHE-XR-SGL10A	OPERATOR FAILS TO RESTORE RHR A ROOM COOLER AFTER T&M	1.00E-3

Appendix B: Key Event Trees

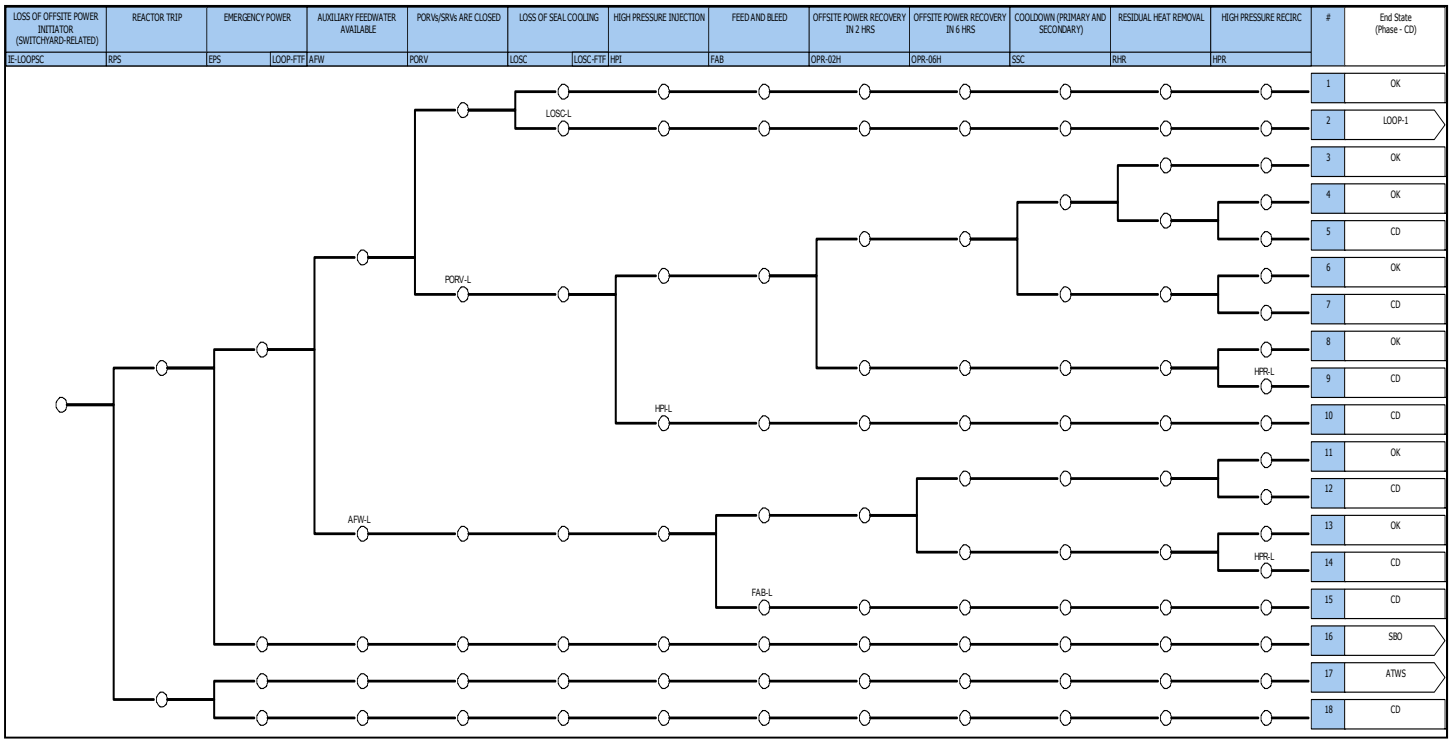

Figure B-1. Wolf Creek Generating Station Switchyard-Related LOOP Event Tree.

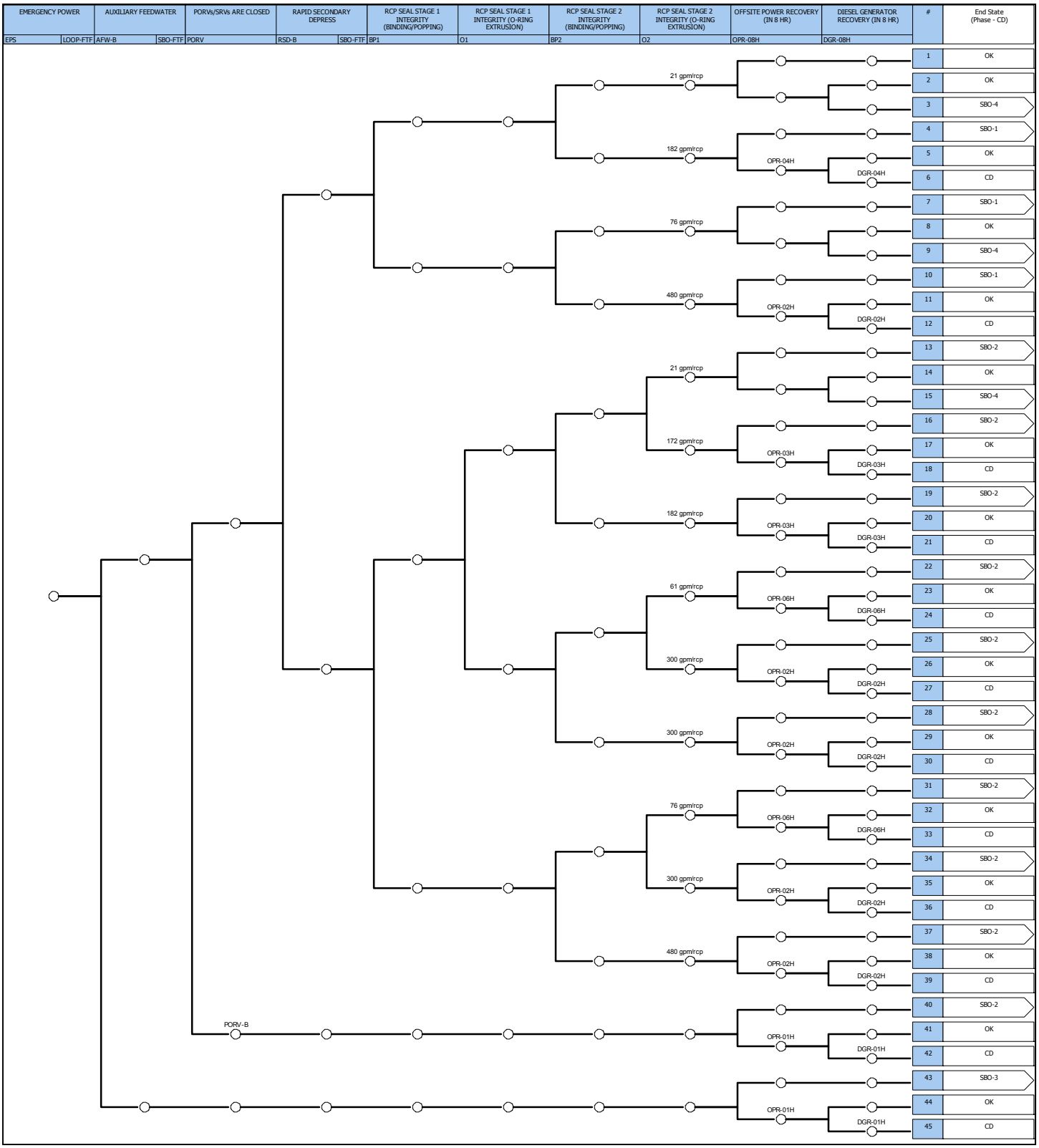

Figure B-2. Wolf Creek Generating Station SBO Event Tree.

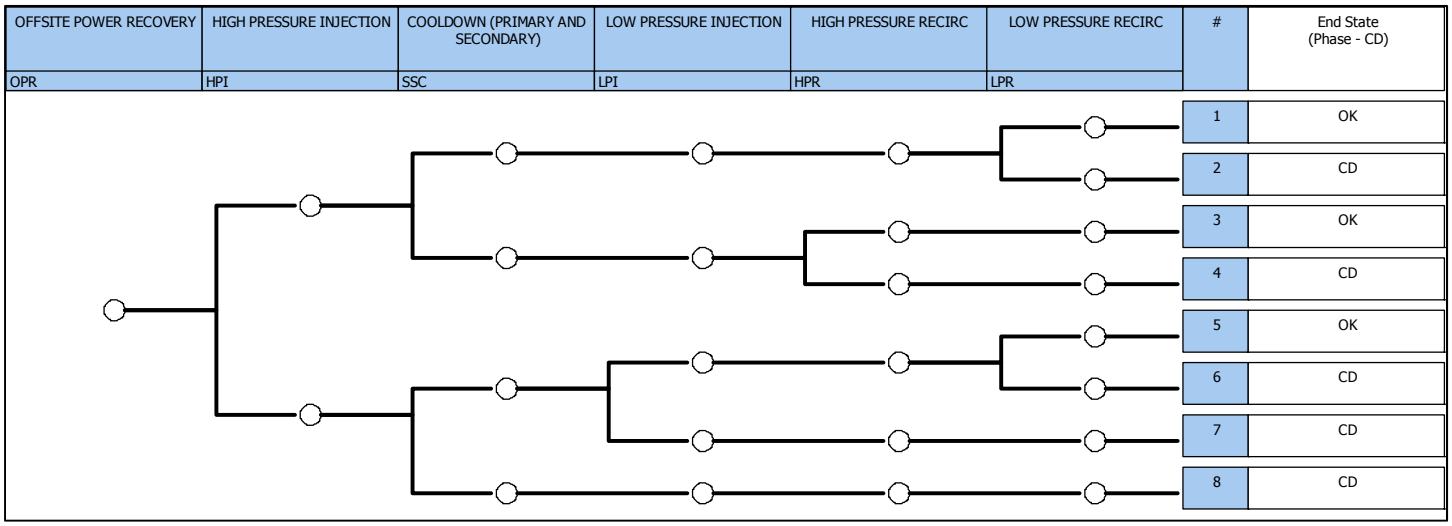

Figure B-3. Wolf Creek Generating Station SBO-1 Event Tree.