
REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 312-8343
SRP Section: SRP 19
Application Section: 19.1
Date of RAI Issue: 11/16/2015

Question No. 19-18

10 CFR 52.47(a)(27) requires that a standard design certification applicant provide a description of the design specific PRA. SRP Chapter 19.0, Revision 3 (Draft), Section "II. Acceptance Criteria," states that "the staff determines whether... the technical adequacy of the PRA is sufficient to justify the specific results and risk insights that are used to support the DC or COL application."

In APR1400 DCD Chapter 19, Table 19.1-16 describes the basic event "MTC-ATWS" as "no adverse moderator temperature coefficient" with an assigned probability value of 1.6E-01. However, the staff review finds this description is inconsistent with the event, named "MTC-ATWS," being part of the sequence cutsets generated for Items Rank 11 and Rank 31 in Table 19.1-18 and Item Rank 3 in Table 19.1-19. As shown in Table 19.1-18, the sequence frequency for Item Rank 11 is calculated as ATWS (5.57E-08/yr in Table 19.1-17) * MTC-ATWS = 4.13E-08/yr. This yields MTC-ATWS = 4.13E-08/yr ÷ 5.57E-08/yr = 7.4E-01, which is inconsistent with the probability provided in Table 19.1-16.

It is not clear whether "MTC-ATWS" represents "adverse" event or "no adverse" event and the meaning of its assigned probability value is unclear. Therefore, to allow the staff to reach a reasonable assurance finding on the APR1400 PRA technical adequacy, please provide clarification for the following concerns and revise the DCD to address any apparent inconsistencies:

1. The description of basic event "MTC-ATWS"
2. The actual probability used for basic event "MTC-ATWS"
3. The impacts on the cutset frequencies, importance rankings, quantification, and PRA insights if the probability of "MTC-ATWS" is to be reassigned.

Response – (Rev. 1)

1. The definition of MTC-ATWS is “Adverse Moderate Temperature Coefficient” and the converse of this event “/MTC-ATWS” is “No Adverse Moderate Temperature Coefficient”.
2. The probability used for basic event MTC-ATWS is 1.60E-01 and the converse event /MTC-ATWS is 8.40E-01 (i.e., $1 - \text{MTC-ATWS}$).
3. There are no impact on the cutset frequencies, importance rankings, quantification, or PRA insights because it is only a typo. Thus it will be fixed as shown in Attachment 1.

Note that in the original question, an attempt was made to back-calculate the value of MTC-ATWS using the sequence frequency for Item Rank 11 in Table 19.1-18. However, the equation erroneously used the total ATWS CDF of 5.57E-08/yr from Table 19.1-17 as the ATWS initiating event frequency (IEF). There is no ATWS IEF, per se, as an ATWS event is the product of an initiator and subsequent failure of reactor trip. What can be calculated from the Table 19.1-18 Rank 11 sequence is the value of the term ATWS ($4.13\text{E-}08/\text{yr} / 0.16 = 2.58\text{E-}07/\text{yr}$) which is the sum of the product of all initiating events with subsequent failure of reactor trip which transfer to the ATWS event tree.

Impact on DCD

DCD 19.1 will be revised to reflect the response of this RAI as shown in Attachment 1.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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Table 19.1-16

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Special Basic Events

Basic Event	Value	Description	Data Source
MTC-ATWS	1.60E-01	No Adverse Moderator Temperature Coefficient	Engineering Judgment
SEAL-AFSUC	4.00E-03	RCP Seal LOCA Probability after success of secondary heat removal	Engineering Judgment
RAC16H-PL	3.03E-03	Non-recoverable probability of Offsite power within 16 hours after plant-centered LOOP	NUREG/CR-6890, Volume 1, Table 4-1
RAC16H-SW	5.89E-03	Non-recoverable probability of Offsite power within 16 hours after switchyard-centered LOOP	NUREG/CR-6890, Volume 1, Table 4-1
RAC16H-GR	1.01E-02	Non-recoverable probability of Offsite power within 16 hours after grid-related LOOP	NUREG/CR-6890, Volume 1, Table 4-1
RAC16H-WE	1.59E-01	Non-recoverable probability of Offsite power within 16 hours after weather-related LOOP	NUREG/CR-6890, Volume 1, Table 4-1
PFLOOP-TRANS	2.40E-03	Conditional LOOP upon Transients	EPRI Interim Technical Report (Reference 11)
PFLOOP-LOCA	2.40E-02	Conditional LOOP upon LOCA initiators	EPRI Interim Technical Report

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Table 19.1-19 (1 of 24)

Level 1 Internal Events Top 100 CDF Cutsets

Rank	Cutset Frequency	Cutsets			Contribution to CDF (%)	
		Cutset	Basic Event Probability	Cutset Description	Cutset	Cumulative
1	4.47E-08	%TLOCCW	2.34E-04	TOTAL LOSS OF COMPONANT COOLING WATER	3.4	3.4
		CVDPR-S-PP03	4.78E-02	AUXILIARY CHARGING PUMP (PP03) FAILS TO RUN		
		SEAL-AFSUC	4.00E-03	SEAL FAILURE PROBABILITY (SECONDARY HEAT REMOVAL SUCCESS)		
2	4.47E-08	%TLOESW	2.34E-04	TOTAL LOSS OF ESSENTIAL SERVICE WATER	3.4	6.9
		CVDPR-S-PP03	4.78E-02	AUXILIARY CHARGING PUMP (PP03) FAILS TO RUN		
		SEAL-AFSUC	4.00E-03	SEAL FAILURE PROBABILITY (SECONDARY HEAT REMOVAL SUCCESS)		
3	3.13E-08	%GTRN	6.56E-01	GENERAL TRANSIENT	2.4	9.3
		I-ATWS-RPMCFC	2.98E-07	FAILURE TO SCRAM DUE TO MECHANICAL FAILURES		
		MTC-ATWS	1.60E-01	NO ADVERSE MODERATE TEMPERATURE COEFFICIENT		
4	3.06E-08	%RVR	3.06E-08	REACTOR VESSEL RUPTURE	2.4	11.6
5	2.43E-08	%SLOCA	1.99E-03	SMALL LOSS OF COOLANT ACCIDENT	1.9	13.5
		SISPP-S-IRWST	1.22E-05	FAILURE OF IRWST SUMP DUE TO PLUGGING		

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Table 19.1-19 (4 of 24)

Rank	Cutset Frequency	Cutsets			Contribution to CDF (%)	
		Cutset	Basic Event Probability	Cutset Description	Cutset	Cumulative
16	5.23E-09	%LOOP-WE	3.71E-03	WEATHER-RELATED LOOP	0.4	21.7
		PFHBWQ4-SW2OUAT	2.71E-05	CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN		
		PFOPH-S-UATBKR-LOCAL	5.20E-02	OPERATOR FAIL TO RECOVER PCB FOR 1E 4.16kV SW01A,B,C,D AT LOCAL		
17	5.15E-09	%PLOCCW	4.36E-03	PARTIAL LOSS OF COMPONANT COOLING WATER	0.4	22.1
		DGDGR-B-DGB	2.49E-02	FAILS TO RUN OF EDG B		
		PFLOOP-TRANS	2.40E-03	CONDITIONAL LOOP UPON TRANSIENTS		
		WOCHM2B-CH02B	1.98E-02	ECW CHILLER 2B TRAIN UNAVAILABLE DUE TO T&M		
18	5.15E-09	%LOOP-WE	3.71E-03	WEATHER-RELATED LOOP	0.4	22.5
		DATGR-S-AACTG	1.56E-01	AAC GAS TURBINE GENERATOR FAILS TO RUN		
		RAC-16H-WE	1.59E-01	NON-RECOVERY PROBABILITY OF OFFSITE POWER WITHIN 16HR (WEATHER RELATED)		
		SXFLP-S-FT0123AB	5.58E-05	ESW DEBRIS FILTERS PLUGGED		
19	4.43E-09	%GTRN	1.60E-01	GENERAL TRANSIENT	0.3	22.8
		MTC-ATWS	6.56E-01	NO ADVERSE MODERATE TEMPERATURE COEFFICIENT		
		I-ATWS-RPMCF	2.98E-07	FAILURE TO SCRAM DUE TO MECHANICAL FAILURES		
		PI-SGTR	2.70E-02	PRESSURE INDUECD SGTR PROBABILITY		

-MTC-ATWS

6.56E-01

8.40E-01

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Table 19.1-19 (9 of 24)

Rank	Cutset Frequency	Cutsets			Contribution to CDF (%)	
		Cutset	Basic Event Probability	Cutset Description	Cutset	Cumulative
38	3.67E-09	%LOOP-SW	9.88E-03	SWITCHYARD-CENTERED LOOP	0.3	28.6
		PFHBC2A-SW01C-E2	6.66E-03	CLASS 1E 4.16kV SWITCHGEAR PCB SW01C-E2 (AAC) FAILS TO CLOSE		
		SXFLP-S-FT0123AB	5.58E-05	ESW DEBRIS FILTERS PLUGGED		
39	3.44E-09	%PLOCCW	4.36E-03	PARTIAL LOSS OF COMPONANT COOLING WATER	0.3	28.9
		DGDGR-B-DGB	2.49E-02	FAILS TO RUN OF EDG B		
		PFLOOP-TRANS	2.40E-03	CONDITIONAL LOOP UPON TRANSIENTS		
		SXMPM2B-PP02B	1.32E-02	ESW PUMP 2B UNAVAILABLE DUE TO T&M		
40	3.39E-09	%PLOCCW	4.36E-03	PARTIAL LOSS OF COMPONANT COOLING WATER	0.3	29.2
		DGDGR-B-DGB	2.49E-02	FAILS TO RUN OF EDG B		
		PFLOOP-TRANS	2.40E-03	CONDITIONAL LOOP UPON TRANSIENTS		
		WOCHS2B-CH02B	1.30E-02	ECW CHILLER 2B FAILS TO START		
41	3.12E-09	%LOFW	6.55E-02	LOSS OF MAIN FEEDWATER	0.2	29.4
		I-ATWS-RPMCF	2.98E-07	FAILURE TO SCRAM DUE TO MECHANICAL FAILURES		
		MTC-ATWS	1.60E-01	NO ADEVERSE MODERATE TEMPERATURE COEFFICIENT		



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Table 19.1-19 (12 of 24)

Rank	Cutset Frequency	Cutsets			Contribution to CDF (%)	
		Cutset	Basic Event Probability	Cutset Description	Cutset	Cumulative
49	2.66E-09	%SGTR	1.97E-03	STEAM GENERATOR TUBE RUPTURE	0.2	31.1
		CVMVO-S-509	9.65E-04	IRWST RETURN LINE ISOLATION VALVE FAILS TO OPEN		
		HR-RCSCD1-ISOL	1.40E-03	OPERATOR FAILS TO TAKE ACTION FOR SG COOLDOWN, RCS DEPRESS PRIOR TO OVERFILL		
		HR-RCSCD2-CD	1.00E+00	OPERATOR FAILS TO TAKE ACTION FOR SG COOLDOWN, RCS DEPRESS AFTER OVERFILL		
50	2.66E-09	%LOCV	5.57E-02	LOSS OF CONDENSER VACCUM	0.2	31.3
		I-ATWS-RPMCF	2.98E-07	FAILURE TO SCRAM DUE TO MECHANICAL FAILURES		
		MTC-ATWS	1.60E-01	NO ADEVERSE MODERATE TEMPERATURE COEFFICIENT		
51	2.58E-09	%LOOP-PL	1.83E-03	PLANT-CENTERED LOOP	0.2	31.5
		PFHBWQ4-SW2OUAT	2.71E-05	CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN		
		PFOPH-S-UATBKR-LOCAL	5.20E-02	OPERATOR FAIL TO RECOVER PCB FOR 1E 4.16kV SW01A,B,C,D AT LOCAL		
52	2.52E-09	%SLOCA	1.99E-03	SMALL LOSS OF COOLANT ACCIDENT	0.2	31.7
		AFOPH-S-ALT-LT	9.10E-04	OPERATOR FAIL TO ALIGN FOR SUPPLYING AN ALTERNATE SOURCE		
		PFLOOP-LOCA	2.40E-02	CONDITIONAL LOOP UPON LOCA INITIATORS		
		RCOPH-S-SDSL-LD	5.79E-02	FAILURE OF POSRVS LATE PHASE OPEN WITH LOW DEPENDENCY		

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Table 19.1-19 (15 of 24)

Rank	Cutset Frequency	Cutsets			Contribution to CDF (%)	
		Cutset	Basic Event Probability	Cutset Description	Cutset	Cumulative
61	2.30E-09	%GTRN	1.60E-01	GENERAL TRANSIENT	0.2	33.4
		MTC-ATWS	6.56E-01	NO A-ADVERSE MODERATE TEMPERATURE COEFFICIENT		
		CVOPH-S-BORATION	1.40E-02	OPERATOR FAILS TO INITIATE EMERGENCY BORATION TO RCS		
		I-ATWS-RPMCF	2.98E-07	FAILURE TO SCRAM DUE TO MECHANICAL FAILURES		
62	2.29E-09	%SGTR	1.97E-03	STEAM GENERATOR TUBE RUPTURE	0.2	33.6
		AFMPM2A-MDP02A	3.63E-03	AFW PUMP 2A UNAVAILABLE DUE TO T&M		
		AFTPR1A-TDP01A	3.52E-02	AFW PUMP 1A FAILS TO RUN		
		RCOPH-S-SDSE-FW	9.10E-03	FAILURE OF POSRVS EARLY PHASE OPEN		
63	2.24E-09	%GTRN	6.56E-01	GENERAL TRANSIENT	0.2	33.7
		AFPVKQ4-TP01A/B/MP02A/B	4.12E-06	CCF OF ALL AF PUMPS FAIL DUE TO THE VOLUTE FAIL TO RUN		
		FWOPH-S-ERY	5.50E-03	OPERATOR FAILS TO ALIGN STARTUP FEEDWATER PUMP PP07 (EARLY PHASE)		
		RCOPH-S-SDSE-FW-MD	1.51E-01	FAILURE OF POSRVS EARLY PHASE OPEN WITH MEDIUM DEPENDENCY		

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Table 19.1-31 (1 of 33)

ADVERSE Level 2 Internal Events Top 100 LRF Cutsets

Rank	Frequency (/yr)	Cutsets		Contribution to LRF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
1	4.43E-09	-MTC-ATWS %GTRN I-ATWS-RPMCF PDS_2 PI-SGTR	NO ADEVERSE MODERATE TEMPERATURE COEFFICIENT GENERAL TRANSIENT FAILURE TO SCRAM DUE TO MECHANICAL FAILURES CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	4.0	4.0
2	4.25E-09	%LSSB-D MSEVXQ2-012/13 PDS_2 PI-SGTR	LARGE SECONDARY SIDE BREAK (MSIV DOWNDSTREAM) CCF OF MSIVS 012 AND 013 FAIL TO CLOSE CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	3.8	7.8
3	4.25E-09	%LSSB-D MSEVXQ2-011/14 PDS_2 PI-SGTR	LARGE SECONDARY SIDE BREAK (MSIV DOWNDSTREAM) CCF OF MSIVS 011 AND 014 FAIL TO CLOSE CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	3.8	11.6
4	4.25E-09	%LSSB-D MSEVXQ2-012/14 PDS_2 PI-SGTR	LARGE SECONDARY SIDE BREAK (MSIV DOWNDSTREAM) CCF OF MSIVS 012 AND 014 FAIL TO CLOSE CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	3.8	15.4

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Table 19.1-31 (5 of 33)

Rank	Frequency (/yr)	Cutsets		Contribution to LRF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
16	8.90E-10	%LOOP-GR PDS_93 PFHBWQ4-SW2OUAT PFOPH-S-UATBKR-LOCAL	GRID-RELATED LOOP CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-93 CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN OPERATOR FAILS TO RECOVER PCB FOR 1E 4.16kV SW01A,B,C,D AT LOCAL	0.8	34.9
17	8.45E-10	%GTRN I-ATWS-RPMCF MTC-ATWS PDS_2 PI-SGTR	GENERAL TRANSIENT FAILURE TO SCRAM DUE TO MECHANICAL FAILURES NO ADVERSE MODERATE TEMPERATURE COEFFICIENT CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	0.8	35.7
18	7.58E-10	%LOOP-SW PDS_93 PFHBWQ4-SW2OUAT PFOPH-S-UATBKR-LOCAL	SWITCHYARD-CENTERED LOOP CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-93 CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN OPERATOR FAILS TO RECOVER PCB FOR 1E 4.16kV SW01A,B,C,D AT LOCAL	0.7	36.4

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Table 19.1-31 (7 of 33)

Rank	Frequency (/yr)	Cutsets		Contribution to LRF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
22	4.73E-10	%TLOESW CVOPH-S-RCPSEAL PDS-FREQ-CFS PDS-FREQ-SDR-PO-3W PDS_14 SEAL-AFSUC	TOTAL LOSS OF ESSENTIAL SERVICE WATER OPERATOR FAILS TO RECOVER RCP SEAL COOLING PDS FREQUENCY ADJUSTMENT FOR CFS PDS FREQUENCY ADJUSTMENT FOR SDR (3WAY V/V & POSRV OPERATING) CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-14 SEAL FAILURE PROBABILITY (SECONDARY HEAT REMOVAL SUCCESS)	0.4	38.6
23	4.73E-10	%TLOCCW CVOPH-S-RCPSEAL PDS-FREQ-CFS PDS-FREQ-SDR-PO-3W PDS_14 SEAL-AFSUC	TOTAL LOSS OF COMPONANT COOLING WATER OPERATOR FAILS TO RECOVER RCP SEAL COOLING PDS FREQUENCY ADJUSTMENT FOR CFS PDS FREQUENCY ADJUSTMENT FOR SDR (3WAY V/V & POSRV OPERATING) CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-14 SEAL FAILURE PROBABILITY (SECONDARY HEAT REMOVAL SUCCESS)	0.4	39.0
24	4.43E-10	-MTC-ATWS %LOFW I-ATWS-RPMCF PDS_2 PI-SGTR	NO ADVERSE MODERATE TEMPERATURE COEFFICIENT LOSS OF MAIN FEEDWATER FAILURE TO SCRAM DUE TO MECHANICAL FAILURES CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	0.4	39.4

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Table 19.1-31 (9 of 33)

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Rank	Frequency (/yr)	Cutsets		Contribution to LRF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
29	3.77E-10	-MTC-ATWS %LOCV I-ATWS-RPMCF PDS_2 PI-SGTR	NO ADEVERSE MODERATE TEMPERATURE COEFFICIENT LOSS OF CONDENCER VACCUM FAILURE TO SCRAM DUE TO MECHANICAL FAILURES CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	0.3	41.3
30	3.67E-10	%LOOP-SW PDS_7 PFHBC2A-SW01C-E2 SXFLP-S-FT0123AB	SWITCHYARD-CENTERED LOOP CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-7 CLASS 1E 4.16kV SWITCHGEAR PCB SW01C-E2 (AAC) FAILS TO CLOSE ESW DEBRIS FILTERS PLUGGED	0.3	41.6
31	3.67E-10	%LOOP-SW NBHBC2A-SW03N-F2 PDS_7 SXFLP-S-FT0123AB	SWITCHYARD-CENTERED LOOP NON-1E 4.16kV AAC SWITCHGEAR PCB SW03N-F2 FOR SW01C FAILS TO CLOSE CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-7 ESW DEBRIS FILTERS PLUGGED	0.3	41.9

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Table 19.1-31 (20 of 33)

Rank	Frequency (/yr)	Cutsets		Contribution to LRF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
60	1.93E-10	%MLOCA DGDGR-C-DGC PDS_7 PFHBO2B-SW01D-G2 PFLOOP-LOCA	MEDIUM LOSS OF COOLANT ACCIDENT FAILS TO RUN OF EDG C CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-7 4.16kV CLASS 1E 4.16kV SWITCHGEAR PCB SW01D-G2 (UAT) FAILS TO OPEN CONDITONAL LOOP UPON LOCA INITIATORS	0.2	48.8
61	1.93E-10	%MLOCA DGDGR-D-DGD PDS_7 PFHBO2A-SW01C-C2 PFLOOP-LOCA	MEDIUM LOSS OF COOLANT ACCIDENT FAILS TO RUN OF EDG D CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-7 4.16kVCLASS 1E 4.16kV SWITCHGEAR PCB SW01C-C2 (UAT) FAILS TO OPEN CONDITONAL LOOP UPON LOCA INITIATORS	0.2	49.0
62	1.82E-10	-MTC-ATWS %LOIA I-ATWS-RPMCF PDS_2 PI-SGTR	NO ADVERSE MODERATE TEMPERATURE COEFFICIENT LOSS OF INSTRUMENT AIR FAILURE TO SCRAM DUE TO MECHANICAL FAILURES CONDITONAL LARGE RELEASE PROBABILITY FOR PDS-2 PRESSURE INDUECD SGTR PROBABILITY	0.2	49.2

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Table 19.1-66 (5 of 22)

ADVERSE

Rank	Frequency (/yr)	Cutsets		Contribution to CDF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
24	5.53E-10	#IE-TB-MISC I-ATWS-RPMCF MTC-ATWS	THE FLOOD INITIATING EVENT FOR A SIGNIFICANT FLOOD IN THE TURBINE ROOM FAILURE TO SCRAM DUE TO MECHANICAL FAILURES NO ADVERSE MODERATE TEMPERATURE COEFFICIENT	0.2	35.7
25	5.37E-10	#IE-78-15D-AF-X PFHBWQ4-SW2OUAT	THE FLOOD INITIATING EVENT FOR A MAJOR BREAK OF AF-RELATED PIPING IN ROOM 078-A15D CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN	0.2	36.0
26	5.23E-10	#IE-78-19B-FP-X DGDGR-D-DGD PFHBWQ2-SW2OUATAC	THE FLOOD INITIATING EVENT FOR A MAJOR BREAK OF FP PIPING IN ROOM 078-A19B FAILS TO RUN OF EDG D 2/4 CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1C FAIL TO OPEN	0.2	36.2
27	5.02E-10	#IE-100-20A-FP-X DGDGR-C-DGC PFHBWQ2-SW2OUATBD	THE FLOOD INITIATING EVENT FOR A MAJOR BREAK OF FP PIPING IN ROOM 100-A20A FAILS TO RUN OF EDG C 2/4 CCF OF PCB BETWEEN UAT & 4.16kV SW01B,1D FAIL TO OPEN	0.2	36.4
28	4.85E-10	#IE-120-11B-FP-X PFHBWQ4-SW2OUAT	THE FLOOD INITIATING EVENT FOR A MAJOR BREAK OF FP PIPING IN ROOM 120-A11B CCF OF PCB BETWEEN UAT & 4.16kV SW01A,1B,1C,1D FAIL TO OPEN	0.2	36.7
29	4.47E-10	#IE-78-19A-FP-X DGDGR-C-DGC PFHBWQ2-SW2OUATBD	THE FLOOD INITIATING EVENT FOR A MAJOR BREAK OF FP PIPING IN ROOM 078-A19A FAILS TO RUN OF EDG C 2/4 CCF OF PCB BETWEEN UAT & 4.16kV SW01B,1D FAIL TO OPEN	0.2	36.9

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Rank	Frequency (/yr)	Cutsets		Contribution to CDF (%)	
		Basic Event	Cutset Description	Cutset	Cumulative
60	2.55E-09	%ATWS BE-RATE-P15 MTC-ATWS	ANTICIPATED TRANSIENT WITHOUT SCRAM Conversion factor (SD-yr → Calendar yr) for POS15 duration NO ADVERSE MODERATE TEMPERATURE COEFFICIENT	0.1	90.2
61	2.52E-09	%LPPL BE-RATE-P06 HR-FB-LPP06-DE HR-RS-LPP06	Loss of offsite power of Plant-centered for LPSD Conversion factor (SD-yr → Calendar yr) for POS6 duration HRA Dependence for RS & FB at LP POS06 OPERATOR FAILS TO RESTORE SCS AT LO POS06	0.1	90.3
62	2.44E-09	%LPGR BE-RATE-P05 HR-FB-LPP05-DE HR-RS-LPP05	Loss of offsite power of Grid-related for LPSD Conversion factor (SD-yr → Calendar yr) for POS5 duration HRA Dependence for RS & FB at LP POS05 OPERATOR FAILS TO RESTORE SCS AT LO POS05	0.1	90.4
63	2.41E-09	%JL BE-RATE-P05 HR-FB-JLP05-01-DE HR-RS-JLP05	Unrecoverable LOCA Conversion factor (SD-yr → Calendar yr) for POS5 duration HRA Dependence for MI & FB at JL POS05 OPERATOR FAILS TO RESTORE SCS AT JL POS05	0.1	90.5
64	2.40E-09	%JL BE-RATE-P06 HR-FB-JLP06-02-DE HR-MI-JLP06	Unrecoverable LOCA Conversion factor (SD-yr → Calendar yr) for POS6 duration HRA Dependence for MI & FB at JL POS06 Operator Fails To Isolate and Makeup Unrecoverable LOCA (JL) PATH at POS06	0.1	90.6

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