

**Table 19.1-42—U.S. EPR Risk-Significant Equipment based on FV
Importance - Level 1 Flooding**

Rank	System	Component ID	Description	FV	RAW
1	SIS/RHRS	30JND10/20/30/40AP001	MHSI, Motor Driven Pump Train	0.102	4.8
2	RCS	30JEB30/40AA020 30JEB30/40AA010	RCP Seal, Seal Isolation (Nitrogen, Leakoff) MOV Trains 3 and 4	0.063	18.9
3	ESWS	30PED10/20/30/40AN002	UHS, Cooling Tower Cooling Fan Train	0.044	5.1
4	CCWS	30KAA12/22/32/42AA005	CCWS, LHSI HTX Cooling MOV Train	0.031	4.9
5	ESWS	30PEB20/30AP001	ESWS, Motor Driven Pump Trains 2 and 3	0.029	5.4
6	SIS/RHRS	30JNG10/20/30AA006	LHSI, CL Discharge Manual CHECK Valve	0.020	3.4
7	RCS	30JEB30/40 SSSF	Stand Still Seal for RCP Train	0.016	17.0
8	SIS/RHRS	30JNG13/23/33AA005	LHSI, CL First SIS Isolation Check Valve	0.014	5.1
9	ELEC	30XKA10/20/30/40	ELEC, Emergency Diesel Generator	0.014	1.3
10	SCWS	30QKA10/40GH001	SCWS, Chiller Unit Trains 1 and 4	0.013	6.7
11	HVAC	30SAC31/32/33/34AN001 30SAC01/02/03/04AN001	SAC, Normal Air Supply/Exhaust Fan Train	0.012	3.8
12	EFWS	30LAS11/21/31/41AP001	EFWS, Motor Driven Pump Train	0.011	1.2
13	CCWS	30KAA20/30AP001	CCWS, Motor Driven Pump Train	0.009	3.9

**Table 19.1-43—U.S. EPR Risk-Significant Equipment based on RAW
Importance - Level 1 Flooding**

Rank	System	Component ID	Description	RAW	FV
1	RCS	30JEB30/40AA020 30JEB30/40AA010	RCP Seal, RCP Seal Isolation (Nitrogen/Leakoff) MOV Trains 3 and 4	18.9	0.063
2	RCS	30JEB30/40 SSSF	Stand Still Seal for RCP Trains 3 and 4	17.0	0.016
3	EFWS	30LAR10/20/30/40BB001	EFWS, EFW Storage Tank Train	11.8	0.000
4	ELEC	32BRU03	ELEC, Inverter	8.2	0.000
5	ELEC	32BUD	ELEC, Non 1E 250V DC Distribution Panel Train	7.7	0.000
6	ELEC	32BRC/33BRB/34BRB	ELEC, 480V MCC	7.3	0.000
7	SCWS	30QKA10GH001	SCWS, Chiller Unit Train	6.7	0.013
8	ESWS	30PEB10/20/30AP001	ESWS, Motor Driven Pump Train	5.4	0.029
9	SIS/RHRS	30JNG13AA005	LHSI, CL First SIS Isolation Check Valve	5.1	0.014
10	ESWS	30PED10AN002	UHS, Cooling Tower Cooling Fan Train	5.1	0.044
11	CCWS	30KAA12AA005	CCWS, LHSI HTX Cooling MOV Train	4.9	0.031
12	SIS/RHRS	30JND10AP001	MHSI, Motor Driven Pump Train	4.8	0.102
13	CCWS	30KAA20AP001	CCWS, Motor Driven Pump Train	4.6	0.010

Table 19.1-44—U.S. EPR Risk-Significant Human Actions based on FV Importance - Level 1 Flooding

Rank	Basic Event	Description	Nominal Value	FV	RAW
1	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.119	10.0
2	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	0.014	28.2
3	OPF-RCP-10M	Operator Fails to Trip RCPs on a Loss of Seal Injection	6.0E-02	0.010	1.2
4	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	0.006	1.2

**Table 19.1-45—U.S. EPR Risk-Significant Human Actions based on RAW
Importance - Level 1 Flooding**

Rank	Basic Event	Description	Nominal Value	FV	RAW
1	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	0.014	28.2
2	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.119	10.0
3	OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	2.0E-04	0.001	4.0

**Table 19.1-46—U.S. EPR Risk-Significant Common Cause Events based on
RAW - Level 1 Flooding**

Rank	System	ID	Description	RAW
1	HVAC	SAC01/31AN001EFR_D-ALL	CCF to Run Normal Air Exhaust/Supply Fans	6,995.0
2	SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6,993.0
3	ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety-related Batteries on Demand	1,018.0
4	SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run/Start	470.1
5	SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	460.9
6	CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	450.3
7	ESWS	PED10AN002EFS_D-ALL	CCF to Start/Run Cooling Tower Fans	448.9
8	SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start/Run	436.4
9	IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	430.0
10	SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	382.5
11	EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start/Run	312.4
12	ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps to Start (Standby)	67.9
13	SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	67.5
14	CCWS	KAA20AP001EFS_B-ALL	CCF of CCWS Pumps to Start (Standby)	66.5
15	MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	63.6
16	MSS	LBA11AA191SFO_H-ALL	CCF to Open Main Steam Safety Relief Valves	37.7
17	ELEC	XKA10____DFR_D-ALL	CCF of EDGs to Run/Start	30.4

**Table 19.1-47—U.S. EPR Risk-Significant Common Cause I&C Events
based on RAW Importance - Level 1 Flooding**

Rank	ID	Description	Nominal Value	RAW
1	CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	1.0E-07	1,764.0
2	CL-PS-B-SWCCF	SW CCF of Protection System diversity group B	5.0E-06	453.8
3	ALU-B CCF NS-ALL	CCF of ALU-B Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	437.0
4	PZR PRES CCF-ALL	CCF of pressurizer (RCS) pressure sensors	6.7E-07	416.3
5	APU3 CCF NS-ALL	CCF of APU-3 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	397.0
6	APU3 CCF SM-ALL	CCF of APU-3 Protection System Computer Processors (Self-Monitored)	9.0E-08	364.2
7	ALU-B CCF SM-ALL	CCF of ALU-B Protection System Computer Processors (Self-Monitored)	9.0E-08	364.2
8	CL-PS-A-SWCCF	SW CCF of Protection System diversity group A	5.0E-06	306.0
9	APU2 CCF SM-ALL	CCF of APU-2 Protection System Computer Processors (Self-Monitored)	9.0E-08	290.4
10	APU2 CCF NS-ALL	CCF of APU-2 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	290.4
11	ALU-A CCF SM-ALL	CCF of ALU-A Protection System Computer Processors (Self-Monitored)	9.0E-08	290.4
12	ALU-A CCF NS-ALL	CCF of ALU-A Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	290.4
13	PAS	Process Automation System (PAS) Fails (Estimate)	1.0E-03	60.9
14	SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	48.0

**Table 19.1-48—U.S. EPR Risk-Significant PRA Parameters - Level 1
Flooding
Sheet 1 of 2**

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood	5.0E-01	0.522	1.5
PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.302	2.2
Preventive Maintenance				
CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.041	1.6
CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.048	1.7
LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.018	1.4
LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.009	1.2
LHSI PM3	LHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.015	1.3
MHSI PM1	MHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.027	1.6
MHSI PM2	MHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.017	1.4
MHSI PM3	MHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.017	1.4
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.0E-02	0.075	3.4
SAC02/QKA20 PM2	Normal SAC02/QKA20 Train Unavailable due to Preventive Maintenance	3.0E-02	0.009	1.3
SAC03/QKA30 PM3	Normal SAC03/QKA30 Train Unavailable due to Preventive Maintenance	3.0E-02	0.011	1.4
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.0E-02	0.008	1.3
Offsite Power Related Events				
LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.009	187.0
LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.016	10.2

**Table 19.1-48—U.S. EPR Risk-Significant PRA Parameters - Level 1
Flooding
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ID	Description	Nominal Value	FV	RAW
LOOPCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to a Controlled Shutdown	1.8E-04	0.037	208.4

Table 19.1-49—U.S. EPR Level 1 Flooding Events Sensitivity Studies
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Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF (%)
0	0	Base Case (Flooding Events)	6.1E-08	0%
1	Common Cause Assumption			
	1a	Common cause events not considered	5.1E-08	-16%
	1b	EDGs & SBODGs in the same CC group	6.8E-08	11%
	1c	CC for I&C Software - recovery not credited	6.2E-08	0%
2	LOOP Assumptions			
	2a	No Credit was given for LOOP recoveries (DG MT also set back to 24 hours)	6.3E-08	3%
	2b	DG Mission Time set to 24 hours	6.3E-08	3%
	2c	SBO DG Mission Time set to 18 hours	6.1E-08	0%
	2d	Consequential LOOP events were not considered	5.8E-08	-5%
	2e	All Consequential LOOP values set to 5.3E-03 (value for LOCA)	1.4E-07	122%
3	Assumptions on Electrical Dependencies			
	3a	MSRT Realignment to One Power Train per Train	6.1E-08	0%
	3b	For CVCS seal injection, assume that a switchover from the VCT to the IRWST is always required (Div1 & Div4 required)	6.1E-08	0%
	3c	UHS 4 assumed unavailable during SBO Conditions (no credit for SBO x-tie for dedicated ESW)	6.1E-08	0%
	3d	The same credit given to the operators to X-tie two divisions in SBO (HEP=7E-2) & non-SBO conditions (HEP=0.5)	6.1E-08	0%
4	Assumptions on HVAC Recoveries			
	4a	Room heat-up was not considered	5.5E-08	-11%
	4b	Operator recovery of HVAC not credited	6.2E-07	909%
	4c	Circular logic adjustment: Failure of HVAC 1 disables HVAC 2 (HVAC4 disables HVAC 3)	6.2E-08	0%
5	Sensitivity to HEPs Values			
	5a	All HEPs Set to 5% Value	5.3E-08	-14%
	5b	All HEPs Set to 95% Value	9.4E-08	54%
6	Assumptions on Probabilities of an RCP LOCA			
	6a	RCP Seal LOCA Probability - 1.0	1.4E-07	129%

Table 19.1-49—U.S. EPR Level 1 Flooding Events Sensitivity Studies
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Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF (%)
	6b	RCP Seal LOCA Probability - 0.5	9.1E-08	48%
	6c	RCP Seal LOCA Probability - 0.1	5.2E-08	-16%
7	Assumptions on Long Term Cooling Mission Time			
	7a	SAHR Mission Time set to 36 hours	6.1E-08	0%
	7b	SAHR Mission Time set to 72 hours	6.1E-08	0%
8	Preventive Maintenance Assumptions			
	8a	Train 3 assumed to be in Preventive Maintenance for all year	1.2E-07	101%
	8b	W/o Preventive Maintenance	4.2E-08	-31%
9	Isolation of EFW Tank Leak			
	9	EFW Isolation not possible	6.6E-08	7%
10	Location of CCW Switchover Valves			
	10	Flood in SAB14 doesn't disable CCWS SO	4.6E-08	-24%

Table 19.1-50—Level 2 Flooding Events Release Category Results - LRF
Sheet 1 of 2

Release Category	Description	Mean	Contribution to LRF	Conditional Containment Failure Probability
RC201	Containment fails before vessel breach due to isolation failure, melt retained in vessel	1.9E-11	1.7%	.0003
RC202	Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex vessel, with containment sprays	1.7E-17	0.0%	0.0
RC203	Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex vessel, without containment sprays	1.6E-13	0.0%	0.0
RC204	Containment fails before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex vessel with containment sprays	1.5E-14	0.0%	0.0
RC205	Containment failures before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex vessel without containment sprays	4.1E-11	3.7%	0.0007
RC301	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, with containment sprays	4.3E-15	0.0%	0.0
RC302	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, without containment sprays	3.0E-12	0.3%	0.0
RC303	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, with containment sprays	1.1E-11	1.0%	0.0002

Table 19.1-50—Level 2 Flooding Events Release Category Results - LRF
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Release Category	Description	Mean	Contribution to LRF	Conditional Containment Failure Probability
RC304	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, without containment sprays	8.5E-10	75.8%	.014
RC702	Steam Generator Tube Rupture without Fission Product Scrubbing	2.0E-10	17.6%	.0032
RC801	Interfacing System LOCA with Fission Product Scrubbing	0.00E+00	0.0%	0.0
RC802	Interfacing System LOCA without Fission Product Scrubbing but building credited	0.00E+00	0.0%	0.0
	Total LRF:	1.1E-09	100.0%	0.018

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 201	4.48E-13	0.0400%	IE FLD-SAB14 FB	Flood in Safeguard Building 1 or 4 (Pump Room) Including Fuel Building	Level 1: <ul style="list-style-type: none"> • A flood in the pump room of SB 4 extending to the FB results in the loss of CCWS CH2 and CVCS. • The failure of a seal valve to isolate causes a seal LOCA. • SW CCF results in a loss of SI signal which prevents MHSI injection. • Fast cooldown and injection with LHSI are successful, but long term IRWST cooling fails due to the loss of SAHRS.
			CL-PS-B-SWCCF	SW CCF of Protection System diversity group	
			JEB30AA020EFC	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Close on Demand	
			PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	
			OPE-FCD-40M=Y	Operator successfully initiates secondary cooldown	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			L2FLCDES-SSD	Level 2 FLAG: SSD CDES	Level 2: <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Operators depressurize primary Sequence enters CET Low Pressure Automatic CI signal fails due to SW CCF. Operators fail to initiate manual CI signal with Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open.
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2FLOP DEPRESS	Level 2 FLAG: Depressurization of high CDES by operator	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			PROB KLA10/20 OP	Probability that the Containment Sweep Vent System Small Flow Lines are Open	
			OPD-L2-CIH	Dependent operator failure to close containment isolation valves	
Flood RC202	1.26E-17	0.0000%	IE FLD-TB	Flood in the Turbine Building	Level 1: <ul style="list-style-type: none"> A flood in the Turbine Building fails MFW and SSS SW CCF disables EFW. Failure of the operators to perform Feed and Bleed leads to CD.
			CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	
			OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Operators depressurize primary Sequence enters CET Low Pressure Automatic CI signal fails due to SW CCF. Operators fail to initiate manual CI signal with Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open. In vessel recovery of core fails, core is released from vessel Significant CCI occurs with no system failures
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2FLOP DEPRESS	Level 2 FLAG: Depressurization of high CDES by operator	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			PROB KLA10/20 OP	Probability that the Containment Sweep Vent System Small Flow Lines are Open	
			OPD-L2-CIH	Dependent operator failure to close containment isolation valves	
			L2PH INVREC(T-DEP)=N	In-vessel recovery, phenomenological failure given sufficient injection	
			L2PH CCI	Level 2 phenomena: significant MCCI, no system failures	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 203	5.12E-14	0.0046%	IE FLD-ANN ALL	Flood in the Reactor Building Annulus (contained)	Level 1: <ul style="list-style-type: none"> • A flood caused by a pipe break in the annulus reaches the level of the electrical penetrations and connection boxes. • The flood damages the connection boxes, therefore all sensors and signals from inside containment are lost, which is assumed to lead to core damage.
			PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood.	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			L2FLCDES-TR	Level 2 FLAG: TR CDES	<p>Level 2:</p> <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Primary stays pressurized until vessel failure Sequence enters CET2 High Pressure Automatic CI signal fails due to the loss of signals from inside containment. Operators fail to initiate manual CI signal with Containment Sweep Ventilation Small Flow Line Ventilation initially open. Pit damaged due to overpressure from complete circumferential rupture of the vessel MCCI occurs due to early melt release from pit SAHRS sprays are assumed to fail because of the lack of sensors and signals from inside the containment.
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH LOCA-DEPRESS=N	Primary remains pressurized until vessel failure	
			L2FLCET2 HI PRESSURE	Level 2 FLAG: CET2 HI PRESSURE	
			PROB KLA10/20 OP	Probability that the Containment Sweep Vent System Small Flow Lines are Open	
			OPF-L2-CI-30M	Operators fails to initiate manual Containment Isolation Signal	
			L2PH CBV HP	Complete circumferential rupture of vessel	
			L2PH CP-PITF-VF(CBV)	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	
			L2PH CCI-EARLYREL=Y	MCCI occurs, following early melt release from pit.	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 204	1.26E-14	0.0011%	IE FLD-TB	Flood in the Turbine Building	Level 1: <ul style="list-style-type: none"> • A flood in the Turbine Building fails MFW and SSS • SW CCF disables EFW. • Failure of the operators to perform F&B leads to CD.
			CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	
			OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> • Sequence enters CET1 High Pressure • Operators depressurize primary • Sequence enters CET Low Pressure • Automatic CI signal fails due to SW CCF. • Operators fail to initiate manual CI signal with Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open. • In vessel recovery of core fails, core is released from vessel
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2FLOP DEPRESS	Level 2 FLAG: Depressurization of high CDES by operator	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			PROB KLA10/20 OP	Probability that the Containment Sweep Vent System Small Flow Lines are Open	
			OPD-L2-CIH	Dependent operator failure to close containment isolation valves	
			L2PH INVREC(T-DEP)=N	In-vessel recovery, phenomenological failure given sufficient injection	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 205	3.20E-11	2.8562%	IE FLD-ANN ALL	Flood in the Reactor Building Annulus (contained)	Level 1: <ul style="list-style-type: none"> • A flood caused by a pipe break in the annulus reaches the level of the electrical penetrations and connection boxes. • The flood damages the connection boxes, therefore all sensors and signals from inside containment are lost, which is assumed to lead to core damage.
			PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood.	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			L2FLCDES-TR	Level 2 FLAG: TR CDES	<p>Level 2:</p> <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Primary stays pressurized until vessel failure Sequence enters CET2 High Pressure Automatic CI signal fails due to the loss of signals from inside containment. Operators fail to initiate manual CI signal with Containment Sweep Ventilation Small Flow Line Ventilation initially open. Pit damaged due to overpressure from complete circumferential rupture of the vessel MCCI occurs due to early melt release from pit SAHRS sprays are assumed to fail because of the lack of sensors and signals from inside the containment.
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH LOCA-DEPRESS=N	Primary remains pressurized until vessel failure	
			L2FLCET2 HI PRESSURE	Level 2 FLAG: CET2 HI PRESSURE	
			PROB KLA10/20 OP	Probability that the Containment Sweep Vent System Small Flow Lines are Open	
			OPF-L2-CI-30M	Operators fails to initiate manual Containment Isolation Signal	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 301	8.97E-16	0.0001%	IE FLD-TB	Flood in the Turbine Building	Level 1: <ul style="list-style-type: none"> • A flood in the Turbine Building fails MFW and SSS. • CCF of EFW pumps to start requires the operators to initiate Feed and Bleed. • Failure to do so results in core damage.
			LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	
			OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> • Sequence enters CET1 High Pressure • Operators depressurize primary • Sequence enters CET Low Pressure • Containment fails before vessel rupture due to hydrogen flame acceleration • In vessel recovery of core fails, core is released from vessel • Significant CCI occurs with no system failures
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2FLOP DEPRESS	Level 2 FLAG: Depressurization of high CDES by operator	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	
			L2PH INVREC(T-DEP)=N	In-vessel recovery, phenomenological failure given sufficient injection	
			L2PH CCI	Level 2 phenomena: significant MCCI, no system failures	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 302	8.19E-13	0.0731%	IE FLD-ANN ALL	Flood in the Reactor Building Annulus (contained)	Level 1: <ul style="list-style-type: none"> A flood caused by a pipe break in the annulus reaches the level of the electrical penetrations and connection boxes. The flood damages the connection boxes, therefore all sensors and signals from inside containment are lost, which is assumed to lead to core damage.
			PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood.	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Primary stays pressurized until vessel failure Sequence enters CET2 High Pressure Containment fails before vessel rupture due to hydrogen flame acceleration Pit damaged due to overpressure from complete circumferential rupture of the vessel MCCI occurs due to early melt release from pit SAHRS sprays are assumed to fail because of the lack of sensors and signals from inside the containment.
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH LOCA-DEPRESS=N	Primary remains pressurized until vessel failure	
			L2FLCET2 HI PRESSURE	Level 2 FLAG: CET2 HI PRESSURE	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	
			L2PH CBV HP	Complete circumferential rupture of vessel	
			L2PH CP-PITF-VF(CBV)	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	
			L2PH CCI-EARLYREL=Y	MCCI occurs, following early melt release from pit.	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 303	2.99E-12	0.2668%	IE FLD-TB	Flood in the Turbine Building	Level 1: <ul style="list-style-type: none"> • A flood in the Turbine Building fails MFW and SSS. • CCF of EFW pumps to start requires the operators to initiate Feed and Bleed. • Failure to do so results in core damage.
			LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	
			OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> • Sequence enters CET1 High Pressure • Operators depressurize primary • -Sequence enters CET Low Pressure • Containment fails before vessel rupture due to hydrogen flame acceleration • In vessel recovery of core fails, core is released from vessel
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2FLOP DEPRESS	Level 2 FLAG: Depressurization of high CDES by operator	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 304 -1	5.12E-10	45.6996%	IE FLD-ANN ALL	Flood in the Reactor Building Annulus (contained)	Level 1: <ul style="list-style-type: none"> • A flood caused by a pipe break in the annulus reaches the level of the electrical penetrations and connection boxes. • The flood damages the connection boxes, therefore all sensors and signals from inside containment are lost, which is assumed to lead to core damage.
			PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood.	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: <ul style="list-style-type: none"> • Sequence enters CET1 High Pressure • Primary stays pressurized until vessel failure • Sequence enters CET2 High Pressure • Containment fails before vessel rupture due to hydrogen flame acceleration • In vessel recovery of core fails, core is released from vessel
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH LOCA-DEPRESS=N	Primary remains pressurized until vessel failure	
			L2FLCET2 HI PRESSURE	Level 2 FLAG: CET2 HI PRESSURE	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 304 -2	3.44E-11	3.0687%	IE FLD-SAB14 FB	Flood in Safeguard Building 1 or 4 (Pump Room) Including Fuel Building	Level 1: <ul style="list-style-type: none"> A flood in the pump room of SB 4 results in the loss of CCWS CH2. With SAC1 in maintenance, PAS failure and operator failure to recover room cooling results in the loss of ventilation in Division 1, 2 and 3. PAS fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. PBL fails because of loss of Division 1.
			PAS	Process Automation System Fails	
			SAC01/QKA10 PM1	Normal SAC01/QKA10 Train unavailable due to preventive maintenance	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			L2FLCDES-TR1	Level 2 FLAG: TR1 CDES	Level 2: <ul style="list-style-type: none"> Sequence enters CET1 High Pressure Induced hot leg rupture depressurizes primary Sequence enters CET Low Pressure Containment fails before vessel rupture due to hydrogen flame acceleration SAHRS sprays fail to control source term due to the loss of SAHRS pump to the flood
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2FLHLR DEPRESS	Level 2 FLAG: Depressurization of high CDES by HLR	
			L2FLCET LO PRESSURE	Level 2 FLAG: CET LO PRESSURE	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 702-1, 2	8.27E-11	7.3771%	IE FLD-SAB14 FB	Flood in Safeguard Building 1 or 4 (Pump Room) Including Fuel Building	Level 1: <ul style="list-style-type: none"> A flood in the pump room of SB 4 results in the loss of CCWS CH2. With SAC1 in maintenance, PAS failure and operator failure to recover room cooling results in the loss of ventilation in Division 1, 2 and 3. A seal LOCA occurs on loss of seal injection or loss of bearing cooling and failure to trip the RCPs PAS fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. PBL fails because of loss of Division 1.
			OPF-RCP-10M or OPF-RCP-30M	Operator fails to trip RCPs, leading to seal LOCA	
			PAS	Process Automation System Fails	
			SAC01/QKA10 PM1	Normal SAC01/QKA10 Train unavailable due to preventive maintenance	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			OPE-FCD-40M=Y	Operator tries to depressurize primary, but cannot	
			L2FLCDES-SS1D	Level 2 FLAG: SS1D CDES	Level 2: <ul style="list-style-type: none"> Induced steam generator tube rupture with secondary depressurized and feedwater unavailable
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH ISGTR-SS2D=Y	Level 2 conditional probability: Seal LOCA has 2" diameter	
			L2CP SS2"DIAM	Induced SGTR. 2" LOCA, secondary depressurized	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
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Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 702-3,5	2.81E-11	2.5117%	IE FLD-SAB14 FB	Flood in Safeguard Building 1 or 4 (Pump Room) Including Fuel Building	Level 1: <ul style="list-style-type: none"> A flood in the pump room of SB 4 results in the loss of CCWS CH2. With SAC1 in maintenance, PAS failure and operator failure to recover room cooling result in the loss of ventilation in Division 1, 2 and 3. A seal LOCA occurs on loss of seal injection or loss of bearing cooling and failure to trip the RCPs PAS fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. -PBL fails because of loss of Division 1
			OPF-RCP-10M or OPF-RCP-30M	Operator fails to trip RCPs, leading to seal LOCA	
			PAS	Process Automation System Fails	
			SAC01/QKA10 PM1	Normal SAC01/QKA10 Train unavailable due to preventive maintenance	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			OPE-FCD-40M=Y	Operator tries to depressurize primary, but cannot	
			L2FLCDES-SS1D	Level 2 FLAG: SS1D CDES	
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	Level 2: <ul style="list-style-type: none"> Induced steam generator tube rupture with secondary depressurized and feedwater unavailable
			L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	
			L2CP SS0.6"DIA	Level 2 conditional probability: seal LOCA has 0.6" diameter	

Table 19.1-51—Level 2 Flooding Events Large Release Significant Cutsets
Sheet 16 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
Flood RC 702-4	1.20E-11	1.0684%	IE FLD-EFW	EFW Pipe Break	Level 1: <ul style="list-style-type: none"> • A flood occurs due to a pipe break in EFW train 4, flooding SB 4 pump room and the fuel building. • The flood in the pump room of SB 4 results in the loss of CCWS CH2. With SAC1 in maintenance, PAS failure and operator failure to recover room cooling results in the loss of ventilation in Division 1, 2 and 3. • A seal LOCA occurs on loss of seal cooling and failure to trip the RCPs • PAS fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. • PBL fails because of loss of Division 1
			OPF-RCP-10M	Operator fails to isolate seals, leading to seal LOCA	
			PAS	Process Automation System Fails	
			SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			OPE-FCD-40M=Y	Operator tries to depressurize primary, but cannot	
			L2FLCDES-SS1D	Level 2 FLAG: SS1D CDES	Level 2: <ul style="list-style-type: none"> • Induced steam generator tube rupture with secondary depressurized and feedwater unavailable
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2PH ISGTR-SS2D=Y	Induced SGTR. 2" LOCA, secondary depressurized	
			L2CP SS2"DIAM	Level 2 conditional probability: seal LOCA has 2" diameter	

**Table 19.1-52—U.S. EPR Core Damage End States Contributions - Level 2
Internal Flooding**

CDES	LRF (1/yr)	Contribution Total
TR	5.8E-10	52%
SS1D	1.9E-10	17%
TR1	1.4E-10	12%
SSD	1.3E-10	11%
SS	7.9E-11	7%
SS1	1.0E-11	1%
AT	5.3E-13	0%
Total:	1.1E-09	100%

Table 19.1-53—U.S. EPR Initiating Event Contributions - Level 2 Internal Flooding

Flood IE	Description	Frequency (1/yr)	LRF(1/yr)	Contribution (Total)
IE FLD-ANN ALL	Initiator - Flood in the RB Annulus (Contained)	6.4E-08	5.6E-10	50%
IE FLD-SAB14 FB	Initiator - Flood in Safeguard Building 1 or 4 (Pump Room) Including Fuel Building	5.8E-03	4.0E-10	36%
IE FLD-EFW	Initiator - EFW Pipe Break	1.4E-03	9.2E-11	8%
IE FLD-TB	Initiator - Flood in the Turbine Building	3.3E-02	6.0E-11	5%
		Total:	1.1E-09	100%

Table 19.1-54—U.S. EPR Risk-Significant Phenomena Based on FV Importance - Level 2 Internal Flooding

Rank	ID	Description	Nominal Value	FV	RAW
1	L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	1.6E-02	0.750	47.1
2	L2PH LOCA-DEPRESS=N	Level 2 phenomena. Small LOCA remains at high pressure.	1.0E+00	0.515	1.0
3	L2PH ISGTR-SS2D=Y	Induced SGTR. 2" LOCA, secondary depressurized	8.4E-01	0.146	1.0
4	L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	9.5E-01	0.104	1.0
5	L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	2.9E-01	0.047	1.1
6	L2PH VECF-FA(HL)	Very early flame acceleration loads fail containment following induced Hot Leg Rupture	1.3E-03	0.010	9.4
7	L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS,SL cases.	1.0E+00	0.007	1.0
8	L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	1.0E+00	0.005	1.0

**Table 19.1-55—U.S. EPR Risk-Significant Phenomena based on RAW
Importance - Level 2 Internal Flooding**

Rank	ID	Description	Nom.val.	RAW	FV
1	L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	1.6E-02	47.1	0.750
2	L2PH STM EXP INV HP	Level 2 phenomena: containment failure due to in-vessel steam explosion. High pressure CET sequences	2.3E-05	30.4	0.001
3	L2PH VECF-H2DEF(H)	V early CF due to hydrogen deflagration. High pressure CDES, in-vessel - PRV cycling phase	2.0E-06	30.4	0.000
4	L2PH VECF-FA(HL)	Very early flame acceleration loads fail containment following induced Hot Leg Rupture	1.3E-03	9.4	0.010
5	L2PH VECF-H2DEF(HL)	V Early CF due to hydrogen deflagration. High pressure CDES with Induced Hot Leg Rupture	1.4E-04	5.0	0.001

**Table 19.1-56—U.S. EPR Risk-Significant Equipment based on FV
Importance - Level 2 Internal Flooding
Sheet 1 of 2**

Rank	System	Component ID	Description	FV	RAW
1	SIS/RHRS	30JND10AP001	MHSI, MHSI Motor Driven Pump Train 1	0.060	2.9
2	SIS/RHRS	30JND20/30AP001	MHSI, MHSI Motor Driven Pump Trains 2 and 3	0.047	2.1
3	RCS	30JEB30/40AA020	RCP Seal, RCP Seal Isolation MOV, Trains 3 and 4	0.041	12.8
4	ESWS	30PED10AN002	UHS, Cooling Tower Cooling Fan	0.024	2.6
5	ESWS	30PED20/30AN002	UHS, Cooling Tower Cooling Fan, Trains 2 and 3	0.020	2.0
6	CCWS	30KAA12AA005	CCWS, to LHSI HTX Cooling MOV Train 1	0.019	2.4
7	SIS/RHRS	30JND40AP001	MHSI, MHSI Motor Drive Pump, Train 4	0.017	1.0
8	CCWS	30KAA22/32AA005	CCWS, LHSI HTX 20 Cooling MOV, Trains 2 and 3	0.016	1.8
9	HVAC	30SAC01/31AN001	SAC, Normal Air Supply/Exhaust Fan Trains 1 and 3	0.014	6.9
10	ESWS	30PEB20/30AP001	ESWS, Motor Driven Pump Trains 2 and 3	0.013	2.9
11	SIS/RHRS	30JNG13/23/33AA005	LHSI, CL First SIS Isolation Check Valve	0.012	1.4
12	SCWS	30QKA10GH001	SCWS, Chiller Unit Train 1	0.012	7.6
13	HVAC	30SAC02/03/04 32/33/34AN001	SAC, Normal Air Supply/Exhaust Fan Train	0.012	1.0
14	OCWS	30QNA21AN001	OCWS, Train Chiller Unit, Trains 1A and 2B	0.011	17.2
15	SCWS	30QKA10AP107	SCWS, Motor Driven Safety Chiller Pump Train 1	0.009	6.9
16	CCWS	30KAA42AA005	CCWS, LHSI HTX 40 Cooling MOV, Train 4	0.009	1.0
17	ESWS	30PED40AN002	UHS, Cooling Tower Cooling Fan Train 4	0.009	1.0
18	RCS	30JEB30/40 SSSF	Stand Still Seal for RCP3 and RCP4	0.008	9.3
19	EFWS	30LAS11/21/31/41AP001	EFWS, Motor Driven Pump Train	0.007	1.0
20	SCWS	30QKA20/30/40AP107	SCWS, Motor Driven Safety Chiller Pump, Trains 2, 3 and 4	0.007	1.3

**Table 19.1-56—U.S. EPR Risk-Significant Equipment based on FV
Importance - Level 2 Internal Flooding
Sheet 2 of 2**

Rank	System	Component ID	Description	FV	RAW
21	SCWS	30QKA40GH001	SCWS, Chiller Unit Train 4	0.006	1.6
22	RCS	30JEB10/20AA020	RCP Seal, RCP Seal Isolation MOV, Trains 1 and 2	0.006	2.7

**Table 19.1-57—U.S. EPR Risk-Significant Equipment based on RAW
Importance - Level 2 Internal Flooding**

RANK	System	Component ID	Description	RAW	FV
1	OCWS	30QNA21/24AN001	OCWS, Chiller Unit Trains 1A and 2B	17.2	0.011
2	RCS	30JEB40AA020	RCP Seal, RCP Seal Isolation MOV Trains 3 and 4	12.8	0.041
3	CCWS	30KAB10AA191/192/193	CCWS, CCWS CH Return Safety Valve	9.5	0.001
4	SIS/RHRS	30JNA10AA101	RHR, LHSI HTX Bypass MOV Train	9.5	0.001
5	RCS	30JEB30/40 SSSF	Stand Still Seal for RCP3 and RCP4	8.6	0.007
6	SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit Train 1	7.6	0.007
7	HVAC	30SAC01/31AN001	SAC, Normal Air Supply/Exhaust Fan	6.9	0.014
8	SCWS	30QKA10AP107	SCWS, Motor Driven Safety Chiller Pump Train 1	6.9	0.008
9	ELEC	32BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery	6.8	0.004
10	ELEC	32BUD	ELEC, Non 1E 250V DC Distribution Panel	4.7	0.000
11	ELEC	34BRB	ELEC, 480V MCC	3.8	0.000
12	SIS/RHRS	30JND10AP001	MHSI, MHSI Motor Driven Pump Train 1	2.9	0.058
13	ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump Train 2	2.7	0.012
14	RCS	30JEB10AA020	RCP Seal, RCP Seal Isolation MOV, Trains 1 and 2	2.7	0.006
15	ELEC	31BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery	2.6	0.001
16	ESWS	30PED10AN002	UHS, Cooling Tower Cooling Fan Train 1	2.6	0.024
17	ESWS	30PEB30AP001	ESWS, Motor Driven Pump Train 3	2.3	0.010
18	CCWS	30KAA12AA005	CCWS, LHSI HTX 10 Cooling MOV Train 1	2.2	0.018
19	RCS	30JEB10 SSSF	Stand Still Seal for RCP1 and RCP2	2.2	0.001
20	SIS/RHRS	30JND20/30AP001	MHSI, MHSI Motor Driven Pump, Trains 2 and 3	2.1	0.047

Table 19.1-58—U.S. EPR Risk-Significant Human Actions based on FV Importance - Level 2 Internal Flooding

Rank	ID	Description	Nominal Value	FV	RAW
1	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.313	24.7
3	OPF-RCP-10M	Operator Fails to Trip RCPs on a Loss of Seal Injection	6.0E-02	0.089	2.4
4	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	0.058	2.4
5	OPF-L2-CI-30M	Operators fails to initiate manual Containment Isolation Signal	2.0E-02	0.031	2.5
6	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	0.012	25.0

**Table 19.1-59—U.S. EPR Risk-Significant Human Actions based on RAW
Importance - Level 2 Internal Flooding**

Rank	ID	Description	Nominal Value	RAW	FV
1	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	25.0	0.012
2	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	24.7	0.313
3	OPF-L2-CI-30M	Operators fails to initiate manual Containment Isolation Signal	2.0E-02	2.5	0.031
4	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	2.4	0.058
5	OPF-RCP-10M	Operator Fails to Trip RCPs on a Loss of Seal Injection	6.0E-02	2.4	0.089

**Table 19.1-60—U.S. EPR Risk-Significant Common Cause Events based on
RAW - Level 2 Internal Flooding
Sheet 1 of 2**

Rank	System	ID	Description	Nominal Value	RAW
1	HVAC	SAC01AN001EFR_D-ALL	CCF to Run Normal Air Supply/Exhaust Fans	1.3E-06	8,390.0
2	SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6.4E-07	8,280.0
3	ELEC	BTD01_BAT_ST_D-ALL	CCF of Safety-related Batteries on Demand	2.9E-07	874.0
4	ESWS	PED10AN002EFS_D-ALL	CCF to Start Standby Cooling Tower Fans	1.9E-05	404.0
5	CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	404.0
6	SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run/Start	3.8E-05	358.0
7	SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	4.5E-06	331.0
8	ESWS	PED10AN002EFR_D-ALL	CCF to Run Standby Cooling Tower Fans	2.7E-06	328.0
9	ESWS	PED10AN001EFR_D-ALL	CCF to Run Normally Running Cooling Tower Fans	2.7E-06	328.0
10	SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start/Run	1.9E-06	271.0
11	EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start/Run	1.1E-05	262.0
12	MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	3.7E-05	45.7
13	ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	9.9E-05	42.0
14	CCWS	KAA20AP001EFS_B-ALL	CCF of CCWS Pumps 2 and 3 to Start (Standby)	6.7E-05	37.9
15	MSS	MSRIVSCPFO_P-ALL	CCF to Open Main Steam Relief Isolation Pneumatic Pilot Valves	1.3E-05	31.8

**Table 19.1-60—U.S. EPR Risk-Significant Common Cause Events based on
RAW - Level 2 Internal Flooding
Sheet 2 of 2**

Rank	System	ID	Description	Nominal Value	RAW
16	MSS	MSRIVSOOFO_P-ALL	CCF to Open Main Steam Relief Isolation Solenoid Pilot Valves	4.2E-06	31.8
17	SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	2.2E-05	23.3
18	ELEC	XKA10____DFR_D-ALL	CCF of EDGs to Run	1.0E-04	22.9