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

June 14, 2012

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: SURRY POWER STATION, UNIT NOS. 1 AND 2, TRANSMITTAL OF FINAL ACCIDENT SEQUENCE PRECURSOR (ASP) ANALYSIS

Dear Mr. Heacock:

The enclosure provides the final result of the Accident Sequence Precursor (ASP) analysis of an event which occurred at Surry Power Station, Units 1 and 2 (Plant) as documented in licensee event report (LER) 280/11-001 and inspection report (IR) 05000280/2011003. The event occurred on April 16, 2011; Plant experienced a complete loss of offsite power to the Reserve Station Service Transformers (RSSTs) A and B, for about 5 hours and 3 minutes. This resulted in a turbine trip and subsequent reactor trip. Due to the station blackout signal, the circulating water outlet motor operated valves throttled closed to approximately 25% open and the Alternate AC Diesel Generator automatically started as designed. In addition, the auxiliary feedwater pumps started and all reactor coolant pump motors tripped as designed. RSSTs A and B were energized by offsite power. On April 17th, offsite power was restored to Emergency Bus 1J (Unit 1) and Emergency Bus 2H (Unit 2). The ASP analysis calculated a conditional core damage probability (CCDP) of 9×10-5 for Unit 1 and 7×10-5 for Unit 2.

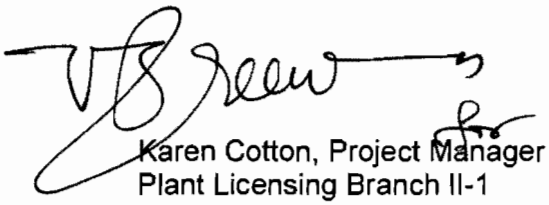
The U.S. Nuclear Regulatory Commission (NRC) established the ASP Program in 1979 in response to the Risk Assessment Review Group Report (see NUREG/CR-0400, dated September 1978). The ASP Program systematically evaluates U.S. nuclear power plant operating experience to identify, document, and rank the 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 CCDP less than or equal to 1×10^{-4}; therefore, a formal licensee review was not requested.

For more information about the ASP Program, see the annual ASP Program status report at http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2010/2010-0125/20100125scy.pdf

The enclosure containing the final analysis report is provided for your information.

Sincerely,



Karen Cotton, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosure:
Final Precursor Analysis

cc: Distribution via Listserv

Final Precursor Analysis

Accident Sequence Precursor Program – Office of Nuclear Regulatory Research

Surry Power Station, Unit 1 and 2	Dual Unit Loss of Offsite Power Due to Switchyard Damage Caused by a Tornado	
Event Date: 04/16/2011	**LER:** 280/11-001 **IR:** 50-280/11-03	**Unit 1 CCDP =** 9×10^{-5} **Unit 2 CCDP =** 7×10^{-5}

EVENT SUMMARY

Event Description. At 1849 on April 16, 2011, Surry Power Station Units 1 and 2 experienced a complete loss of offsite power (LOOP) to the Reserve Station Service Transformers (RSSTs) A and B, for about 5 hours and 3 minutes. This condition resulted from damage inflicted in the switchyard from a tornado. This resulted in a turbine trip and subsequent reactor trip. Emergency Diesel Generators (EDGs) auto started and loaded. Due to the station blackout (SBO) signal, the circulating water outlet motor operator valves throttled closed to approximately 25% open and the Alternate AC (AAC) Diesel Generator automatically started as designed. In addition, the auxiliary feedwater (AFW) pumps started and all reactor coolant pump (RCP) motors tripped as designed.

The swing EDG, EDG 3, automatically loaded onto the Unit 1 Emergency Bus 1J leaving the Unit 2 Emergency Bus 2J de-energized as designed. At 1917, EDG 3 was transferred to Bus 2J and the AAC Diesel Generator was aligned to Bus 1J, thus providing power to all emergency buses. At 2352, RSSTs A and B were energized by offsite power. On April 17th, at 0035, offsite power was restored to Bus 1J. At 0153, offsite power was restored to the Unit 2 Emergency Bus 2H. Offsite power was restored to the two remaining Emergency Buses, 1H and 2J on April 17, 2011 at 1803 and 2109, respectively. Additional information is provided in References 1 and 2.

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

- A tornado led to a dual-unit reactor trip and LOOP event.
- Offsite power recovery to an emergency bus was possible five hours and three minutes after the LOOP occurred.

ANALYSIS RESULTS

Conditional Core Damage Probabilities. The point estimate conditional core damage probabilities (CCDPs) for this event is 9.3×10^{-5} for Unit 1 and 7.2×10^{-5} for Unit 2.

The Accident Sequence Precursor 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., feed water and condensate), whichever is greater. This CCDP equivalent for Surry is 3×10^{-7}.

Dominant Sequence. The dominant accident sequences are LOOPWR Sequence 02-06 (CCDP = 4.6×10^{-5}) which contributes 50% of the total internal events CCDP for Unit 1 and LOOPWR Sequence 17-03-10 (CCDP = 2.2×10^{-5}) which contributes 30% of the total internal events CCDP for Unit 2. 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 LOOPWR Sequence 02-06 are:

- Weather-related LOOP occurs,
- Reactor scram succeeds,
- Emergency power succeeds,
- 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 integrity fails,
- Operators fail to restore offsite power within 2 hours,
- High pressure injection fails,

The events and important component failures in LOOPWR Sequence 17-03-10 are:

- Weather-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 1 integrity is maintained,
- RCP Seal 2 integrity is maintained,
- Operators fail to restore offsite power within 4 hours,
- Operators fail to recover an EDG within 4 hours,

Analysis Results. Appendix A provides tables that include the following:

- Modified basic events and initiating event frequencies, including base and change case probabilities/frequencies.
- Dominant sequences (including CCDPs).
- Sequence logic for all dominant sequences.
- Fault tree definitions.
- Sequence cutsets.
- Definitions and probabilities for key basic events.

MODELING ASSUMPTIONS

Analysis Type. The Surry Unit 1 and Unit 2 SPAR models created in April 2012 were used for this event analysis. This event was modeled as a weather-related LOOP initiating event.

Analysis Rules. The ASP program uses Significance Determination Process results for degraded conditions when available. However, the ASP Program performs independent analysis for initiating events.

Unique Design Features. Surry, Units 1 and 2 have the following unique design features associated with its emergency electrical distribution system.

- EDG 1 provides power to Emergency Bus 1H only.
- EDG 2 provides power to Emergency Bus 2H only.
- EDG 3 (swing diesel) provides power to Emergency Buses 1J and 2J. The swing EDG was aligned to Bus 1J during the event. EDG 3 is available for the unit of concern unless the dedicated diesel generator for the other unit is not available. In that case, the swing diesel will be aligned to the other unit.
- The AAC Diesel Generator can be aligned to either Emergency Bus 1J or 2H given that the diesels that normally align to these buses have failed.
- The diesel generators do not require cooling water.

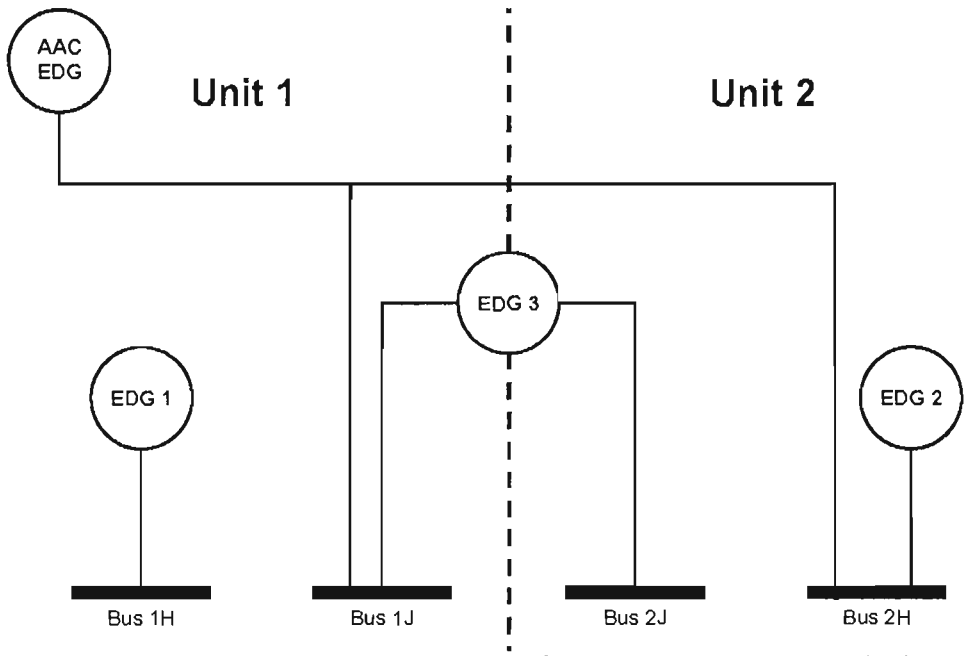


Figure 1. Surry, Units 1 and 2 simplified diagram of emergency electrical distribution system.

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

- This analysis models the April 16, 2011 dual-unit reactor trip at Surry Unit 1 and 2 as a LOOP initiating event.
- Offsite power recovery to an emergency bus was possible five hours and three minutes after the LOOP occurred.

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

Unit 1

- The LOOP initiating event frequency (IE-LOOP) was set 1.0 to represent the operational event that occurred at Surry Unit 1 on April 16, 2011. All other initiating events frequencies were set to zero.

- The non-recovery probability for basic events OEP-XHE-XL-NR01H (*Operator Fails to Recover Offsite Power in 1 Hour*), OEP-XHE-XL-NR02H (*Operator Fails to Recover Offsite Power in 2 Hours*), OEP-XHE-XL-NR03H (*Operator Fails to Recover Offsite Power in 3 Hours*), OEP-XHE-XL-NR04H (*Operator Fails to Recover Offsite Power in 4 Hours*) were set to TRUE because offsite power recovery to an emergency bus was not possible until five hours and three minutes after the LOOP occurred.

- The default diesel generator mission times were changed to reflect the actual time offsite power was restored to the first vital bus (approximately 6 hours for Unit 1). 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 = 5 hours.

Unit 2

- The LOOP initiating event frequency (IE-LOOP) was set 1.0 to represent the operational event that occurred at Surry Unit 2 on April 16, 2011. All other initiating events frequencies were set to zero.

- The non-recovery probability for basic events OEP-XHE-XL-NR01H (*Operator Fails to Recover Offsite Power in 1 Hour*), OEP-XHE-XL-NR02H (*Operator Fails to Recover Offsite Power in 2 Hours*), OEP-XHE-XL-NR03H (*Operator Fails to Recover Offsite Power in 3 Hours*), OEP-XHE-XL-NR04H (*Operator Fails to Recover Offsite Power in 4 Hours*) were set to TRUE because offsite power recovery to an emergency bus was not possible until five hours and three minutes after the LOOP occurred.

- The default diesel generator mission times were changed to reflect the actual time offsite power was restored to the first vital bus (approximately 7 hours for Unit 2). 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 = 6 hours.

REFERENCES

1. Surry Power Station Unit 1, "LER 280/11-001– Reactor Trip on Both Units Due to Loss of Offsite Power" dated June 14, 2011. (ML11178A032)

2. U.S. Nuclear Regulatory Commission, "Surry Power Station NRC Integrated Inspection Report 05000280/2011003," dated July 28, 2011. (ML112092845)

Appendix A: Analysis Results

Unit 1

Summary of Conditional Event Changes

Event	Description	Cond. Value	Nominal Value
DUAL-UNIT-LOOP	LOOP AFFECTING BOTH UNITS	TRUE	5.82E-1
IE-LOOPWR	LOSS OF OFFSITE POWER INITIATOR (WEATHER-RELATED)	1.00E+0	4.83E-3
OEP-XHE-XL-NR01HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR (WEATHER-RELATED)	TRUE	6.87E-1
OEP-XHE-XL-NR02HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS (WEATHER-RELATED)	TRUE	5.59E-1
OEP-XHE-XL-NR03HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 3 HOURS (WEATHER-RELATED)	TRUE	4.80E-1
OEP-XHE-XL-NR04HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS (WEATHER-RELATED)	TRUE	4.24E-1
ZT-DGN-FR-L	DIESEL GENERATOR FAILS TO RUN	5.42E-3	2.47E-2
EPS-DGN-FR-DG1	DIESEL GENERATOR 1 FAILS TO RUN	9.17E-3	2.84E-2
EPS-DGN-FR-DG2	DIESEL GENERATOR 2 FAILS TO RUN	9.17E-3	2.84E-2
EPS-DGN-FR-DG3	DIESEL GENERATOR 3 FAILS TO RUN	9.17E-3	2.84E-2
EPS-DGN-FR-SBO	SBO DIESEL GENERATOR FAILS TO RUN	1.09E-2	3.01E-2

Dominant Sequence Results

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

Event Tree	Sequence	CCDP	% Contribution	Description
LOOPWR	02-06	4.62E-5	49.6%	/RPS-L, /EPS, /AFW-L, /PORV-L, LOSC-L, /RSD, /BP1, BP2, OPR-02H, HPI-L
LOOPWR	17-03-10	1.75E-5	18.7%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, OPR-04H, DGR-04H, AFW-MAN, SG-DEP-LT1
LOOPWR	17-06	1.45E-5	15.6%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, BP2, OPR-04H, DGR-04H
LOOPWR	17-03-04	3.46E-6	3.7%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, OPR-04H, DGR-04H, /AFW-MAN, /CST-REFILL-LT1, SG-DEP-LT2, PWR-REC-24H
LOOPWR	16	3.03E-6	3.2%	/RPS-L, /EPS, AFW-L, FAB-L
LOOPWR	02-11	2.30E-6	2.5%	/RPS-L, /EPS, /AFW-L, /PORV-L, LOSC-L, /RSD, BP1, /BP2, OPR-02H, HPI-L
LOOPWR	17-45	1.30E-6	1.4%	/RPS-L, EPS, AFW-B, OPR-01H, DGR-01H
Total		**9.33E-5**	**100.0%**	

Referenced Fault Trees

Fault Tree	Description
AFW-B	AUXILIARY FEEDWATER
AFW-L	AUXILIARY FEEDWATER
AFW-MAN	MANUAL CONTROL AFW
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

Fault Tree	Description
DGR-04H	DIESEL GENERATOR RECOVERY (IN 4 HR)
EPS	Emergency Power
FAB-L	FEED AND BLEED
HPI-L	HIGH PRESSURE INJECTION
LOSC-L	SURRY 1 & 2 LOSS OF ALL RCP SEAL COOLING USING LOOP-FTF
OPR-01H	OFFSITE POWER RECOVERY IN 1 HR
OPR-02H	OFFSITE POWER RECOVERY IN 2 HRS
OPR-04H	OFFSITE POWER RECOVERY (IN 4 HR)
PWR-REC-24H	LATE POWER RECOVERY (24 HR)
SG-DEP-LT1	DEPRESSURIZE SGs (DEPENDENT)
SG-DEP-LT2	DEPRESSURIZE SGs (DEPENDENT)

Cutset Report - LOOPWR 02-06

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

#	CCDP	Total%	Cutset
	4.62E-5	100	Displaying 4315 of 4315 Cutsets.
1	2.87E-6	6.21	IE-LOOPWR,EPS-DGN-TM-DG1,RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
2	2.76E-6	5.98	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP2
3	2.76E-6	5.98	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP2
4	2.76E-6	5.98	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP2
5	2.76E-6	5.98	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP2
6	2.58E-6	5.57	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-TM-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP2
7	1.83E-6	3.97	IE-LOOPWR,EPS-DGN-FR-DG1,RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
8	1.77E-6	3.82	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP2
9	1.77E-6	3.82	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP2
10	1.77E-6	3.82	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP2
11	1.77E-6	3.82	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP2
12	1.65E-6	3.56	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-FR-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP2
13	1.44E-6	3.1	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-XHE-XM-LVL,RCS-MDP-LK-BP2
14	9.17E-7	1.98	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-XHE-XM-LVL,RCS-MDP-LK-BP2
15	5.78E-7	1.25	IE-LOOPWR,EPS-DGN-FS-DG1,RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
16	5.57E-7	1.2	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP2
17	5.57E-7	1.2	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP2
18	5.57E-7	1.2	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP2
19	5.57E-7	1.2	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP2
20	5.19E-7	1.12	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-FS-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP2

Cutset Report - LOOPWR 17-03-10

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

#	CCDP	Total%	Cutset
	1.75E-5	100	Displaying 754 of 754 Cutsets.
1	6.83E-6	39.1	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
2	1.91E-6	10.9	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
3	4.41E-7	2.53	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,/RCS-MDP-LK-BP2
4	4.41E-7	2.53	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,/RCS-MDP-LK-BP2
5	3.17E-7	1.81	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
6	3.17E-7	1.81	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
7	2.82E-7	1.62	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,/RCS-MDP-LK-BP2
8	2.41E-7	1.38	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
9	2.41E-7	1.38	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG1,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
10	2.02E-7	1.16	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-1BATA4HR,DCP-BAT-LP-1BATB4HR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2

Cutset Report - LOOPWR 17-06

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

#	CCDP	Total%	Cutset
	1.45E-5	100	Displaying 733 of 733 Cutsets.
1	5.69E-6	39.1	IE-LOOPWR,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
2	1.59E-6	10.9	IE-LOOPWR,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
3	3.68E-7	2.53	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,RCS-MDP-LK-BP2
4	3.68E-7	2.53	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,RCS-MDP-LK-BP2
5	2.64E-7	1.81	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
6	2.64E-7	1.81	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
7	2.35E-7	1.62	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO1J,RCS-MDP-LK-BP2
8	2.01E-7	1.38	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
9	2.01E-7	1.38	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
10	1.69E-7	1.16	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2

Cutset Report - LOOPWR 17-03-04

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

#	CCDP	Total%	Cutset
	3.46E-6	100	Displaying 487 of 487 Cutsets.
1	1.36E-6	39.2	IE-LOOPWR,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
2	3.79E-7	10.9	IE-LOOPWR,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
3	8.75E-8	2.53	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO1J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
4	8.75E-8	2.53	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO1J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
5	6.28E-8	1.81	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG1,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
6	6.28E-8	1.81	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
7	5.59E-8	1.62	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO1J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
8	4.78E-8	1.38	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG1,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
9	4.78E-8	1.38	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
10	4.01E-8	1.16	IE-LOOPWR,EPS-DGN-FR-DG1,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2

Cutset Report - LOOPWR 16

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

#	CCDP	Total%	Cutset
	3.03E-6	100	Displaying 4208 of 4208 Cutsets.
1	9.22E-7	30.4	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,HPI-XHE-XM-FB
2	4.80E-7	15.9	IE-LOOPWR,AFW-SYS-LK-SGCKVS,AFW-XHE-XM-XTIE,HPI-XHE-XM-FB
3	4.31E-7	14.2	IE-LOOPWR,AFW-PMP-CF-ALL,HPI-XHE-XM-FB
4	9.92E-8	3.27	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,DCP-BAT-LP-1BATA4HR,EPS-DGN-TM-DG1,PPR-MOV-FC-RC1535
5	6.34E-8	2.09	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,DCP-BAT-LP-1BATA4HR,EPS-DGN-FR-DG1,PPR-MOV-FC-RC1535
6	5.19E-8	1.71	IE-LOOPWR,AFW-MDP-TM-1P3B,AFW-TDP-FR-1P2,AFW-XHE-XM-XTIE,DCP-BAT-LP-1BATA4HR,EPS-DGN-FR-DG1,PPR-MOV-FC-RC1535
7	5.17E-8	1.71	IE-LOOPWR,AFW-SYS-LK-SGCKVS,AFW-XHE-XM-XTIE,DCP-BAT-LP-1BATA4HR,EPS-DGN-TM-DG1,PPR-MOV-FC-RC1535
8	5.14E-8	1.7	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-CKV-CC-CN151,HPI-XHE-XM-FB

#	CCDP	Total%	Cutset
9	4.64E-8	1.53	IE-LOOPWR,AFW-PMP-CF-ALL,DCP-BAT-LP-1BATA4HR,EPS-DGN-TM-DG1,PPR-MOV-FC-RC1535
10	3.30E-8	1.09	IE-LOOPWR,AFW-SYS-LK-SGCKVS,AFW-XHE-XM-XTIE,DCP-BAT-LP-1BATA4HR,EPS-DGN-FR-DG1,PPR-MOV-FC-RC1535
11	3.25E-8	1.07	IE-LOOPWR,AFW-MOV-CO-260A,HPI-XHE-XM-FB
12	3.25E-8	1.07	IE-LOOPWR,AFW-MOV-CO-260B,HPI-XHE-XM-FB

Cutset Report - LOOPWR 02-11

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

#	CCDP	Total%	Cutset
	2.30E-6	100	Displaying 1440 of 1440 Cutsets.
1	1.44E-7	6.23	IE-LOOPWR,EPS-DGN-TM-DG1,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
2	1.38E-7	6	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
3	1.38E-7	6	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
4	1.38E-7	6	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
5	1.38E-7	6	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
6	1.29E-7	5.59	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-TM-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
7	9.17E-8	3.98	IE-LOOPWR,EPS-DGN-FR-DG1,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
8	8.83E-8	3.83	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
9	8.83E-8	3.83	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
10	8.83E-8	3.83	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
11	8.83E-8	3.83	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
12	8.24E-8	3.57	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-FR-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
13	7.18E-8	3.11	IE-LOOPWR,EPS-DGN-TM-DG1,MCW-XHE-XM-LVL,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
14	4.59E-8	1.99	IE-LOOPWR,EPS-DGN-FR-DG1,MCW-XHE-XM-LVL,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
15	2.89E-8	1.25	IE-LOOPWR,EPS-DGN-FS-DG1,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2,SWS-101A-OPEN,SWS-XHE-XM-ISOL
16	2.78E-8	1.21	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-106B,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
17	2.78E-8	1.21	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-100A,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
18	2.78E-8	1.21	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-100C,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
19	2.78E-8	1.21	IE-LOOPWR,EPS-DGN-FS-DG1,MCW-MOV-OO-106D,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2
20	2.60E-8	1.13	IE-LOOPWR,DCP-BAT-LP-1BATA4HR,EPS-DGN-FS-DG1,MCW-LGC-FC-LOGICB,RCS-MDP-LK-BP1,/RCS-MDP-LK-BP2

Cutset Report - LOOPWR 17-45

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

#	CCDP	Total%	Cutset
	1.30E-6	100	Displaying 2441 of 2441 Cutsets.
1	1.68E-7	13	IE-LOOPWR,AFW-TDP-FR-1P2,AFW-XHE-XM-XTIE,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
2	5.54E-8	4.27	IE-LOOPWR,AFW-TDP-FR-1P2,AFW-TDP-FR-2P2,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
3	4.71E-8	3.63	IE-LOOPWR,AFW-TDP-FR-1P2,AFW-XHE-XM-XTIE,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR01H
4	3.25E-8	2.5	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG2,EPS-DGN-TM-DG1,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
5	3.25E-8	2.5	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG1,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
6	2.81E-8	2.16	IE-LOOPWR,AFW-TDP-FR-1P2,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H,EPS-XHE-XM-SBO2H
7	2.77E-8	2.13	IE-LOOPWR,AFW-TDP-FS-1P2,AFW-XHE-XM-XTIE,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
8	2.47E-8	1.91	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG1,EPS-XHE-XL-NR01H
9	2.47E-8	1.91	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG1,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR01H
10	2.30E-8	1.77	IE-LOOPWR,AFW-TDP-TM-1P2,AFW-XHE-XM-XTIE,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
11	2.08E-8	1.6	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG1,EPS-DGN-FR-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
12	2.01E-8	1.55	IE-LOOPWR,AFW-TDP-FR-1P2,EPS-DGN-CF-FRALL,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
13	1.58E-8	1.22	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-1P2,EPS-DGN-FR-DG1,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-XHE-XL-NR01H
14	1.55E-8	1.19	IE-LOOPWR,AFW-TDP-FR-1P2,AFW-TDP-FR-2P2,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR01H
15	1.53E-8	1.18	IE-LOOPWR,AFW-TDP-FR-1P2,EPS-DGN-CF-FRALL,EPS-DGN-FR-SBO,EPS-XHE-XL-NR01H

Referenced Events

Event	Description	Probability
ACP-DG3-ALIGN-AWAY	DG3 ALIGNED TO OPPOSITE UNIT	5.00E-1
AFW-MDP-TM-1P3B	AFW MDP 1-FW-P-3B UNAVAILABLE DUE TO T&M	3.98E-3
AFW-MOV-CO-260A	AFW CROSS-TIE 2-FW-MOV-260A DIVERTS FLOW	8.13E-7
AFW-MOV-CO-260B	AFW CROSS-TIE 2-FW-MOV-260B DIVERTS FLOW	8.13E-7
AFW-PMP-CF-ALL	COMMON CAUSE FAILURE OF AFW PUMPS(BOTH UNITS)	1.08E-5
AFW-SYS-LK-SGCKVS	STEAM LEAKAGE THRU CKVS 27.58 & 89 (PSA)	1.00E-4
AFW-TDP-FR-1P2	AFW TURBINE DRIVEN PUMP 1-FW-P-2 FAILS TO RUN	3.95E-2
AFW-TDP-FR-2P2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	3.95E-2
AFW-TDP-FS-1P2	AFW TURBINE DRIVEN PUMP 1-FW-P-2 FAILS TO START	6.49E-3
AFW-TDP-TM-1P2	AFW TDP 1-FW-P-2 UNAVAILABLE DUE TO T&M	5.39E-3
AFW-XHE-XM-CNTRL	OPERATOR FAILS TO CONTROL AFW TDP	3.00E-1
AFW-XHE-XM-XTIE	OPERATOR FAILS TO INITIATE AFW CROSSCONNECT	1.20E-1
CDS-CKV-CC-CN151	ECST M/U CHK VALVE 1-CN-151 FAILS CLOSED	1.07E-5

Event	Description	Probability
CDS-XVM-CC-CN150	ECST M/U VALVE 1-CN-150 FAILS CLOSED	1.92E-4
DCP-BAT-LP-1BATA4HR	BATTERY 1A 1-EPD-B-1A FAILURE AT 4 HOURS	1.00E+0
DCP-BAT-LP-1BATB4HR	BATTERY 1B 1-EPD-B-1B FAILURE AT 4 HOURS	1.00E+0
EPS-DGN-CF-FRALL	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO RUN	4.08E-5
EPS-DGN-CF-FSALL	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO START	1.14E-5
EPS-DGN-FR-DG1	DIESEL GENERATOR 1 FAILS TO RUN	9.17E-3
EPS-DGN-FR-DG2	DIESEL GENERATOR 2 FAILS TO RUN	9.17E-3
EPS-DGN-FR-DG3	DIESEL GENERATOR 3 FAILS TO RUN	9.17E-3
EPS-DGN-FR-SBO	SBO DIESEL GENERATOR FAILS TO RUN	1.09E-2
EPS-DGN-FS-DG1	DIESEL GENERATOR 1 FAILS TO START	2.89E-3
EPS-DGN-TM-DG1	DIESEL GENERATOR 1 UNAVAILABLE DUE TO T&M	1.43E-2
EPS-DGN-TM-DG2	DIESEL GENERATOR 2 UNAVAILABLE DUE TO T&M	1.43E-2
EPS-DGN-TM-DG3	DIESEL GENERATOR 3 UNAVAILABLE DUE TO T&M	1.43E-2
EPS-DGN-TM-SBO	SBO DIESEL GENERATOR UNAVAILABLE DUE TO T&M	1.43E-2
EPS-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR	8.71E-1
EPS-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 4 HOURS	6.98E-1
EPS-XHE-XL-NR24H4	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 24 HOURS (GIVEN FAILURE AT 4)	4.16E-1
EPS-XHE-XM-SBO1J	OPERATOR FAILS TO ALIGN SBO DIESEL TO BUS 1J	2.00E-2
EPS-XHE-XM-SBO2H	OPERATOR FAILS TO ALIGN SBO DIESEL TO BUS 2H	2.00E-2
HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	4.00E-2
IE-LOOPWR	LOSS OF OFFSITE POWER INITIATOR (WEATHER-RELATED)	1.00E+0
MCW-LGC-FC-LOGICB	LOGIC TRAIN B NON-ESSENTL SW ISOLLOSS OF FUNCTION (PSA)	8.98E-4
MCW-MOV-OO-100A	CONDENSER OUTLET 1-CW-MOV-100A FAILS OPEN	9.63E-4
MCW-MOV-OO-100C	CONDENSER OUTLET 1-CW-MOV-100CD FAILS OPEN	9.63E-4
MCW-MOV-OO-106B	CONDENSER INLET MOV1-CW-MOV-106B FAILS OPEN	9.63E-4
MCW-MOV-OO-106D	CONDENSER INLET MOV1-CW-MOV-106D FAILS OPEN	9.63E-4
MCW-XHE-XM-LVL	LEVEL INSTRUMENTS 1-CW-LS-102 / 103 CCF MISCALIBRATED (PSA)	5.00E-4
OEP-XHE-XL-NR24H4WR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 24 HOURS (GIVEN FAILURE AT 4, WEATHER)	1.43E-1
PPR-MOV-FC-RC1535	BLOCK VALVE 1535 CLOSED DUE TO PORV LEAKING	3.00E-1
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
SWS-101A-OPEN	PROBABILITY OF 1-SW-MOV-101A ALIGNED OPEN	5.00E-1
SWS-XHE-XM-ISOL	FAILURE TO VERIFY/ISOLATE SWS/CW INLET MOVS (AP-12, STEP 11)	2.00E-3

Unit 2

Summary of Conditional Event Changes

Event	Description	Cond. Value	Nominal Value
DUAL-UNIT-LOOP	LOOP AFFECTING BOTH UNITS	TRUE	5.82E-1
IE-LOOPWR	LOSS OF OFFSITE POWER INITIATOR (WEATHER-RELATED)	1.00E+0	4.83E-3
OEP-XHE-XL-NR01HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR (WEATHER-RELATED)	TRUE	6.87E-1
OEP-XHE-XL-NR02HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 2 HOURS (WEATHER-RELATED)	TRUE	5.59E-1
OEP-XHE-XL-NR03HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 3 HOURS (WEATHER-RELATED)	TRUE	4.80E-1
OEP-XHE-XL-NR04HWR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 4 HOURS (WEATHER-RELATED)	TRUE	4.24E-1
ZT-DGN-FR-L	DIESEL GENERATOR FAILS TO RUN	6.50E-3	2.47E-2
EPS-DGN-FR-DG1	DIESEL GENERATOR 1 FAILS TO RUN	1.02E-2	2.84E-2
EPS-DGN-FR-DG2	DIESEL GENERATOR 2 FAILS TO RUN	1.02E-2	2.84E-2
EPS-DGN-FR-DG3	DIESEL GENERATOR 3 FAILS TO RUN	1.02E-2	2.84E-2
EPS-DGN-FR-SBO	SBO DIESEL GENERATOR FAILS TO RUN	1.20E-2	3.01E-2

Dominant Sequence Results

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

Event Tree	Sequence	CCDP	% Contribution	Description
LOOPWR	17-03-10	2.15E-5	30.0%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, OPR-04H, DGR-04H, AFW-MAN, SG-DEP-LT1
LOOPWR	17-06	1.79E-5	25.0%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, BP2, OPR-04H, DGR-04H
LOOPWR	02-06	1.31E-5	18.4%	/RPS-L, /EPS, /AFW-L, /PORV-L, LOSC-L, /RSD, /BP1, BP2, OPR-02H, HPI-L
LOOPWR	16	6.03E-6	8.4%	/RPS-L, /EPS, AFW-L, FAB-L
LOOPWR	17-45	4.85E-6	6.8%	/RPS-L, EPS, AFW-B, OPR-01H, DGR-01H
LOOPWR	17-03-04	4.26E-6	6.0%	/RPS-L, EPS, /AFW-B, /PORV-B, /RSD, /BP1, /BP2, OPR-04H, DGR-04H, /AFW-MAN, /CST-REFILL-LT1, SG-DEP-LT2, PWR-REC-24H
Total		**7.15E-5**	**100.0%**	

Referenced Fault Trees

Fault Tree	Description
AFW-B	AUXILIARY FEEDWATER
AFW-L	AUXILIARY FEEDWATER
AFW-MAN	MANUAL CONTROL AFW
BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING)
DGR-01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR
DGR-04H	DIESEL GENERATOR RECOVERY (IN 4 HR)
EPS	EMERGENCY POWER IS UNAVAILABLE
FAB-L	FEED AND BLEED
HPI-L	HIGH PRESSURE INJECTION

Fault Tree	Description
LOSC-L	SURRY 2 LOSS OF ALL RCP SEAL COOLING USING LOOP-FTF
OPR-01H	OFFSITE POWER RECOVERY IN 1 HR
OPR-02H	OFFSITE POWER RECOVERY IN 2 HRS
OPR-04H	OFFSITE POWER RECOVERY (IN 4 HR)
PWR-REC-24H	LATE POWER RECOVERY (24 HR)
SG-DEP-LT1	DEPRESSURIZE SGs (DEPENDENT)
SG-DEP-LT2	DEPRESSURIZE SGs (DEPENDENT)

Cutset Report - LOOPWR 17-03-10

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

#	CCDP	Total%	Cutset
	2.15E-5	100	Displaying 931 of 931 Cutsets.
1	3.83E-6	17.8	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
2	9.62E-7	4.48	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,/RCS-MDP-LK-BP2
3	9.55E-7	4.45	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
4	6.90E-7	3.22	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,/RCS-MDP-LK-BP2
5	6.87E-7	3.2	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,/RCS-MDP-LK-BP2
6	5.77E-7	2.69	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,/RCS-MDP-LK-BP2
7	4.93E-7	2.3	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,/RCS-MDP-LK-BP2
8	4.93E-7	2.3	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,/RCS-MDP-LK-BP2
9	4.93E-7	2.3	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,/RCS-MDP-LK-BP2
10	4.12E-7	1.92	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,/RCS-MDP-LK-BP2
11	3.54E-7	1.65	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
12	3.54E-7	1.65	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
13	3.52E-7	1.64	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,/RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
14	2.96E-7	1.38	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
15	2.96E-7	1.38	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2
16	2.53E-7	1.18	IE-LOOPWR,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATA4HR,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,/RCS-MDP-LK-BP2

Cutset Report - LOOPWR 17-06

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

#	CCDP	Total%	Cutset
	1.79E-5	100	Displaying 911 of 911 Cutsets.
1	3.19E-6	17.8	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
2	8.02E-7	4.48	IE-LOOPWR,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,RCS-MDP-LK-BP2
3	7.96E-7	4.45	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
4	5.75E-7	3.22	IE-LOOPWR,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,RCS-MDP-LK-BP2
5	5.73E-7	3.2	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,RCS-MDP-LK-BP2
6	4.81E-7	2.69	IE-LOOPWR,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,RCS-MDP-LK-BP2
7	4.11E-7	2.3	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,RCS-MDP-LK-BP2
8	4.11E-7	2.3	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,RCS-MDP-LK-BP2
9	4.11E-7	2.3	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,RCS-MDP-LK-BP2
10	3.43E-7	1.92	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XM-DG32J,RCS-MDP-LK-BP2
11	2.95E-7	1.65	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
12	2.95E-7	1.65	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
13	2.93E-7	1.64	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XM-SBO2H,RCS-MDP-LK-BP2
14	2.46E-7	1.38	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
15	2.46E-7	1.38	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2
16	2.10E-7	1.18	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,RCS-MDP-LK-BP2

Cutset Report - LOOPWR 02-06

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

#	CCDP	Total%	Cutset
	1.31E-5	100	Displaying 3769 of 3769 Cutsets.
1	1.68E-6	12.8	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-XHE-XM-DG32J,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
2	1.20E-6	9.18	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-TM-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
3	8.60E-7	6.55	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
4	4.87E-7	3.71	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-XHE-XM-DG32J,IAS-MDC-FS-1C1,RCS-MDP-LK-BP2
5	4.09E-7	3.12	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-TM-DG3,EPS-XHE-XM-SBO1J,RCS-MDP-LK-BP2
6	3.49E-7	2.66	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-TM-DG3,IAS-MDC-FS-1C1,RCS-MDP-LK-BP2
7	3.42E-7	2.61	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-XHE-XM-DG32J,IAS-MDC-TM-1C1,RCS-MDP-LK-BP2
8	3.21E-7	2.45	IE-LOOPWR,CPC-MDP-FS-SWP10A,EPS-XHE-XM-DG32J,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
9	2.93E-7	2.24	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,RCS-MDP-LK-BP2
10	2.92E-7	2.23	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,EPS-XHE-XM-SBO1J,RCS-MDP-LK-BP2
11	2.50E-7	1.9	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,IAS-MDC-FS-1C1,RCS-MDP-LK-BP2
12	2.45E-7	1.87	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-TM-DG3,IAS-MDC-TM-1C1,RCS-MDP-LK-BP2
13	2.45E-7	1.87	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,RCS-MDP-LK-BP2
14	2.43E-7	1.85	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FS-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
15	2.30E-7	1.75	IE-LOOPWR,CPC-MDP-FS-SWP10A,EPS-DGN-TM-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
16	2.10E-7	1.6	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,RCS-MDP-LK-BP2
17	2.10E-7	1.6	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,RCS-MDP-LK-BP2
18	2.10E-7	1.6	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,RCS-MDP-LK-BP2
19	2.01E-7	1.53	IE-LOOPWR,ACP-CRB-OO-25J3,CPC-MDP-TM-SWP10A,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
20	1.75E-7	1.34	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,IAS-MDC-TM-1C1,RCS-MDP-LK-BP2
21	1.75E-7	1.33	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,RCS-MDP-LK-BP2
22	1.64E-7	1.25	IE-LOOPWR,CPC-MDP-FS-SWP10A,EPS-DGN-FR-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2
23	1.50E-7	1.14	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,RCS-MDP-LK-BP2
24	1.48E-7	1.13	IE-LOOPWR,CPC-MDP-TM-SWP10A,EPS-SEQ-FO-DG3,IAS-MDC-FR-1C1,RCS-MDP-LK-BP2

Cutset Report - LOOPWR 16

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

#	CCDP	Total%	Cutset
	6.03E-6	100	Displaying 6814 of 6814 Cutsets.
1	9.22E-7	15.3	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,HPI-XHE-XM-FB
2	4.80E-7	7.96	IE-LOOPWR,AFW-SYS-LK-SGCKVS,AFW-XHE-XM-XTIE,HPI-XHE-XM-FB
3	4.31E-7	7.15	IE-LOOPWR,AFW-PMP-CF-ALL,HPI-XHE-XM-FB
4	1.38E-7	2.29	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,DCP-BAT-LP-2BATB4HR,EPS-XHE-XM-DG32J,PPR-MOV-FC-RC1536
5	1.13E-7	1.88	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-TDP-FR-2P2,AFW-XHE-XM-XTIE,DCP-BAT-LP-2BATB4HR,EPS-XHE-XM-DG32J,PPR-MOV-FC-RC1536
6	1.03E-7	1.7	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG3,EPS-XHE-XM-SBO1J,PPR-MOV-FC-RC1536
7	9.92E-8	1.65	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG3,PPR-MOV-FC-RC1536
8	8.11E-8	1.35	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-TDP-FR-2P2,AFW-XHE-XM-XTIE,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG3,PPR-MOV-FC-RC1536
9	7.37E-8	1.22	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATB4HR,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,PPR-MOV-FC-RC1536
10	7.33E-8	1.22	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG3,EPS-XHE-XM-SBO1J,PPR-MOV-FC-RC1536
11	7.20E-8	1.19	IE-LOOPWR,AFW-SYS-LK-SGCKVS,AFW-XHE-XM-XTIE,DCP-BAT-LP-2BATB4HR,EPS-XHE-XM-DG32J,PPR-MOV-FC-RC1536
12	7.08E-8	1.18	IE-LOOPWR,AFW-XHE-XM-XTIE,CDS-XVM-CC-CN150,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-DG3,PPR-MOV-FC-RC1536
13	6.46E-8	1.07	IE-LOOPWR,AFW-PMP-CF-ALL,DCP-BAT-LP-2BATB4HR,EPS-XHE-XM-DG32J,PPR-MOV-FC-RC1536
14	6.16E-8	1.02	IE-LOOPWR,AFW-MDP-TM-2P3A,AFW-XHE-XM-CNTRL,DCP-BAT-LP-2BATB4HR,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,PPR-MOV-FC-RC1536

Cutset Report - LOOPWR 17-45

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

#	CCDP	Total%	Cutset
	4.85E-6	100	Displaying 1740 of 1740 Cutsets.
1	7.86E-7	16.2	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-2P2,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
2	1.96E-7	4.04	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FR-2P2,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR01H
3	1.42E-7	2.92	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H,EPS-XHE-XM-DG32J
4	1.29E-7	2.66	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-FS-2P2,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
5	1.18E-7	2.44	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR01H,EPS-XHE-XM-DG32J
6	1.07E-7	2.21	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,AFW-TDP-TM-2P2,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR01H
7	1.01E-7	2.09	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-XHE-XL-NR01H,EPS-XHE-XM-SBO2H
8	1.01E-7	2.09	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-XHE-XL-NR01H,EPS-XHE-XM-SBO2H
9	1.01E-7	2.09	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H,EPS-XHE-XM-DG32J

#	CCDP	Total%	Cutset
10	8.46E-8	1.74	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-XHE-XL-NR01H,EPS-XHE-XM-DG32J
11	7.26E-8	1.5	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
12	7.26E-8	1.5	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H
13	7.23E-8	1.49	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-XHE-XL-NR01H,EPS-XHE-XM-SBO2H
14	6.07E-8	1.25	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR01H
15	6.07E-8	1.25	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR01H
16	5.19E-8	1.07	IE-LOOPWR,AFW-TDP-FR-2P2,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR01H

Cutset Report - LOOPWR 17-03-04

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

#	CCDP	Total%	Cutset
	4.25E-6	100	Displaying 603 of 603 Cutsets.
1	7.59E-7	17.9	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,EPS-DGN-CF-FRALL,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
2	1.91E-7	4.49	IE-LOOPWR,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
3	1.89E-7	4.45	IE-LOOPWR,ACP-DG3-ALIGN-AWAY,EPS-DGN-CF-FSALL,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
4	1.37E-7	3.22	IE-LOOPWR,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
5	1.36E-7	3.2	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,EPS-XHE-XM-SBO2H,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
6	1.14E-7	2.69	IE-LOOPWR,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
7	9.78E-8	2.3	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO2H,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
8	9.78E-8	2.3	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO2H,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
9	9.78E-8	2.3	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
10	8.17E-8	1.92	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-DG32J,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
11	7.02E-8	1.65	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-TM-DG2,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
12	7.02E-8	1.65	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-TM-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2

#	CCDP	Total%	Cutset
13	6.98E-8	1.64	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,EPS-XHE-XM-SBO2H,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
14	5.86E-8	1.38	IE-LOOPWR,EPS-DGN-FR-DG3,EPS-DGN-FR-SBO,EPS-DGN-TM-DG2,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
15	5.86E-8	1.38	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-SBO,EPS-DGN-TM-DG3,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2
16	5.01E-8	1.18	IE-LOOPWR,EPS-DGN-FR-DG2,EPS-DGN-FR-DG3,EPS-DGN-TM-SBO,EPS-XHE-XL-NR04H,EPS-XHE-XL-NR24H4,OEP-XHE-XL-NR24H4WR,/RCS-MDP-LK-BP2

Referenced Events

Event	Description	Probability
ACP-CRB-OO-25J3	XFR BUS TO 2J BKR 2-EP-BKR-25J3 FAILS OPENS	2.39E-3
ACP-DG3-ALIGN-AWAY	DG3 ALIGNED TO OPPOSITE UNIT	5.00E-1
AFW-MDP-TM-2P3A	UNIT 2 AFW MD PUMP 2-FW-P-3A TEST AND MAINTENANCE	3.98E-3
AFW-PMP-CF-ALL	COMMON CAUSE FAILURE OF AFW PUMPS(BOTH UNITS)	1.08E-5
AFW-SYS-LK-SGCKVS	STEAM LEAKAGE THRU CKVS 27.58 & 89 (PSA)	1.00E-4
AFW-TDP-FR-2P2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO RUN	3.95E-2
AFW-TDP-FS-2P2	UNIT 2 AFW TD PUMP 2-FW-P-2 FAILS TO START	6.49E-3
AFW-TDP-TM-2P2	UNIT 2 AFW TD PUMP 2-FW-P-2 TEST AND MAINTENANCE	5.39E-3
AFW-XHE-XM-CNTRL	OPERATOR FAILS TO CONTROL AFW TDP	3.00E-1
AFW-XHE-XM-XTIE	OPERATOR FAILS TO INITIATE AFW CROSSCONNECT	1.20E-1
CDS-XVM-CC-CN150	ECST M/U VALVE 2-CN-150 FAILS CLOSED	1.92E-4
CPC-MDP-FS-SWP10A	CPC SWS TRAIN 1-SW-P-10A FAILURES TO START	1.36E-3
CPC-MDP-TM-SWP10A	CPC SWS MDP 1-SW-P-10A UNAVAILABLE DUE TO T&M`	7.12E-3
DCP-BAT-LP-2BATA4HR	BATTERY 2A 2-EPD-B-2A FAILURE AT 4 HOURS	1.00E+0
DCP-BAT-LP-2BATB4HR	BATTERY 2B 2-EPD-B-2B FAILURE AT 4 HOURS	1.00E+0
EPS-DGN-CF-FRALL	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO RUN	4.57E-5
EPS-DGN-CF-FSALL	COMMON CAUSE FAILURE OF DIESEL GENERATORS TO START	1.14E-5
EPS-DGN-FR-DG2	DIESEL GENERATOR 2 FAILS TO RUN	1.02E-2
EPS-DGN-FR-DG3	DIESEL GENERATOR 3 FAILS TO RUN	1.02E-2
EPS-DGN-FR-SBO	SBO DIESEL GENERATOR FAILS TO RUN	1.20E-2
EPS-DGN-FS-DG3	DIESEL GENERATOR 3 FAILS TO START	2.89E-3
EPS-DGN-TM-DG2	DIESEL GENERATOR 2 UNAVAILABLE DUE TO T & M	1.43E-2
EPS-DGN-TM-DG3	DIESEL GENERATOR 3 UNAVAILABLE DUE TO T & M	1.43E-2
EPS-DGN-TM-SBO	SBO DIESEL GENERATOR UNAVAILABLE DUE TO T & M	1.43E-2
EPS-SEQ-FO-DG3	DG3 SEQUENCENCER FAILS	1.76E-3
EPS-XHE-XL-NR01H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR	8.71E-1
EPS-XHE-XL-NR04H	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 4 HOURS	6.98E-1
EPS-XHE-XL-NR24H4	OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 24 HOURS (GIVEN FAILURE AT 4)	4.16E-1
EPS-XHE-XM-DG32J	OPERATOR FAILS TO ALIGN DG 3 TO BUS 2J	2.00E-2

Event	Description	Probability
EPS-XHE-XM-SBO1J	OPERATOR FAILS TO ALIGN SBO DIESEL TO BUS 1J	2.00E-2
EPS-XHE-XM-SBO2H	OPERATOR FAILS TO ALIGN SBO DIESEL TO BUS 2H	2.00E-2
HPI-XHE-XM-FB	OPERATOR FAILS TO INITIATE FEED AND BLEED COOLING	4.00E-2
IAS-MDC-FR-1C1	INSTRUMENT AIR COMPRESSOR 1-IA-C-1 FAILS TO RUN	5.89E-2
IAS-MDC-FS-1C1	INSTRUMENT AIR COMPRESSOR 1-IA-C-1 FAILS TO START	1.71E-2
IAS-MDC-TM-1C1	INSTRUMENT AIR COMPRESSOR 1-IA-C-1 UNAVAILABLE DUE TO T&M	1.20E-2
IE-LOOPWR	LOSS OF OFFSITE POWER INITIATOR (WEATHER-RELATED)	1.00E+0
OEP-XHE-XL-NR24H4WR	OPERATOR FAILS TO RECOVER OFFSITE POWER IN 24 HOURS (GIVEN FAILURE AT 4, WEATHER)	1.43E-1
PPR-MOV-FC-RC1536	BLOCK VALVE 1536 CLOSED DUE TO PORV LEAKING	3.00E-1
RCS-MDP-LK-BP2	RCP SEAL STAGE 2 INTEGRITY (BINDING/POPPING OPEN) FAILS	2.00E-1

Appendix B: Key Event Trees

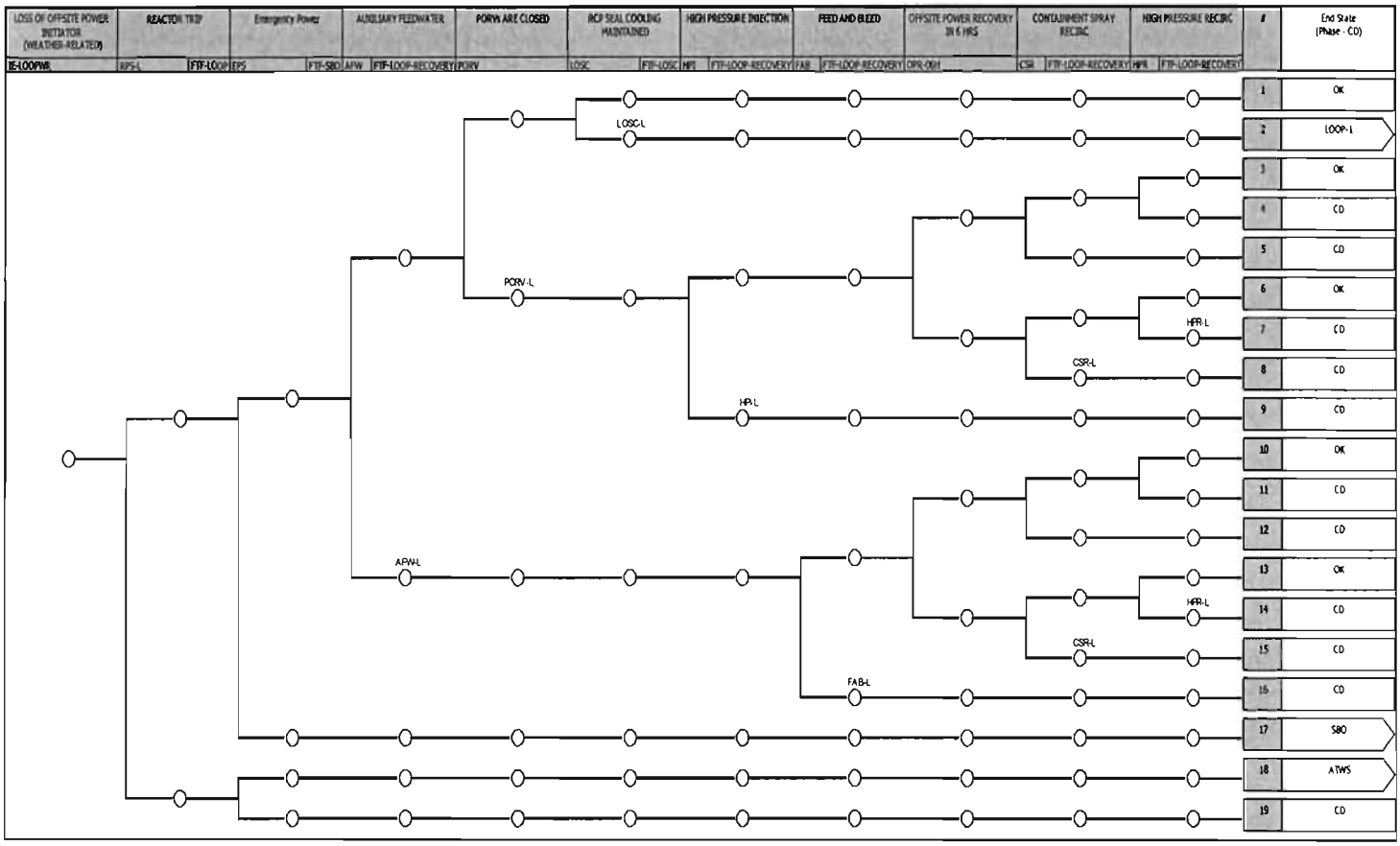


Figure B-1. Surry Weather-Related LOOP event tree.

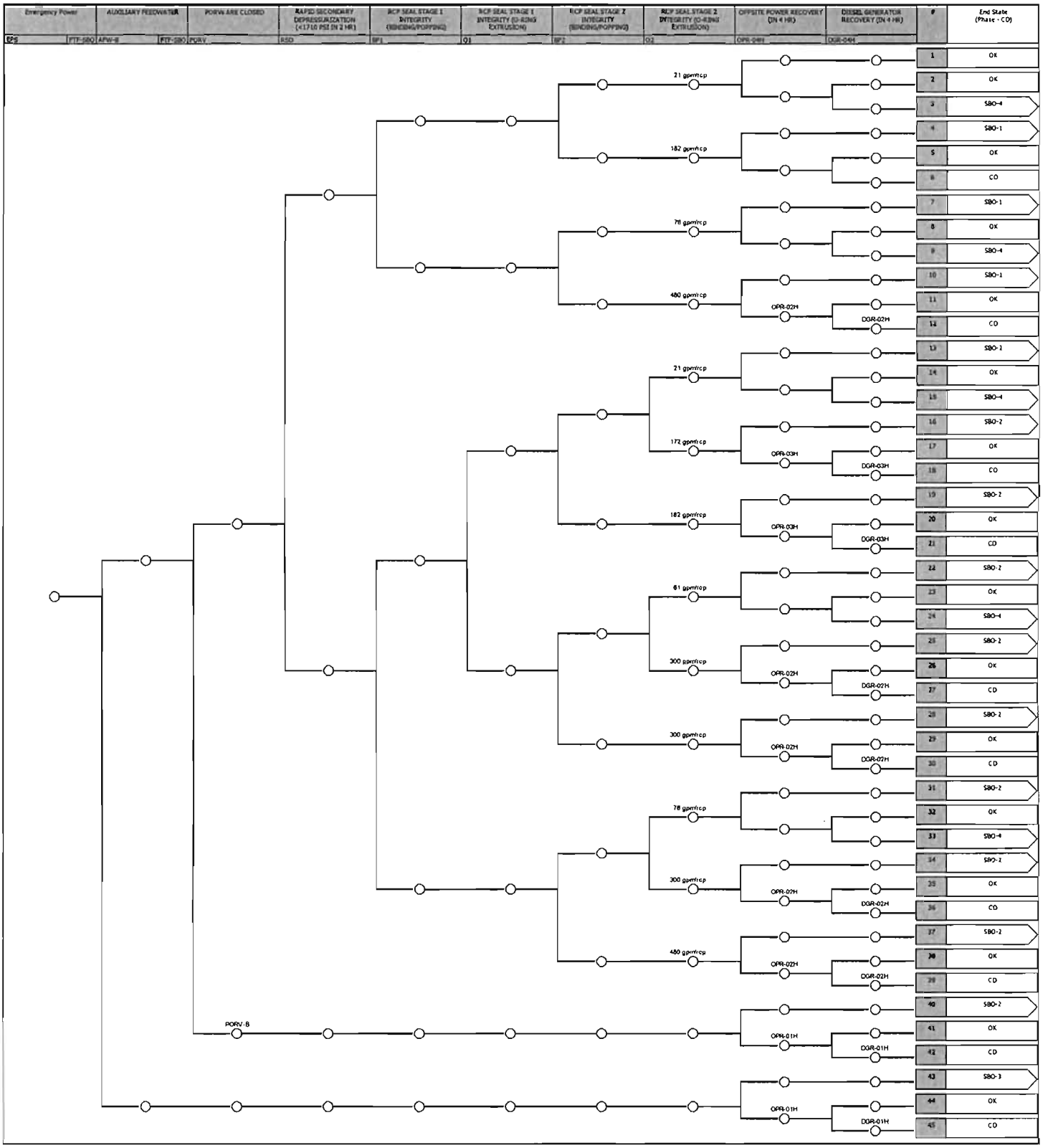


Figure B-2. Surry SBO event tree.

The enclosure containing the final analysis report is provided for your information.

Sincerely,

/RA by V. Sreenivas for/

Karen Cotton, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-280 and 50-281

Enclosure:
Final Precursor Analysis

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NAME	KCotton (VSreevinas for)	SFigueroa	NSalgado	KCotton (VSreevinas for)
DATE	06/14/12	06/14/12	06/14/12	06/14/12

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