

Table 19.1-6—U.S. EPR Significant Initiating Event Contributions – Level 1 Internal Events (Contributing more than 1% to Internal Events CDF)

IE	Description	IE Frequency (1/yr)	CDF (1/yr)	Contribution
LOOP	Loss of Offsite Power	1.9E-02	1.2E-07	41.5%
SLOCA	Small LOCA (0.6 to 3-Inch Diameter)	1.4E-03	3.9E-08	13.4%
LOCCW	Loss Component Cooling Water Common Headers	2.5E-01	3.6E-08	12.3%
SGTR	Steam Generator Tube Rupture	3.5E-03	2.6E-08	8.9%
GT	General Transient (Includes Turbine Trip and Reactor Trip)	7.5E-01	2.0E-08	6.9%
BDA	Loss of 6.9kV Power from Bus BDA	3.5E-02	1.1E-08	3.9%
ATWS	Anticipated Transient Without Scram	4.3E-08	8.9E-09	3.0%
IND SGTR	Induced SGTR	1.2E-06	8.5E-09	2.9%
LOMFW	Total Loss of Main Feedwater	9.6E-02	7.4E-09	2.5%
LLOCA	Large LOCA (>6-Inch Diameter)	1.3E-06	4.6E-09	1.6%
LBOP	Loss of Closed Cooling Water or Aux Cooling Water	5.0E-02	3.8E-09	1.3%
LOC	Loss of Main Condenser (Includes MSIV Closure etc.)	8.1E-02	2.5E-09	0.9%
		Total:	2.9E-07	
		RS Total:	2.4E-07	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
LOOP Sequences							
1	9, 10, 14, 15, 37, 38, 52-55, 58, 59, 73, 74, 92, 95	2.22E-09 - 1.68E-10	4.7	4.7	Sequence: LOOP-48: EDG, REC OSP, EFW, MHSI FB, LTC		
					IE LOOP	Initiator - Loss Of Offsite Power	LOOP sequence, no recovery of OSP in 2 hours; the CC failure of all 4 EDGs and a failure of one SBO DG. The only available electric division has its EFW pump in PM, so no EFW is available and F&B is not possible without both SBO DGs.
					EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	
					REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	
					SBODG8 PM8	SBODG Train 8 Unavailable due to Preventive Maintenance	
XKA10_____DFR_ D-ALL	CCF of EDGs to Run						

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
2	7, 8, 12, 23, 64-69, 81, 82, 84, 89, 90	2.46E-09 - 1.79E-10	4.2	8.9	Sequence: LOOP-53: EDG, REC LOOP, SBO		
					IE LOOP	Initiator - Loss Of Offsite Power	LOOP sequence, no recovery of OSP in 2 hours; the CC failure of all 4 EDGs and failures of both SBODGs results in a station blackout (loss of all AC power).
					REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	
					SBODG8 PM8	SBODG Train 8 Unavailable due to Preventive Maintenance	
					XKA10____DFR_D-ALL	CCF of EDGs to Run	
					XKA50____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
3	16-19, 46-48, 75, 76, 93, 94	1.75E-09 - 1.68E-10	3.6	12.5	Sequence: LOOP-50: LOOP, EDG, REC LOOP, EFW, MHSI FB, LHSI		
					IE LOOP	Initiator - Loss Of Offsite Power	LOOP sequence, no recovery of OSP in 2 hours; the CC failure of all 4 EDGs and a failure of one SBODG. An alternative alignment of Div4 (when EDG is in PM) prevents Div 4 SBODG to be aligned to EUPS Div 4. These events lead to a total station blackout (loss of all AC power).
					EDG PM4	EDG Train 4 Unavailable due to Preventive Maintenance (Alternative Feed Alignment)	
					REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	
					XKA10____DFR_D-ALL	CCF of EDGs to Run	
XKA50____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run						
4	6	3.06E-09	1.3	13.7	Sequence: LOOP-63: LOOP, EDG, I&C		
					IE LOOP	Initiator - Loss Of Offsite Power	LOOP sequence where a loss of all 1E 2 hr batteries prevents starting of EDGs and results in loss of all instrumentation. Given that no instrumentation is available, OSP recoveries or alignment of two SBO DGs (started from 12-hour batteries) are not credited.
					BTD01_BAT_ST_D-ALL	CCF of Safety Related Batteries on Demand	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
5	77	2.05E-10	0.1	13.8	Sequence: LOOP-11: REC OSP, EFW, LTC		
					IE LOOP	Initiator - Loss Of Offsite Power	LOOP sequence, no recovery of OSP in 2 hours; the CC failure of 3 EDGs and a failure of one SBODG. The only available electric division has its EFW pump in PM, so no EFW is available and F&B is not possible without both SBODGs (Div 1 and 4).
					EFWS PM4	EFWS Train 4 Unavailable due to Preventive Maintenance	
					OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBODGs During Non-SBO Conditions	
					QKA40 PM4	Normal QKA40 Train Unavailable due to Preventive Maintenance	
					REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	
					XKA10_____DFR_D-123	CCF of EDGs to Run	
SLOCA Sequences							
6	1, 78, 79	7.91E-09 - 1.93E-10	3.4	17.3	Sequence: SLOCA-15: SLOCA, MHSI, LHSI		
					IE SLOCA	Initiator - Small LOCA (0.6 to 3-Inch Diameter)	SLOCA sequence, a CC failure of common IRWST suction strainers to MHSI/ LHSI pumps results in a loss of all injection.
JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged						

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
7	5, 11, 83, 91, 97, 98, 99	3.22E-09 - 1.61E-10	2.6	19.8	Sequence: SLOCA-2: SLOCA, LTC		
					IE SLOCA	Initiator - Small LOCA (0.6 to 3-Inch Diameter)	SLOCA sequence, common cause failure to start SB CT Fans (or CCF to open CCWS MOVs to LHSI HTX), SAHR train in PM, results in a loss of all long term cooling (LTC).
					PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
					SAHR PM4	SAHR Train Unavailable due to Preventive Maintenance	
8	2	5.73E-09	2.4	22.2	Sequence: SLOCA-15: SLOCA, MHSI, LHSI		
					IE SLOCA	Initiator - Small LOCA (0.6 to 3-Inch Diameter)	SLOCA sequence, CC failure to open MHSI/ACC/LHSI common discharge check valves results in a loss of all injection.
					JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	
9	13, 40, 45, 57, 60	1.77E-09 - 2.51E-10	1.3	23.5	Sequence: SLOCA-11: SLOCA, EFW, OP FB		
					IE SLOCA	Initiator - Small LOCA (0.6 to 3-Inch Diameter)	SLOCA sequence; a CC failure of all MSRIVs fails the PCD function; failure of operator to initiate F&B results in a loss of all cooling.
					LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	
					OPE-FB-40M	Operator Fails to Initiate Feed and Bleed for SLOCA	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
10	21, 100	1.17E-09 - 1.60E-10	0.5	24.0	Sequence: SLOCA-27: SLOCA, MHSI, OP FCD		
					IE SLOCA	Initiator - Small LOCA (0.6 to 3-Inch Diameter)	SLOCA sequence with a CC failure of all MHSI pumps; operator failure to initiate FCD leads to a loss of all injection.
					JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run	
					OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	
ATWS Sequences							
11	3, 4, 22, 39	3.93E-09 - 4.19E-10	3.6	27.7	Sequence: ATWS-11: Initiator, RT, PSR		
					IE LOMFW	Initiator - Total Loss of Main Feedwater	ATWS events, pressure relief was not credited for ATWS events w/o MFW.
					STUCK ROD	CCF of 38 out of 89 Control Rods being stuck - NUREG/CR-5500, 50% control rods CCF	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
12	61, 62, 63	2.43E-10	0.3	28.0	Sequence: ATWS-11: GT, RT, PSR		
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	ATWS events, failure of one PSRV fails pressure relief (all PSRVs required).
					JEF10AA193RFO	PZR, Pressurizer Safety Relief Valve JEF10AA193, Fails to Open on Demand	
					STUCK ROD	CCF of 38 out of 89 Control Rods being stuck - NUREG/CR-5500, 50% control rods CCF	
13	26	6.77E-10	0.3	28.2	Sequence: ATWS-4: Initiator, RT, EBS		
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	ATWS events, failure to actuate EBS fails reactivity control.
					OPF-EBS-30M	Operator Fails to Manually Actuate EBS (SLB and ATWS)	
					STUCK ROD	CCF of 38 out of 89 Control Rods being stuck - NUREG/CR-5500, 50% control rods CCF	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
General Transient Sequences							
14	28, 29, 36, 41, 44, 49, 50, 70	5.47E-10 - 2.26E-10	1.3	29.6	Sequence: GT-17: GT, MFW, SSS, EFW, MHSI FB, LHSI		
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	These are the same sequences as in Group 2, where instead of a LOOP initiator, the initiator is a plant trip (GT) followed by a consequential LOOP (with recovery failed).
					LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
					SBODG5 PM5	SBO-DG Train 5 Unavailable due to Preventive Maintenance	
					XKA10____DFR_ D-ALL	CCF of EDGs to Run	
XKA80____DFR	ELEC, SBO Diesel Generator XKA80, Fails to Run						

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
15	34, 35, 42, 43	4.94E-10 - 3.90E-10	0.7	30.3	Sequence: GT-15: GT, MFW, SSS, EFW, MHSI FB, LTC		These are the same sequences as in Group 1, where instead of a LOOP initiator, the initiator is a plant trip (GT) followed by a consequential LOOP (with recovery failed).
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	
					EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	
					LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
					SBODG8 PM8	SBO-DG Train 8 Unavailable due to Preventive Maintenance	
					XKA10_____DFR_ D-ALL	CCF of EDGs to Run	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
16	72	2.16E-10	0.1	30.4	Sequence: GT-17: MFW, SSS, EFW, MHSI FB, LHSI		
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	These are the same sequences as in Group 4, where instead of a LOOP initiator, the initiator is a plant trip (GT) followed by a consequential LOOP (with recovery failed).
					BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	
					LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
17	80	1.92E-10	0.1	30.5	Sequence: GT-18: GT, MFW, SSS, EFW, PBL		
					IE GT	Initiator - General Transient (Includes Turbine Trip and Reactor Trip)	Initiator is a plant trip (GT), followed by a failure of PS-B. PS failure also disables MFW/SSS full load line isolation, and MSRTs. Failure of MSSVs fails all steam removal (turbine bypass is not credited).
					CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	
					LBA11AA191SFO_H-ALL	CCF to Open Main Steam Safety Relief Valves	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
Loss of Main Feedwater Sequences							
18	31-33	5.44E-10	0.9	31.4	Sequence: LOMFW-9: LOMFW, SSS, EFW INV, OP FB		
					IE LOMFW	Initiator - Total Loss of Main Feedwater	Initiator LOMFW caused by a failure common for MFW and SSS fails both systems. One EFW train is in PM. Failure to refill or cross tie EFW tanks results in an inadequate EFW inventory for 24 hours mission time. Operator failure to initiate feed and bleed, after EFW tanks inventory runs out, results in a total loss of heat removal.
					CF LOMFW/SSS	Common Factor LOMFW/SSS	
					EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	
					OPD-EFWR/XTIE	Failure to Refill EFW Tanks Within 6 Hrs Given Failure to Xtie Tanks	
					OPD-FB-_90M-LOW	Operator fails to start F&B for transient or low DH transient - low dependency	
OPF-EFW-6H	Operator Fails to Manually Align EFW Tanks Within 6 Hrs						

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
19	56, 71	2.96E-10 - 2.24E-10	0.2	31.6	Sequence: LOMFW-18: LOMFW, SSS, EFW, OP FB		
					IE LOMFW	Initiator - Total Loss of Main Feedwater	Initiator LOMFW caused by a failure common for MFW and SSS fails both systems. CCF of EFW pumps to start disables EFW. Operator failure to initiate feed and bleed results in a total loss of heat removal.
					CF LOMFW/SSS	Common Factor LOMFW/SSS	
					LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	
					OPE-FB-90M	Operator Fails to Initiate Feed and Bleed for Transient	
Induced SGTR Sequences							
20	20, 27	1.32E-09 - 6.00E-10	0.8	32.4	Sequence: IND SGTR-8,-12: IND SGTR, TUBES, OP RHR		
					IE IND SGTR	Initiator - Induced Steam Generator Tube Rupture	Initiator is an Induced SGTR with a failure of 2 to 9 tubes. Operator fails to depressurize and initiate RHR cooling in time to prevent an excessive inventory lost.
					2-9 TUBES	2-9 Ruptured SG Tubes	
					OPE-RHR-3H	Operator Fails to Initiate RHR Within 3 Hours	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
Loss of Component Cooling Water Sequences							
21	24, 25, 51	7.35E-10 - 3.42E-10	0.7	33.1	Sequence: LOCCW-21: LOCCW, RCP LOCA, LTC		
					IE LOCCW	Initiator - Loss of CCW	A loss of the running CCW pump Div 4, due to a failure of running CT fan, requires actuation of the standby CCW pump Div 3. Failure of the standby fan in Div 3 to start, leads to a loss of CCW CH2 and a loss of cooling to RCP pumps 3 and 4 motor bearings. Failure to trip either pump, auto (priority modeled failure) or manually (operator failure) leads to a RCP seal LOCA. Failure to start all standby CT fans leads to failure of LTC (SAHR is disabled by a failure of UHS4).
					JEB30AP001PMNS	RCP, Train 3 Pump JEB10AP001, Priority Module Fails (Non-Self-Monitored)	
					OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	
					PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
PED40AN001EFR	UHS, Cooling Tower Train 4 Cooling Fan PED40AN001, Fails to Run						

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
Loss of Balance of Plant Sequences							
22	85-88	1.84E-10	0.3	33.4	Sequence: LBOP-8: LBOP, EFW INV, OP FB		
					IE LBOP	Initiator - Loss of Balance of Plant - Closed Cooling Water or Aux Cooling Water	Initiator LBOP, caused by a CLCWS safety valve opening, fails both MFW and SSS. One EFW train is in PM. Failure to refill or cross tie EFW tanks results in an inadequate EFW inventory for 24 hours mission time. Operator failure to initiate feed and bleed, after EFW tanks inventory runs out, results in a total loss of heat removal.
					EFWS PM2	EFWS Train 2 Unavailable due to Preventive Maintenance	
					OPD-EFWR/XTIE	Failure to Refill EFW Tanks Within 6 Hrs Given Failure to Xtie Tanks	
					OPD-FB-_90M-LOW	Operator fails to start F&B for transient or low DH transient - low dependency	
					OPF-EFW-6H	Operator Fails to Manually Align EFW Tanks Within 6 Hrs	
					PGB19AA191SPO	CLCWS, Safety Valve PGB19AA191, Premature Opening	

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Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
Large LOCA Sequences							
23	96	1.66E-10	0.1	33.5	Sequence: LLOCA-4: LLOCA, LHSI		
					IE LLOCA	Initiator - Large LOCA (>6-Inch Diameter)	Initiator is a large LOCA. CCF to open CCWS to LHSI Pump Seal Cooler MOVs results in a failure of LHSI.
					KAA22AA013EFO_B-ALL	CCF to Open CCWS to LHSI Pump Seal Cooler MOVs	

Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	FV	RAW
1	ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.443	3.4
2	ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	0.430	3.2
3	ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.397	3.9
4	ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.393	3.8
5	ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	0.236	3.3
6	ELEC	30XKA80	ELEC, SBO Diesel Generator XKA80	0.225	3.2
7	EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	0.101	3.5
8	EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.094	3.5
9	ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	0.089	4.3
10	ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	0.088	4.2
11	SAHR	30JMQ40AP001	SAHR, Motor Driven Pump JMQ40AP001	0.059	1.8
12	SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	0.052	2.4
13	MSS	30LBA40AA002	MSS, Train 4 Main Steam Isolation Valve LBA40AA002	0.044	53.6
14	IRWST	30JNK10AT001	IRWST, SIS Sump Strainer to MHSI/LHSI Train 1 Pumps JNK10AT001	0.042	1.1
15	IRWST	30JNK11AT001	IRWST, SIS Sump Strainer to MHSI/LHSI Train 4 Pumps JNK11AT001	0.041	1.1
16	IRWST	30JNK11AT002	IRWST, SIS Sump Strainer to MHSI/LHSI Train 3 Pumps JNK11AT002	0.040	1.2
17	IRWST	30JNK10AT002	IRWST, SIS Sump Strainer to MHSI/LHSI Train 2 Pumps JNK10AT002	0.040	1.2
18	IRWST	30JNK11AT003	IRWST, SAHR Sump Strainer JNK11AT003	0.039	1.3
19	IRWST	30JNK10AT003	IRWST, CVCS Sump Strainer JNK10AT003	0.039	–
20	SIS/RHR	30JNG13AA005	LHSI, MHSI/LHSI Train 1 First SIS Isolation Check Valve JNG13AA005	0.034	1.3
21	SIS/RHR	30JNG43AA005	LHSI, MHSI/LHSI Train 4 First SIS Isolation Check Valve JNG43AA005	0.033	1.2
22	SIS/RHR	30JNG23AA005	LHSI, MHSI/LHSI Train 2 First SIS Isolation Check Valve JNG23AA005	0.033	2.4

Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	FV	RAW
23	SIS/RHR	30JNG33AA005	LHSI, MHSI/LHSI Train 3 First SIS Isolation Check Valve JNG33AA005	0.032	2.4
24	ELEC	31BTD01	ELEC, 250V 1E 2-hr Battery 31BTD01	0.030	21.6
25	ESWS	30PEB10AP001	ESWS, Train 1 Motor Driven Pump PEB10AP001	0.027	57.6
26	ELEC	34BTD01	ELEC, 250V 1E 2-hr Battery 34BTD01	0.025	12.3
27	ESWS	30PEB40AP001	ESWS, Train 4 Motor Driven Pump PEB40AP001	0.025	41.8
28	ELEC	33BTD01	ELEC, 250V 1E 2-hr Battery 33BTD01	0.023	8.2
29	EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	0.022	1.3
30	EFWS	30LAS31AP001	EFWS, Train 3 Motor Driven Pump LAS31AP001	0.022	1.2
31	CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	0.022	2.0
32	CCWS	30KAA42AA005	CCWS, Train 4 to LHSI HTX 40 Cooling MOV KAA42AA005	0.022	2.0
33	SIS/RHR	30JNG10AP001	LHSI, Train 1 Motor Driven Pump JNG10AP001	0.021	1.9
34	MSS	30LBA41AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA41AA191	0.021	9.6
35	MSS	30LBA42AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA42AA191	0.021	9.6
36	ELEC	32BTD01	ELEC, 250V 1E 2-hr Battery 32BTD01	0.020	2.1
37	MSS	30LBA31AA191	MSS, Train 3 Main Steam Safety Relief Valve LBA31AA191	0.020	1.6
38	MSS	30LBA32AA191	MSS, Train 3 Main Steam Safety Relief Valve LBA32AA191	0.020	1.6
39	MSS	30LBA22AA191	MSS, Train 2 Main Steam Safety Relief Valve LBA22AA191	0.020	1.6
40	MSS	30LBA21AA191	MSS, Train 2 Main Steam Safety Relief Valve LBA21AA191	0.020	1.6
41	MSS	30LBA11AA191	MSS, Train 1 Main Steam Safety Relief Valve LBA11AA191	0.020	1.6
42	MSS	30LBA12AA191	MSS, Train 1 Main Steam Safety Relief Valve LBA12AA191	0.020	1.6

Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	FV	RAW
43	SIS/RHR	30JNG40AP001	LHSI, Train 4 Motor Driven Pump JNG40AP001	0.019	1.8
44	CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	0.018	1.5
45	CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	0.018	1.4
46	UHS	30PED20AA010	UHS, Cooling Tower Train 2 Spray MOV PED20AA010	0.017	4.2
47	ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	0.017	4.2
48	UHS	30PED30AA010	UHS, Cooling Tower Train 3 Spray MOV PED30AA010	0.016	4.1
49	ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	0.016	4.1
50	UHS	30PED40AN001	UHS, Cooling Tower Train 4 Cooling Fan PED40AN001	0.015	20.8
51	ELEC	31BDA	ELEC, 6.9kV Switchgear 31BDA	0.014	IE
52	SIS/RHR	30JNG20AP001	LHSI, Train 2 Motor Driven Pump JNG20AP001	0.014	1.7
53	SIS/RHR	30JNG30AP001	LHSI, Train 3 Motor Driven Pump JNG30AP001	0.013	1.6
54	MSS	30LBA43AA001	MSS, Train 4 MSRIV LBA43AA001	0.011	1.1
55	MSS	30LBA23AA001	MSS, Train 2 MSRIV LBA23AA001	0.011	1.0
56	MSS	30LBA33AA001	MSS, Train 3 MSRIV LBA33AA001	0.011	1.0
57	MSS	30LBA13AA001	MSS, Train 1 MSRIV LBA13AA001	0.011	1.0
58	SIS/RHR	30JND10AP001	MHSI, Train 1 Motor Driven Pump JND10AP001	0.011	1.1
59	CLCWS	30PGB19AA191	CLCWS, Safety Valve PGB19AA191	0.010	IE
60	SIS/RHR	30JND40AP001	MHSI, Train 4 Motor Driven Pump JND40AP001	0.010	1.1
61	SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	0.010	2.2
62	SCWS	30QKA20GH001	SCWS, Train 2 Chiller Unit QKA20GH001	0.010	1.3
63	SIS/RHR	30JND20AP001	MHSI, Train 2 Motor Driven Pump JND20AP001	0.010	1.0
64	SIS/RHR	30JND30AP001	MHSI, Train 3 Motor Driven Pump JND30AP001	0.009	1.0

Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	FV	RAW
65	CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	0.008	28.6
66	CVCS	30KBA32AP001	CVCS, HP Motor Driven Charging Pump KBA32AP001	0.008	1.1
67	ELEC	BDT01_3BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 33BDA Circuit Breaker	0.007	2.4
68	RCS	30JEB40AP001-BKR	ELEC, 13.8kV SWGR 34BDE Circuit Breaker to RCP JEB40AP001	0.007	3.9
69	RCS	30JEB30AP001-BKR	ELEC, 13.8kV SWGR 33BDE Circuit Breaker to RCP JEB30AP001	0.007	3.9
70	ELEC	BDT02_2BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 32BDA Circuit Breaker	0.007	2.4
71	CCWS	30KAB30AA192	CCWS, RCP Thermal Barrier to CCWS CH2 Return Safety Valve KAB30AA192	0.007	IE
72	RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	0.007	3.0
73	RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	0.007	3.0
74	RCS	30JEB10AA010	RCP, RCP1 Leakoff Isolation MOV JEB10AA010	0.007	3.0
75	RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	0.007	3.0
76	RCS	30JEB20AA020	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020	0.007	3.0
77	RCS	30JEB20AA010	RCP, RCP2 Leakoff Isolation MOV JEB20AA010	0.007	3.0
78	RCS	30JEB10AA020	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020	0.007	3.0
79	RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	0.007	3.0
80	ELEC	34BDA	ELEC, 6.9kV SWGR 34BDA	0.007	IE
81	SIS/RHR	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	0.007	1.8
82	I&C	BDC00CE853	6.9kv div 3 phase 3 voltage sensor	0.007	–
83	I&C	BDD00CE853	6.9kv div. 4 phase 3 voltage sensor	0.007	–
84	I&C	BDD00CE852	6.9kv div. 4 phase 2 voltage sensor	0.007	–
85	I&C	BDD00CE851	6.9kv div. 4 phase 1 voltage sensor	0.007	–

Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
Sheet 5 of 6

Rank	System US	Comp ID	Component Description	FV	RAW
86	I&C	BDA00CE853	6.9kV bus div 1 phase 3 voltage sensor	0.007	–
87	I&C	BDC00CE851	6.9kv div 3 phase 1 voltage sensor	0.007	–
88	I&C	BDA00CE851	6.9kV bus div 1 phase 1 voltage sensor	0.007	–
89	I&C	BDB00CE853	6.9kV division 2 phase 3 voltage sensor	0.007	–
90	I&C	BDB00CE852	6.9kV division 2 phase 2 voltage sensor	0.007	–
91	I&C	BDB00CE851	6.9kV division 2 phase 1 voltage sensor	0.007	–
92	I&C	BDC00CE852	6.9kv div 3 phase 2 voltage sensor	0.007	–
93	I&C	BDA00CE852	6.9kV bus div 1 phase 2 voltage sensor	0.007	–
94	CCWS	30KAA40AP001	CCWS, Train 4 Motor Driven Pump KAA40AP001	0.007	14.2
95	SCWS	30QKA40AA101	SCWS, Train 4 Chiller By-pass MOV QKA40AA101	0.007	2.3
96	EFWS	30LAR41AA103	EFWS, Train 4 SG Pressure Control MOV LAR41AA103	0.006	2.9
97	EFWS	30LAR41AA105	EFWS, Train 4 SG Level Control MOV LAR41AA105	0.006	2.9
98	ELEC	BDT01_1BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 31BDA Circuit Breaker	0.006	2.1
99	SIS/RHR	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	0.006	1.8
100	EFWS	30LAR11AA103	EFWS, Train 1 SG Pressure Control MOV LAR11AA103	0.006	2.8
101	EFWS	30LAR11AA105	EFWS, Train 1 SG Level Control MOV LAR11AA105	0.006	2.8
102	CCWS	30KAB30AA191	CCWS, RCP Thermal Barrier to CCWS CH1 Return Safety Valve KAB30AA191	0.006	IE
103	SIS/RHR	30JNG30AA006	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006	0.006	1.7
104	CCWS	30KAB70AA191	CCWS, CVCS HP Cooler 2 Return Safety Valve KAB60AA191	0.006	IE
105	CCWS	30KAB20AA192	CCWS, CCWS CH2 Return Safety Valve KAB20AA192	0.006	IE
106	CCWS	30KAB20AA193	CCWS, FPCS Train 2 Cooling Header Safety Valve KAB20AA193	0.006	IE
107	UHS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	0.006	7.9

**Table 19.1-8—U.S. EPR Risk-Significant Components based on FV Importance – Level 1 Internal Events
Sheet 6 of 6**

Rank	System US	Comp ID	Component Description	FV	RAW
108	ELEC	BDT02_4BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 34BDA Circuit Breaker	0.006	2.0
109	UHS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	0.006	2.2
110	UHS	30PED40AN002	UHS, Cooling Tower Train 4 Cooling Fan PED40AN002	0.006	2.1
111	HVAC	30SAC04AA003	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003	0.005	7.7
112	SIS/RHR	30JNG40AA006	LHSI, LHSI CL4 Discharge Manual CHECK Valve JNG40AA006	0.005	1.6
113	OCWS	30QNA24AN001	OCWS, Chiller Unit QNA24AN001	0.005	1.0

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 1 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
1	ESWS	30PEB10AP001	ESWS, Train 1 Motor Driven Pump PEB10AP001	57.6	0.027
2	MSS	30LBA40AA002	MSS, Train 4 Main Steam Isolation Valve LBA40AA002	53.6	0.044
3	UHS	30PED40AA010	UHS, Cooling Tower Train 4 Spray MOV PED40AA010	51.1	0.000
4	UHS	30PED40AA011	UHS, Cooling Tower Train 4 Bypass Line MOV PED40AA011	51.1	0.000
5	ESWS	30PEB40AP001	ESWS, Train 4 Motor Driven Pump PEB40AP001	41.8	0.025
6	ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	31.9	0.001
7	ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	31.5	0.001
8	ELEC	31BMB	ELEC, 480V Load Center 31BMB	31.5	0.001
9	ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	31.5	0.001
10	CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	28.6	0.008
11	ELEC	31BNB02	ELEC, 480V MCC 31BNB02	24.8	0.002
12	ELEC	31BNT01	ELEC, Constant Voltage Transformer 31BNT01	24.8	0.001
13	ELEC	31BTD01	ELEC, 250V 1E 2-hr Battery 31BTD01	21.6	0.030
14	UHS	30PED40AN001	UHS, Cooling Tower Train 4 Cooling Fan PED40AN001	20.8	0.015
15	SIS/RHR	30JNG10AC001	LHSI, LHSI Train 1 HTX JNG10AC001	19.1	0.000
16	CLCWS	30PGB13AA002	CLCWS, Pump 13 Discharge Check Valve PGB13AA002	17.7	0.000
17	ELEC	33BUC	ELEC, 1E 250V DC Switchboard 33BUC	17.1	0.000
18	ESWS	30PEB10AA005	ESWS, Train 1 Pump Discharge Isolation MOV, PEB10AA005	16.2	0.000
19	UHS	30PED10AA011	UHS, Cooling Tower Train 1 Bypass Line MOV PED10AA011	16.2	0.000
20	UHS	30PED10AA010	UHS, Cooling Tower Train 1 Spray MOV PED10AA010	16.2	0.000
21	ELEC	32BUD	ELEC, Non 1E 250V DC Switchboard 32BUD	16.1	0.000
22	ELEC	34BUC	ELEC, 1E 250V DC Switchboard 34BUC	14.8	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 2 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
23	ELEC	1BDB1BMT02	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker	14.5	0.000
24	ELEC	1BDC_1BDB1	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	14.5	0.000
25	ELEC	1BDC_1BDB2	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	14.5	0.000
26	ELEC	1BMT021BMB	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker	14.5	0.000
27	ELEC	32BUC	ELEC, 1E 250V DC Switchboard 32BUC	14.3	0.000
28	CCWS	30KAA40AP001	CCWS, Train 4 Motor Driven Pump KAA40AP001	14.2	0.007
29	ESWS	30PEB80AA002	ESWS, SA-ESWS Pump 80 Discharge Manual CHECK Valve PEB80AA002	14.0	0.000
30	ELEC	1BDA_1BDC2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	13.9	0.001
31	ELEC	1BDA_1BDC1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	13.9	0.000
32	ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	13.9	0.000
33	ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	13.4	0.000
34	ELEC	34BMB	ELEC, 480V Load Center 34BMB	13.4	0.000
35	ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	13.4	0.000
36	ESWS	30PEB40AA005	ESWS, Train 4 Pump Discharge MOV, PEB40AA005	13.4	0.000
37	ELEC	34BTD01	ELEC, 250V 1E 2-hr Battery 34BTD01	12.3	0.025
38	HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	12.2	0.004
39	HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	12.2	0.004
40	ESWS	30PEB10AA204	ESWS, Train 1 Pump Discharge Check Valve PEB10AA204	12.1	0.000
41	ELEC	34BNT01	ELEC, Constant Voltage Transformer 34BNT01	10.9	0.000
42	ELEC	34BNB02	ELEC, 480V MCC 34BNB02	10.9	0.001
43	ESWS	30PEB40AA204	ESWS, Train 4 Pump Discharge Check Valve PEB40AA204	10.9	0.000
44	ELEC	31BUC	ELEC, 1E 250V DC Switchboard 31BUC	10.8	0.000
45	CCWS	30KAA10BB001	CCWS, Train 1 Surge Tank KAA10BB001	10.5	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	RAW	FV
46	ELEC	31BRW12BUW13	ELEC, 24V DC I&C Power Rack 31BRW12/ 31BUW13	9.8	0.000
47	MSS	30LBA42AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA42AA191	9.6	0.021
48	MSS	30LBA41AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA41AA191	9.6	0.021
49	ELEC	1BMB1BNT01	ELEC, 480V Load Center 31BMB to Transformer 31BNT01 Circuit Breaker	9.2	0.000
50	ELEC	1BNT011BNB02	ELEC, Transformer 31BNT01 to 480V MCC 31BNB02 Circuit Breaker	9.2	0.000
51	SCWS	30QKC40AA101	SCWS, Return from SAC Div 4 MOV QKC40AA101	9.1	0.001
52	HVAC	30SAC04AA004	SAC, Div 4 Recirculation Motor Operated Damper SAC04AA004	9.1	0.001
53	HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	8.6	0.003
54	HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	8.6	0.003
55	SIS/RHR	30JNG40AC001	LHSI, LHSI Train 4 HTX JNG40AC001	8.6	0.000
56	ELEC	33BTD01	ELEC, 250V 1E 2-hr Battery 33BTD01	8.2	0.023
57	CCWS	30KAA10AC001	CCWS, Train 1 HTX 10 KAA10AC001	8.0	0.000
58	CCWS	30KAA10AA112	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112	8.00	0.000
59	UHS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	7.9	0.006
60	HVAC	30SAC04AA003	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003	7.7	0.005
61	ELEC	31BUD	ELEC, Non 1E 250V DC Switchboard 31BUD	7.3	0.000
62	ELEC	32BMT02	ELEC, 6.9kV-480V Transformer 32BMT02	7.3	0.000
63	ELEC	32BMB	ELEC, 480V Load Center 32BMB	7.3	0.000
64	ELEC	32BDB	ELEC, 6.9kV SWGR 32BDB	7.3	0.000
65	SCWS	30QKA40AA103	SCWS, Train 4 Suction Xtie MOV QKA40AA103	7.1	0.000
66	SCWS	30QKA30AA103	SCWS, Train 3 Suction Xtie MOV QKA30AA103	7.1	0.000
67	SCWS	30QKA40AA102	SCWS, Train 4 Discharge Xtie MOV QKA40AA102	7.1	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	RAW	FV
68	SCWS	30QKA30AA102	SCWS, Train 3 Discharge Xtie MOV QKA30AA102	7.1	0.000
69	ELEC	34BRW72BUW73	ELEC, 24V DC I&C Power Rack 34BRW72/34BUW73	6.8	0.000
70	ELEC	33BRW50BUW51	ELEC, 24V DC I&C Power Rack 33BRW50/33BUW51	6.4	0.000
71	ELEC	2BMT022BMB	ELEC, Transformer 32BMT02 to 480V Load Center 32BMB Circuit Breaker	6.3	0.000
72	ELEC	2BDA_2BDB2	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	6.3	0.000
73	ELEC	2BDA_2BDB1	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	6.3	0.000
74	ELEC	2BDB2BMT02	ELEC, 6.9kV SWGR 32BDB to Transformer 32BMT02 Circuit Breaker	6.3	0.000
75	ELEC	33BDB	ELEC, 6.9kV SWGR 33BDB	6.1	0.000
76	ELEC	33BMT02	ELEC, 6.9kV-480V Transformer 33BMT02	6.1	0.000
77	ELEC	33BMB	ELEC, 480V Load Center 33BMB	6.1	0.000
78	HVAC	30SAC01AA004	SAC, Div 1 Recirculation Motor Operated Damper SAC01AA004	5.8	0.000
79	SCWS	30QKC10AA101	SCWS, Return from SAC Div 1 MOV QKC10AA101	5.8	0.000
80	CCWS	30KAA40BB001	CCWS, Train 4 Surge Tank KAA40BB001	5.4	0.000
81	CCWS	30KAA10AA010	CCWS, Train 1 Return from Common Header 1 Hydraulic Valve KAA10AA010	5.3	0.000
82	CCWS	30KAA10AA006	CCWS, Train 1 Discharge to Common Header 1 Hydraulic Valve KAA10AA006	5.3	0.000
83	CCWS	30KAA40AC001	CCWS, Train 4 HTX 40 KAA40AC001	5.2	0.000
84	CCWS	30KAA40AA112	CCWS, Train 4 Heat Exchanger Bypass MOV KAA40AA112	5.2	0.000
85	ELEC	32BTB01	ELEC, 250V Non 1E 12-hr Battery 32BTB01	5.2	0.001
86	ELEC	31BTB01	ELEC, 250V Non 1E 12-hr Battery 31BTB01	5.2	0.001
87	CCWS	30KAA10AA004	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004	5.1	0.000
88	ELEC	33BNB02	ELEC, 480V MCC 33BNB02	5.0	0.000
89	ELEC	33BNT01	ELEC, Constant Voltage Transformer 33BNT01	5.0	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 5 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
90	CCWS	30KAA32AA101	CCWS, Common Header 2 QKA30 Chiller Return 3-Way MOV KAA32AA101	4.5	0.005
91	ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	4.3	0.089
92	ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	4.2	0.017
93	UHS	30PED20AA010	UHS, Cooling Tower Train 2 Spray MOV PED20AA010	4.2	0.017
94	ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	4.2	0.088
95	SCWS	30QKA30GH001	SCWS, Train 3 Chiller Unit QKA30GH001	4.1	0.004
96	ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	4.1	0.016
97	UHS	30PED30AA010	UHS, Cooling Tower Train 3 Spray MOV PED30AA010	4.1	0.016
98	ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	3.9	0.397
99	RCS	30JEB40AP001-BKR	ELEC, 13.8kV SWGR 34BDE Circuit Breaker to RCP JEB40AP001	3.9	0.007
100	RCS	30JEB30AP001-BKR	ELEC, 13.8kV SWGR 33BDE Circuit Breaker to RCP JEB30AP001	3.9	0.007
101	SCWS	30QKA10AA102	SCWS, Train 1 Discharge Xtie MOV QKA10AA102	3.9	0.000
102	SCWS	30QKA20AA102	SCWS, Train 2 Discharge Xtie MOV QKA20AA102	3.9	0.000
103	SCWS	30QKA20AA103	SCWS, Train 2 Suction Xtie MOV QKA20AA103	3.9	0.000
104	SCWS	30QKA10AA103	SCWS, Train 1 Suction Xtie MOV QKA10AA103	3.9	0.000
105	CCWS	30KAA40AA004	CCWS, Train 4 Discharge from CCW HTX 40 Check Valve KAA40AA004	3.9	0.000
106	HVAC	30SAC01AA003	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003	3.8	0.002
107	ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	3.8	0.393
108	CCWS	30KAA40AA006	CCWS, Train 4 Discharge from Common Header 2 Hydraulic Valve KAA40AA006	3.6	0.000
109	CCWS	30KAA40AA010	CCWS, Train 4 Return from Common Header 2 Hydraulic Valve KAA40AA010	3.6	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	RAW	FV
110	EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	3.5	0.101
111	EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	3.5	0.094
112	ELEC	31BRU03	ELEC, Inverter 31BRU03	3.5	0.001
113	ELEC	32BRU03	ELEC, Inverter 32BRU03	3.5	0.001
114	ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	3.4	0.443
115	ELEC	32BRA	ELEC, 480V MCC 32BRA	3.4	0.000
116	ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	3.3	0.236
117	ELEC	34BRA	ELEC, 480V MCC 34BRA	3.3	0.000
118	ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	3.2	0.430
119	ELEC	30XKA80	ELEC, SBO Diesel Generator XKA80	3.2	0.225
120	SCWS	30QKA30AA101	SCWS, Train 3 Chiller By-pass MOV QKA30AA101	3.1	0.000
121	HVAC	30SAC34AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC34AA002	3.1	0.000
122	ELEC	4BDC_4BDB2	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	3.1	0.000
123	ELEC	4BMT024BMB	ELEC, Transformer 34BMT02 to 480V Load Center 34BMB Circuit Breaker	3.1	0.000
124	ELEC	4BDC_4BDB1	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	3.1	0.000
125	ELEC	4BDB4BMT02	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT02 Circuit Breaker	3.1	0.000
126	RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	3.0	0.007
127	RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	3.0	0.007
128	RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	3.0	0.007
129	RCS	30JEB20AA020	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020	3.0	0.007
130	RCS	30JEB20AA010	RCP, RCP2 Leakoff Isolation MOV JEB20AA010	3.0	0.007
131	RCS	30JEB10AA020	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020	3.0	0.007

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 7 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
132	RCS	30JEB10AA010	RCP, RCP1 Leakoff Isolation MOV JEB10AA010	3.0	0.007
133	RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	3.0	0.007
134	EFWS	30LAR41AA105	EFWS, Train 4 SG Level Control MOV LAR41AA105	2.9	0.006
135	EFWS	30LAR41AA103	EFWS, Train 4 SG Pressure Control MOV LAR41AA103	2.9	0.006
136	EFWS	30LAR11AA105	EFWS, Train 1 SG Level Control MOV LAR11AA105	2.8	0.006
137	EFWS	30LAR11AA103	EFWS, Train 1 SG Pressure Control MOV LAR11AA103	2.8	0.006
138	ELEC	31BRA	ELEC, 480V MCC 31BRA	2.8	0.000
139	ELEC	3BDA_3BDB2	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker	2.7	0.000
140	ELEC	3BMT023BMB	ELEC, Transformer 33BMT02 to 480V Load Center 33BMB Circuit Breaker	2.7	0.000
141	ELEC	3BDB3BMT02	ELEC, 6.9kV SWGR 33BDB to Transformer 33BMT02 Circuit Breaker	2.7	0.000
142	ELEC	3BDA_3BDB1	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker	2.7	0.000
143	HVAC	30SAC31AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002	2.6	0.000
144	RCS	30JEB10 SSSF	Stand Still Seal for RCP1	2.6	0.002
145	RCS	30JEB30 SSSF	Stand Still Seal for RCP3	2.6	0.002
146	RCS	30JEB40 SSSF	Stand Still Seal for RCP4	2.6	0.002
147	RCS	30JEB20 SSSF	Stand Still Seal for RCP2	2.6	0.002
148	ELEC	4BDA_4BDC1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	2.5	0.000
149	ELEC	4BDA_4BDC2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	2.5	0.001
150	EFWS	30LAR41CF801	EFW pump 4 discharge flow sensor	2.5	0.002
151	SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	2.4	0.052
152	ELEC	31BRB	ELEC, 480V MCC 31BRB	2.4	0.000
153	ELEC	34BRB	ELEC, 480V MCC 34BRB	2.4	0.000

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 8 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
154	ELEC	30XKA30_3BDA	ELEC, EDG XKA30 to 6.9kV SWGR 33BDA Circuit Breaker	2.4	0.003
155	ELEC	BDT01_3BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 33BDA Circuit Breaker	2.4	0.007
156	ELEC	BDT02_3BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 33BDA Circuit Breaker	2.4	0.003
157	ELEC	33BRA	ELEC, 480V MCC 33BRA	2.4	0.000
158	SIS/RHR	30JNG23AA005	LHSI, MHSI/LHSI Train 2 First SIS Isolation Check Valve JNG23AA005	2.4	0.033
159	EFWS	30LAR11CF801	EFW pump 1 discharge flow sensor	2.4	0.002
160	ELEC	BDT02_2BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 32BDA Circuit Breaker	2.4	0.007
161	ELEC	30XKA20_2BDA	ELEC, EDG XKA20 to 6.9kV SWGR 32BDA Circuit Breaker	2.4	0.003
162	ELEC	BDT01_2BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 32BDA Circuit Breaker	2.4	0.003
163	ELEC	1BBH_1BDC1	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker	2.4	0.001
164	ELEC	30XKA50_1BBH	ELEC, SBO DG XKA50 to 6.9kV SWGR 31BBH Circuit Breaker	2.4	0.001
165	ELEC	1BBH_1BDC2	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker	2.4	0.001
166	ELEC	1BBT081BBH	ELEC, Transformer 31BBT08 to 6.9kV SWGR 31BBH Circuit Breaker	2.4	0.001
167	ELEC	30XKA80_2BBH	ELEC, SBO DG XKA80 to 6.9kV SWGR 34BBH Circuit Breaker	2.4	0.001
168	ELEC	2BBH_4BDC2	ELEC, 6.9kV SWGR 32BBH to 6.9kV SWGR 34BDC Circuit Breaker	2.4	0.001
169	ELEC	2BBH_4BDC1	ELEC, 6.9kV SWGR 32BBH to 6.9kV SWGR 34BDC Circuit Breaker	2.4	0.001
170	ELEC	2BBT082BBH	ELEC, Transformer 32BBT08 to 6.9kV SWGR 32BBH Circuit Breaker	2.4	0.001
171	SIS/RHR	30JNG33AA005	LHSI, MHSI/LHSI Train 3 First SIS Isolation Check Valve JNG33AA005	2.4	0.032
172	CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001	2.3	0.005

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
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Rank	System US	Comp ID	Component Description	RAW	FV
173	RCS	30JEB20AP001-BKR	ELEC, 13.8kV SWGR 32BDE Circuit Breaker to RCP JEB20AP001	2.3	0.003
174	RCS	30JEB10AP001-BKR	ELEC, 13.8kV SWGR 31BDE Circuit Breaker to RCP JEB10AP001	2.3	0.003
175	RCS	30JEB30AA018	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018	2.3	0.001
176	RCS	30JEB10AA018	RCP Seal, RCP1 Nitrogen Supply Solenoid Valve JEB10AA018	2.3	0.001
177	RCS	30JEB20AA018	RCP Seal, RCP2 Nitrogen Supply Solenoid Valve JEB20AA018	2.3	0.001
178	RCS	30JEB40AA018	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018	2.3	0.001
179	SCWS	30QKA40AA101	SCWS, Train 4 Chiller By-pass MOV QKA40AA101	2.3	0.007
180	SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	2.3	0.010
181	CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	2.2	0.004
182	UHS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	2.2	0.006
183	UHS	30PED40AN002	UHS, Cooling Tower Train 4 Cooling Fan PED40AN002	2.1	0.006
184	ELEC	30XKA10_1BDA	ELEC, EDG XKA10 to 6.9kV SWGR 31BDA Circuit Breaker	2.1	0.003
185	ELEC	BDT02_1BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 31BDA Circuit Breaker	2.1	0.003
186	ELEC	BDT01_1BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 31BDA Circuit Breaker	2.1	0.006
187	ELEC	32BTD01	ELEC, 250V 1E 2-hr Battery 32BTD01	2.1	0.020
188	EFWS	30LAR41AA001	EFWS, Train 4 Pump Suction Manual Valve LAR41AA001	2.1	0.000
189	EFWS	30LAR11AA001	EFWS, Train 1 Pump Suction Manual Valve LAR11AA001	2.0	0.000
190	ELEC	BDT02_4BDA	ELEC, Aux Transformer 30BDT02 to 6.9kV SWGR 34BDA Circuit Breaker	2.0	0.006
191	ELEC	BDT01_4BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 34BDA Circuit Breaker	2.0	0.002

**Table 19.1-9—U.S. EPR Risk-Significant Components based on RAW
Importance – Level 1 Internal Events
Sheet 10 of 10**

Rank	System US	Comp ID	Component Description	RAW	FV
192	ELEC	30XKA40_4BDA	ELEC, EDG XKA40 to 6.9kV SWGR 34BDA Circuit Breaker	2.0	0.002
193	CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	2.0	0.022

Table 19.1-10—U.S. EPR Risk-Significant Human Actions based on FV Importance – Level 1 Internal Events

Rank	Basic Event	Description	Nominal Value	FV	RAW
1	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.2E-02	0.122	11.1
2	OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBO DGs During Non-SBO Conditions	1.0E-01	0.096	1.9
3	OPF-CCWS TR SO	Operator Fails to Switch CH Supply to Standby CCW Train Before A Loss of the Running Train	1.6E-01	0.025	1.1
4	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	0.022	1.5
5	OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	2.8E-02	0.022	1.8
6	OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	2.8E-02	0.015	1.5
7	OPF-EFW-6H	Operator Fails to Manually Align EFW Tanks Within 6 Hrs	2.0E-05	0.012	610.8
8	OPD-EFWRF/XTIE	Failure to Refill EFW Tanks Within 6 Hrs Given Failure to Xtie Tanks	1.4E-01	0.012	1.1
9	OPD-FB-_90M-LOW	Operator fails to start F&B for transient or low DH transient - low dependency	5.0E-02	0.012	1.2
10	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	3.8E-04	0.008	23.3
11	OPE-RHR-3H	Operator Fails to Initiate RHR Within 3 Hours	2.2E-03	0.005	3.5
12	OPF-XTIE-LHSI	Operator Fails to Xtie LHSI Trains During PM	5.5E-02	0.005	1.1

Table 19.1-11—U.S. EPR Risk-Significant Human Actions based on RAW Importance – Level 1 Internal Events

Rank	Basic Event	Description	Nominal Value	RAW	FV
1	OPF-EFW-6H	Operator Fails to Manually Align EFW Tanks Within 6 Hrs	2.0E-05	610.8	0.012
2	OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	5.5E-05	23.5	0.001
3	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	3.8E-04	23.3	0.008
4	OPF-SGTR-1H	Operator Fails to Isolate SGTR and Initiate Cooldown	1.1E-04	16.1	0.002
5	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.2E-02	11.1	0.122
6	OPF-XTLDSBO-2H	Operator Fails to Connect and Load SBO DGs	6.0E-04	8.4	0.004
7	OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	1.1E-04	3.5	0.000
8	OPE-RHR-3H	Operator Fails to Initiate RHR Within 3 Hours	2.2E-03	3.5	0.005

Table 19.1-12—U.S. EPR Risk-Significant Common Cause Events based on RAW Importance – Level 1 Internal Events
Sheet 1 of 2

Rank	System	ID	Description	Nominal Value	RAW
1	ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	1.6E-07	88,115.0
2	IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-06	6,906.5
3	ESWS	PEB10AP001EFR_B-ALL	CCF of ESWS Pumps 1 and 4 to Run (Normally Running)	1.9E-06	6,858.5
4	SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	4.1E-06	6,459.0
5	CCWS	KAA10AP001EFR_B-ALL	CCF of CCWS Pumps 1 and 4 to Run (Normally Running)	9.6E-07	5,219.4
6	ELEC	XKA10____DFR/FS_D-ALL	CCF of EDGs to Run/Start	1.0E-04	1,739.0
7	ESWS	PED10AN002EFS/FR_F-ALL	CCF to Start/Run Standby Cooling Tower Fans (At Power)	3.3E-05	1,583.8
8	ESWS	PEB10AA204CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	4.5E-07	1,108.0
9	CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	615.4
10	HVAC	SAC01/31AN001EFR_B-ALL	CCF to Run Normal Air Supply/Exhaust Fans (Trains 1 & 4)	5.1E-06	587.8
11	SIS/RHRS	JNG10AP001EFS/FR_D-ALL	CCF of LHSI Pumps to Start/Run	1.7E-06	565.9
12	ESWS	PED10AN001EFR_B-ALL	CCF to Run Normally Running Cooling Tower Fans (At Power)	1.0E-05	548.3
13	CCWS	KAA12AA012CFO_D-ALL	CCF to Open CCWS from LHSI HTX Discharge Check Valve	4.5E-07	526.2
14	SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	516.6

Table 19.1-12—U.S. EPR Risk-Significant Common Cause Events based on RAW Importance – Level 1 Internal Events
Sheet 2 of 2

Rank	System	ID	Description	Nominal Value	RAW
15	EFWS	LAS11AP001EFS/FR_D-ALL	CCF of EFWS Pumps to Start/Run	1.0E-05	447.3
16	MSS	LBA11AA191SFO_H-ALL	CCF to Open Main Steam Safety Relief Valves	2.6E-05	255.5
17	MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	4.6E-05	219.4
18	SIS/RHRS	JND10AP001EFR/FS_D-ALL	CCF of MHSI Pumps to Run/Start	3.0E-05	178.8
19	HVAC	SAC01/31AN001EFS/FR_B-ALL	CCF to Start Normal Air Supply/Exhaust Fans (Trains 1 & 4)	1.4E-05	105.4
20	SCWS	QKA10GH001_FR_B-ALL	CCF of the Running SCWS Chiller Units to Run	2.2E-05	44.6
21	ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	8.1E-05	44.2
22	SIS/RHRS	JNA10AA001EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	23.6

Table 19.1-13—U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance – Level 1 Internal Event

Rank	ID	Description	Nominal Value	RAW
1	I/O MOD CCF	I/O Module Common Cause Failure	6.5E-06	2,665.3
2	SG LVL CCG	Common Cause Failure of the SG Level Sensors (32)	4.9E-08	2,096.0
3	SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	1,929.8
4	ALU/APU NS-ALL	CCF of ALU and APU Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	1,923.5
5	CL-PS-EDG-SWCCF	CCF of EDG Start Function in PS Diversity Groups A&B Software	1.0E-05	1,632.5
6	BUS UV CCF-ALL	CCF of 6.9KV bus undervoltage sensors	4.3E-06	1,568.5
7	ALU/APU SM-ALL	CCF of ALU and APU Protection System Computer Processors (Self-Monitored)	9.0E-08	1,564.3
8	CL-TXS-OSCCF	CCF of TXS Operating System or Other Common Software	1.0E-07	1,564.3
9	EFW FLOW CCF-ALL	CCF of EFW pump discharge flow sensors	2.7E-06	420.0
10	CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	1.0E-05	326.9
11	SG PRESS CCG	Common Cause Failure of the SG Pressure Sensors (16)	2.5E-08	280.8
12	PZR PRES CCF-ALL	CCF of pressurizer (RCS) pressure sensors	6.7E-07	177.8
13	CL-PS-A-SWCCF	CCF of Protection System Diversity Group A Application Software	1.0E-05	37.9

Table 19.1-14—U.S. EPR Risk-Significant PRA Parameters – Level 1 Internal Events
Sheet 1 of 3

Rank	ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters					
1	PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.126	1.5
2	STUCK ROD	CCF of 38 out of 89 Control Rods being stuck - NUREG/CR-5500, 50% control rods CCF	4.1E-08	0.045	IE
3	CF LOMFW/SSS	Common Factor LOMFW/SSS	8.1E-01	0.013	1.0
4	CVCS VCT	CVCS Switchover to IRWST is required	1.0E-01	0.011	1.1
5	2-9 TUBES	2-9 Ruptured SG Tubes	5.0E-01	0.010	1.0
6	SUP UHS NS	Failure of the Ultimate Heat Sink (Non-Safety)	2.8E-05	0.003	97.3
7	10 TUBES	10 or More Ruptured Tubes	1.0E-03	0.002	3.5
8	1MV-FTO	Failure of Any EFW X-Tie MV to Open (Disabling Connection to One EFW Tank)	4.0E-05	0.000	11.5
9	XKA LOADS-ALL	CCF of SWGR Loads to Disconnect	1.4E-06	0.000	89.6
Maintenance Parameters					
1	EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.079	2.5
2	SBODG5 PM5	SBO-DG Train 5 Unavailable due to Preventive Maintenance	7.0E-02	0.078	2.0
3	EDG PM4	EDG Train 4 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.077	2.5
4	SBODG8 PM8	SBO-DG Train 8 Unavailable due to Preventive Maintenance	7.0E-02	0.072	2.0
5	CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	1.0E-01	0.067	1.6
6	CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	1.0E-01	0.066	1.6
7	EFWS PM4	EFWS Train 4 Unavailable due to Preventive Maintenance	5.0E-02	0.060	2.1
8	SAHR PM4	SAHR Train Unavailable due to Preventive Maintenance	7.0E-02	0.058	1.8
9	EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	5.0E-02	0.052	2.0
10	QKA40 PM4	Normal QKA40 Train Unavailable due to Preventive Maintenance	7.0E-02	0.041	1.5

Table 19.1-14—U.S. EPR Risk-Significant PRA Parameters – Level 1 Internal Events
Sheet 2 of 3

Rank	ID	Description	Nominal Value	FV	RAW
11	LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	5.0E-02	0.018	1.3
12	LHSI PM4	LHSI Train 4 Unavailable due to Preventive Maintenance	5.0E-02	0.016	1.3
13	LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	5.0E-02	0.011	1.2
14	LHSI PM3	LHSI Train 3 Unavailable due to Preventive Maintenance	5.0E-02	0.010	1.2
15	CVCS32 CM2	CVCS Train 2 Unavailable due to Corrective Maintenance	1.0E-01	0.008	1.1
16	EFWS PM3	EFWS Train 3 Unavailable due to Preventive Maintenance	5.0E-02	0.008	1.2
17	EFWS PM2	EFWS Train 2 Unavailable due to Preventive Maintenance	5.0E-02	0.008	1.2
18	QKA20 PM2	Normal QKA20 Train Unavailable due to Preventive Maintenance	7.0E-02	0.008	1.1
19	EDG PM2	EDG Train 2 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.007	1.1
20	EDG PM3	EDG Train 3 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.007	1.1
21	SAC04 CM4	Normal SAC04 Train Unavailable due to Corrective Maintenance	8.0E-04	0.005	7.7
22	QNA24 PM	OCWS Standby Chiller 24 Unavailable due to Preventive Maintenance	3.0E-01	0.005	1.0
23	SAC01 CM1	Normal SAC01 Train Unavailable due to Corrective Maintenance	8.0E-04	0.002	3.8
Offsite Power Related Events					
1	REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	3.2E-01	0.338	1.7
2	LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.116	65.2
3	REC OSP 1HR	Failure to Recover Offsite Power Within 1 Hour	5.3E-01	0.073	1.1
4	LOOPCONL	Consequential LOOP for IEs Leading to a LOCA (No Recovery Credited)	5.3E-03	0.008	2.6

Table 19.1-14—U.S. EPR Risk-Significant PRA Parameters – Level 1 Internal Events
Sheet 3 of 3

Rank	ID	Description	Nominal Value	FV	RAW
5	LOOPCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to a Controlled Shutdown	1.8E-04	0.003	15.0
6	LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.002	36.8

Table 19.1-15—U.S. EPR Level 1 Internal Events Sensitivity Studies
Sheet 1 of 2

Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF
0	0	Base Case (Internal Events)	2.4E-07	0%
1	Common Cause Assumption			
	1b	EDGs & SBODGs in the same CC group	1.1E-06	346%
2	LOOP Assumptions			
	2a	No Credit was given for LOOP recoveries (DG MT also set back to 24 hours)	8.8E-07	262%
	2b	DG Mission Time set to 24 hours	4.3-07	77%
	2c	SBO DG Mission Time set to 18 hours	2.3E-07	-6%
	2d	Consequential LOOP events were not considered	2.2E-07	-11%
3	Assumptions on Electrical Dependencies			
	3a	MSRT Realignment to One Power Train per Train	2.6E-07	7%
	3b	For CVCS seal injection, assume that a switchover from the VCT to the IRWST is always required (Div1 & Div4 required)	2.8E-07	15%
	3c	UHS 4 assumed unavailable during SBO Conditions (no credit for SBO x-tie for dedicated ESW)	2.6E-07	5.5%
4	Assumptions on HVAC Recoveries			
	4a	Room heat-up was not considered	2.2E-07	-10%
	4b	Operator recovery of HVAC not credited	4.9E-06	1944%
5	Sensitivity to HEPs Values			
	5a	All HEPs Set to 5% Value	1.7E-07	-31%
	5b	All HEPs Set to 95% Value	7.3E-07	203%

Table 19.1-15—U.S. EPR Level 1 Internal Events Sensitivity Studies
Sheet 2 of 2

Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF
6	Assumptions on Probabilities of an RCP LOCA			
	6a	RCP seal LOCA Probability - 1.0	3.9E-07	62%
	6b	RCP seal LOCA Probability - 0.5	2.9E-07	22%
	6c	RCP seal LOCA Probability - 0.1	2.3E-07	-7%
7	Assumptions on Long Term Cooling Mission Time			
	7a	SAHR Mission Time set to 36 hours	2.4E-07	0%
	7b	SAHR Mission Time set to 72 hours	2.4E-07	0%
8	Preventive Maintenance Assumptions			
	8a	Train 1 assumed to be in Preventive Maintenance for all year	2.9E-07	20%
	8b	W/o Preventive Maintenance	9.4E-08	-61%
9	I&C Software and Hardware Common Cause			
	9a	Increase I&C CC parameters by factor of 10; include operator dependency	5.7E-07	137%
	9b	Increase I&C CC parameters by factor of 100.	8.3E-07	243%
10	Design Change after the PRA Model Freeze			
	10	Design Change to RCP seal valves: type (SOV to MOV) and electrical supply (12 hr NUPS to 2 hr EUPS)	2.5E-07	3.5%
11	Combination of Different Cases			
	11	Combination of Cases 1b, 2b, 2e, 3a, 3b, 5b, 6a	4.1E-06	1588%

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 1 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
TR	Core damage from transient sequences with: <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE CET ISL	CDES-TR evaluates the sequences to determine: <ul style="list-style-type: none"> ● If the sequence is from initiator FLD-SIS (SIS Flood) it is sent to consequence IS. ● Then the #CDES-IS will send the sequence to CET ISL. ● A scrubbing factor is applied to sequences from initiator FLD-SIS. If the sequence is from a different initiator it will be sent to #CET1 HI PRESSURE CET1 HI PRESSURE evaluates the sequence to determine: <ul style="list-style-type: none"> ● The sequence will be depressurized by operator action or hot leg rupture. ● If the sequence results in SGTR, it is sent to the SGTR tree. ● If the sequence is depressurized, it is sent to the CET LO PRESSURE tree. ● Otherwise it is sent to the CET2 HI PRESSURE tree.
TRD	Core damage from transient sequences with: <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. ● Depressurization of the Secondary side (MSSV, SLBO, and SLBI). Note: Sequences depressurized due to a SLBI initiator are first assigned CDES ATI then TRD if the containment has not failed.	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE evaluates the sequence to determine: <ul style="list-style-type: none"> ● If the sequence will be depressurized by operator action or hot leg rupture. ● If the sequence results in SGTR, it is sent to the SGTR tree. ● If the sequence is depressurized, it is sent to the CET LO PRESSURE tree. ● Otherwise it is sent to the CET2 HI PRESSURE tree.

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 2 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
TR1	<p>Core damage from transient sequences with:</p> <ul style="list-style-type: none"> Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	<p>CDES-TR1 evaluates the sequence to determine:</p> <ul style="list-style-type: none"> If the sequence is from initiator FLD-SIS (SIS Flood) it is sent to consequence IS. Then the CDES-IS will send the sequence to CET ISL. A scrubbing factor is applied to sequences from initiator FLD-SIS. <p>If the sequence is from a different initiator it will be evaluated for the following:</p> <ul style="list-style-type: none"> If 1 LHSI train and depressurization (PSVs or PDSs) are both available, the sequences are sent to the Limited CD tree. Otherwise the sequences are sent to CET1 HI PRESSURE (similar to case TR).
TR1D	<p>Core damage from transient with:</p> <ul style="list-style-type: none"> Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). Depressurization of the Secondary side (MSSV, SLBO, and SLBI). <p>Note: Sequences depressurized due to a SLBI initiator are first assigned CDES ATI then TRD if the containment has not failed. Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	<p>CDES-TR1D evaluates the sequence to determine:</p> <ul style="list-style-type: none"> If 1 LHSI train and depressurization (PSVs or PDSs) are both available, the sequences are sent to the Limited CD tree. Otherwise the sequences are sent to CET1 HI PRESSURE (similar to case TR).

Table 19.1-16—Core Damage End States and their Treatment in the CETs
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Bin	Description of Sequences in Bin	CET	Treatment in CET
TRANN	Core damage from initiator Flood in Containment Annulus with: <ul style="list-style-type: none"> ● Failed isolation of the fire water distribution system (mechanical failure) or, ● Failed isolation of the fire water distribution system (operator isolation failure before penetration level). 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE (similar to case TR)
TP	Core damage from sequences initiated by transient following loss of offsite power with: <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. ● Offsite power not recovered prior to core damage. ● No RCP seal LOCA. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE (Similar to case TR above)

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 4 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
TP1	<p>Core damage from sequences initiated by transient following loss of offsite power with:</p> <ul style="list-style-type: none"> ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). ● Offsite power not recovered prior to core damage. ● No RCP seal LOCA. <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CDES-TP1 (Similar to case TR1 above)
LL	<p>Core damage sequences initiated by Large LOCA with:</p> <ul style="list-style-type: none"> ● LHSI or long term cooling not available. 	CET LO PRESSURE	CET LO PRESSURE evaluates the sequence to determine: <ul style="list-style-type: none"> ● The containment failure progression when the primary system is depressurized.
LL1	<p>Core damage sequences initiated by Large LOCA with:</p> <ul style="list-style-type: none"> ● Failure other than LHSI or long term cooling not available. <p>Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET LIMITED CD CET LO PRESSURE	#CDES-LL1 evaluates the sequence to determine: <ul style="list-style-type: none"> ● If 1 LHSI train and is available, the sequences are sent to the Limited CD tree. ● Otherwise the sequences are sent to CET LO PRESSURE. CET LO PRESSURE (similar to case LL)
ML	<p>Core damage from Medium LOCA sequences with:</p> <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. 	CET LO PRESSURE	CET LO PRESSURE (similar to case LL)

Table 19.1-16—Core Damage End States and their Treatment in the CETs
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Bin	Description of Sequences in Bin	CET	Treatment in CET
ML1	<p>Sequences initiated by Medium LOCA initiator with:</p> <ul style="list-style-type: none"> ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B. Note: RCS depressurization from a medium LOCA is not sufficient to enable LHSI injection. Therefore, primary bleed is also required.</p>	<p>CET LIMITED CD CET LO PRESSURE</p>	<p>CDES-ML1 evaluates the sequence to determine:</p> <ul style="list-style-type: none"> ● If 1 LHSI train and depressurization (PSVs or PDSs) are both available, the sequences are sent to the Limited CD tree. ● Otherwise the sequences are sent to CET LO PRESSURE CET LO PRESSURE (similar to case LL).
SL	<p>Core damage from small LOCA sequences with:</p> <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. ● Fast cooldown has not been attempted. 	<p>CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE</p>	<p>CET1 HI PRESSURE (similar to case TR)</p>
SL1	<p>Core damage from small LOCA sequences with:</p> <ul style="list-style-type: none"> ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). ● Fast cooldown has not been attempted. <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	<p>CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE</p>	<p>CDES-SL1 (Similar to case TR1)</p>

Table 19.1-16—Core Damage End States and their Treatment in the CETs
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Bin	Description of Sequences in Bin	CET	Treatment in CET
SLD	Core damage from small LOCA sequences with: <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. ● Fast cooldown has been attempted. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE (similar to case TR)
SL1D	Core damage from small LOCA sequences with: <ul style="list-style-type: none"> ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). ● Fast cooldown has not been attempted. Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CDES-SL1D (similar to case TR1D)
PL	Core damage from any initiator leading to a Pressurizer LOCA: <ul style="list-style-type: none"> ● ATWS sequences with Pressurizer valves failure to reclose. Note: PL could represent sequences with successful bleed and failed feed or failed long term cooling. However, as stated in Section 1.2, it is assumed that the operator will not proceed with bleed if feed or long term cooling is not available. This conservative modeling choice leads to high pressure core damage.	CET LIMITED CD CET1 LO PRESSURE	CDES-PL (Similar to case LL1)

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 7 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
SS	Core damage from transient with RCP seal LOCA and: <ul style="list-style-type: none"> ● Fast cooldown not attempted. ● Offsite power available. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE CET ISL	CDES-SS evaluates the sequences to determine: <ul style="list-style-type: none"> ● If the sequence is from initiator FLD-SIS (SIS Flood) it is sent to consequence IS. ● Then the CDES-IS will send the sequence to CET ISL. ● A scrubbing factor is applied to sequences from initiator FLD-SIS. ● If the sequence is from a different initiator it will be sent to CET1 HI PRESSURE. CET1 HI PRESSURE evaluates the sequence to determine: <ul style="list-style-type: none"> ● The sequence will be depressurized by operator action or hot leg rupture. ● If the sequence results in SGTR, it is sent to the SGTR tree. ● If the sequence is depressurized, it is sent to the CET LO PRESSURE tree. ● Otherwise it is sent to the CET2 HI PRESSURE tree.
SS1	Core damage from transient with RCP seal LOCA and: <ul style="list-style-type: none"> ● Fast cooldown not attempted. ● Offsite power available. ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CDES-SS1 (Similar to case TR1)

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 8 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
SSD	Core damage from transient with RCP seal LOCA and: <ul style="list-style-type: none"> ● Fast cooldown successful. ● Offsite power available. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE CET ISL	CDES-SSD evaluates the sequences to determine: <ul style="list-style-type: none"> ● If the sequence is from initiator FLD-SIS (SIS Flood) it is sent to consequence IS. ● Then the #CDES-IS will send the sequence to CET ISL. ● A scrubbing factor is applied to sequences from initiator FLD-SIS. If the sequence is from a different initiator it will be sent to CET1 HI PRESSURE.
SS1D	Core damage from transient with RCP seal LOCA and: <ul style="list-style-type: none"> ● Fast cooldown successful. ● Offsite power available. ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.	CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CDES-SS1D evaluates the sequences to determine: <ul style="list-style-type: none"> ● If the sequence is from initiator FLD-SIS (SIS Flood) it is sent to consequence IS. ● Then the CDES-IS will send the sequence to CET ISL. ● A scrubbing factor is applied to sequences from initiator FLD-SIS. If the sequence is from a different initiator it will be evaluated to determine: <ul style="list-style-type: none"> ● If 1 LHSI train and depressurization (PSVs or PDSs) are both available, the sequences are sent to the Limited CD tree. ● Otherwise the sequences are sent to CET1 HI PRESSURE.
SP	Core damage from loss of offsite power with RCP seal LOCA and: <ul style="list-style-type: none"> ● Fast cooldown not attempted. ● Offsite power unavailable. 	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE (similar to case TR)

**Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 9 of 11**

Bin	Description of Sequences in Bin	CET	Treatment in CET
SP1	<p>Core damage from loss of offsite power with RCP seal LOCA and:</p> <ul style="list-style-type: none"> ● Fast cooldown not attempted. ● Offsite power unavailable. ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	<p>CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE</p>	<p>CDES-SP1 (Similar to case TR1)</p>
SPD	<p>Core damage from transient with RCP seal LOCA and:</p> <ul style="list-style-type: none"> ● Fast cooldown successful. ● Offsite power unavailable. 	<p>CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE</p>	<p>CET1 HI PRESSURE (similar to case TRD)</p>
SP1D	<p>Core damage from transient with RCP seal LOCA and:</p> <ul style="list-style-type: none"> ● Fast cooldown successful. ● Offsite power unavailable. ● Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	<p>CET LIMITED CD CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE</p>	<p>CDES-SP1D (similar to case TR1D)</p>

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 10 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
RV	Core damage from reactor vessel rupture following failure to control pressure during ATWS.	CET1 LO PRESSURE	CET1 LO PRESSURE (similar to case LL)
AT	Core damage from Anticipated Transient Without Scram (ATWS) sequences with: <ul style="list-style-type: none"> ● Failed Extra Borating System (both high and low pressure sequences) and: ● Core damage from MSSV sequences with failed Extra Borating System, or ● Core damage from SLBO sequences with failed Extra Borating System. Note: SLBI sequences with failed EBS are assigned CDES ATI and evaluated for immediate containment failure.	CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	CET1 HI PRESSURE (similar to case TR)
ATI	Core damage from Steam Line Break Inside Containment (SLBI) sequences with: <ul style="list-style-type: none"> ● Failure of LHSI or operator initiation of F&B or long term cooling. Note: There is no return to power following SBLI and failure to isolate the SG.	CET CF CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	Link tree CDES-ATI evaluates the availability of SAHRS sprays and the manual operator action to start them for pressure control of the containment. Failure of the sprays or the operator actions to start them are led to containment failure CET CF. Sequences with successful start of the sprays are assigned CDES TRD.

Table 19.1-16—Core Damage End States and their Treatment in the CETs
Sheet 11 of 11

Bin	Description of Sequences in Bin	CET	Treatment in CET
ATI1	<p>Core damage from Steam Line Break Inside Containment (SLBI) sequences with:</p> <ul style="list-style-type: none"> • Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET CF CET1 HI PRESSURE CET SGTR CET LO PRESSURE CET2 HI PRESSURE	Similar to link tree CDES-ATI except for sequences with successful start of the sprays. These are assigned CDES TR1D.
IS	<p>Core Damage from Interfacing System LOCA sequences.</p>	CET ISL	CET ISL determines whether or not there is water available to cover break outside containment and scrub the fission products released from the leak.
SG	<p>Steam Generator Tube Rupture sequences with:</p> <ul style="list-style-type: none"> • Failure of LHSI or operator initiation of F&B or long term cooling. 	CET-SGTR	CET-SGTR treats the sequence as an unscrubbed release.
SG1	<p>Steam Generator Tube Rupture sequences with:</p> <ul style="list-style-type: none"> • Feed and bleed not successful (for a different reason than LHSI or operator initiation of F&B or long term cooling failure). <p>Note: These sequences are evaluated for the Level 2 Success criteria for Feed and Bleed. Note: The Level 2 success criterion relies on the same operator action as the Level 1 F&B.</p>	CET LIMITED CD CET-SGTR	CDES-SG 1 (similar to case TR) CET-SGTR treats the sequence as an unscrubbed release.

Table 19.1-17—Summary of Long Term Challenges Probabilistic Evaluation

Phenomenon	Conditions		Conditional Failure Probability
	CDES	Other Applicable DET Path Outcome DET Header	
No overpressure containment failure due to debris quench peak	TP, TR PL, SL, ML, SS, LL	Passive flooding successful	1E-07 for Rupture
			5E-07 for Leakage
No significant MCCI	All	Passive flooding unsuccessful	1.0
		Passive flooding successful	1 x 10 ⁻³
No overpressure failure	All	Passive flooding unsuccessful	1 x 10 ⁻²
No basemat penetration	All	Flooding not effective AND Significant MCCI	0.99
		Flooding effective AND Significant MCCI AND SAHRS sprays not available AND Active cooling available	
		Flooding effective AND Significant MCCI AND SAHRS available	
Incomplete melt transfer causes overpressurization of containment	All	Flooding effective AND SAHRS Active cooling available and actuated AND No hot leg rupture	1 x 10 ⁻²
	TR, TP, SS, SL	Flooding effective AND SAHRS Active cooling available and actuated AND Hot leg rupture	0.5
Late melt relocation leads to containment failure due to overpressure failure of the core spreading area	All	Flooding effective AND Late melt relocation	0.5

**Table 19.1-18—Description of Level 2 Containment Event Trees
Sheet 1 of 2**

CET ID	Description CET	Figures and Tables presenting further details
CET CF	This CET is used for core damage sequences assigned the ATI and ATI1CDES. Entry is via the link trees for the ATI and ATI1CDES. Sequences assigned to these CDES are steam line breaks inside containment. The core damage sequence arising is considered to be an accident at full reactor power with blowdown of the secondary side directly into containment. It is assumed that the steam generation and pressurization of containment in such a scenario would overpressure the containment causing its failure if steam pressurization control via the SAHRS sprays is not accomplished in a timely manner. Control of steam pressurization is evaluated in the link tree and all failure paths are transferred to this CET. Thus the sequences in this CET are assigned directly to an early containment failure release category.	Table 19C-1 Figure 19C-1
CET ISL	This CET is used for core damage sequences assigned the IS CDES (IS LOCA and SIS flood initiator). A header is included to assess whether or not the break location is scrubbed due to an overlying water pool. Note that (see appendix F) an assessment performed concluded that a conditional probability of 1.0 of no overlying water pool for scrubbing had to be used for IS LOCA sequences for the US EPR. However, in case of SIS flood initiator the IRWST is drained in the safeguard building leading to a higher quantity of water present in the building and covering at least 50% of the SIS piping. Therefore a split fraction of 0.5 is used.	Table 19C-2 Figure 19C-2
CET LIMITED CD	This CET is used for sequences which are identified as being limited core damage cases in the CDES link trees. In these cases as in-vessel arrest of the core damage process and in-vessel retention are assured, the only relevant question is whether or not the containment is isolated. The justification for the success criteria used in the CDES link trees for distinguishing limited core damage states is provided in appendix A.	Table 19C-3 Figure 19C-3
CET LO PRESSURE	Entry to this CET is via transfers from CET1 HI PRESSURE or directly for low pressure CDES. This CET models the remaining applicable phenomena for low pressure sequences (these being those that are low at core damage or become low in the CET1 HI PRESSURE following induced hot leg rupture or operator depressurization).	Table 19C-4 Figure 19C-4

Table 19.1-18—Description of Level 2 Containment Event Trees
Sheet 2 of 2

CET ID	Description CET	Figures and Tables presenting further details
CET SGTR	This CET simply passes the incoming sequences through to RC702 (unscrubbed SGTR). A labeling top event is used to mark the sequences with a flag.	Table 19C-5 Figure 19C-5
CET SGTR FW	This CET simply passes the incoming sequences through to RC701 (scrubbed SGTR). A labeling top event is used to mark the sequences with a flag.	Table 19C-6 Figure 19C-6
CET1 HI PRESSURE	This CET is the initial entry point to the CET model for CDES which are initially at high pressure. This CET asks questions corresponding to phenomena occurring during the initial in-vessel phase (timeframe 1, excluding containment isolation, which is addressed in CET2 HI PRESSURE or CET LO PRESSURE) of the severe accident. Depressurization performed by the operators, emergency feedwater for non-LOCA sequences and natural depressurization due to an induced hot leg rupture and induced steam generator tube rupture are assessed. The outcomes of this initial tree are either release category RC702 (unscrubbed SGTR) or a transfer to the low pressure CET (for sequences depressurized by a hot leg rupture or operator depressurization) or a transfer to the second stage high pressure CET (sequences without depressurization or induced SGTR).	Table 19C-7 Figure 19C-7
CET2 HI PRESSURE	Entry to this CET is via transfers from CET1 HI PRESSURE. This CET models the remaining applicable phenomena for high pressure sequences (which have not depressurized due to the phenomena addressed in CET1 HI PRESSURE).	Table 19C-8 Figure 19C-8

Table 19.1-19—Release Category Definitions
Sheet 1 of 2

Release Category	Description
RC101	No containment failure
RC201	Containment fails before vessel breach due to isolation failure, melt retained in vessel
RC202	Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex-vessel, with containment sprays
RC203	Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex-vessel, without containment sprays
RC204	Containment fails before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex-vessel with containment sprays
RC205	Containment failures before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex-vessel without containment sprays
RC206	Small containment failure due to failure to isolate 2" or smaller lines
RC301	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex-vessel, with containment sprays
RC302	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex-vessel, without containment sprays
RC303	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex-vessel, with containment sprays
RC304	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex-vessel, without containment sprays
RC401	Containment failures after breach and up to melt transfer to the spreading area, with MCCI, without debris flooding, with containment spray
RC402	Containment failures after breach and up to melt transfer to the spreading area, with MCCI, without debris flooding, without containment spray
RC403	Containment failures after breach and up to melt transfer to the spreading area, without MCCI, with debris flooding, with containment spray
RC404	Containment failures after breach and up to melt transfer to the spreading area, without MCCI, with debris flooding, without containment spray
RC501	Long term containment failure during and after debris quench, due to rupture, with MCCI, without debris flooding, with containment sprays
RC502	Long term containment failure during and after debris quench, due to rupture, with MCCI, without debris flooding, without containment sprays
RC503	Long term containment failure during and after debris quench, due to rupture, without MCCI, with debris flooding, with containment sprays
RC504	Long term containment failure during and after debris quench, due to rupture, without MCCI, with debris flooding, without containment sprays

Table 19.1-19—Release Category Definitions
Sheet 2 of 2

Release Category	Description
RC601	Long term containment failure due to basemat failure, without debris flooding, with containment sprays
RC602	Long term containment failure due to basemat failure, without debris flooding, without containment sprays
RC701	SGTR with fission product scrubbing
RC702	SGTR without fission product scrubbing
RC801	ISLOCA with fission product scrubbing
RC802	ISLOCA without fission product scrubbing

Table 19.1-20—Source Terms for Each Release Category
Sheet 1 of 2

Release Category	Fraction of Initial Core Inventory Released as a Total for Each Fission Product Group								
	XE/KR	I	Cs	Te	Sr	Ru	La	Ce	Ba
RC101	1.9E-03	4.9E-05	4.3E-05	7.2E-05	8.3E-06	5.4E-05	2.1E-07	1.4E-06	2.1E-05
RC201	3.3E-01	5.9E-02	4.2E-02	3.5E-02	2.5E-04	9.8E-03	2.7E-06	9.5E-06	1.9E-03
RC202	7.8E-01	1.1E-02	7.5E-03	6.9E-02	3.7E-02	1.5E-02	3.7E-02	3.7E-02	3.1E-02
RC203	8.0E-01	1.4E-02	1.1E-02	7.9E-02	4.0E-02	1.7E-02	4.0E-02	4.0E-02	3.4E-02
RC204	9.9E-01	1.7E-02	1.4E-02	1.1E-01	5.9E-03	5.9E-03	5.2E-03	5.3E-03	6.4E-03
RC205	1.0E+00	5.6E-02	3.1E-02	1.6E-01	7.3E-03	7.0E-03	5.8E-03	5.9E-03	8.1E-03
RC206	5.8E-01	6.8E-03	6.1E-03	9.6E-03	9.7E-04	7.0E-03	2.3E-05	9.4E-05	2.6E-03
RC301	9.9E-01	1.7E-02	1.9E-02	1.4E-01	3.7E-03	4.2E-03	3.0E-03	3.0E-03	5.1E-03
RC302	9.8E-01	5.3E-02	4.3E-02	2.8E-01	4.7E-03	5.1E-03	3.4E-03	3.4E-03	7.0E-03
RC303	9.9E-01	1.8E-02	1.5E-02	1.0E-01	4.2E-02	1.2E-02	4.1E-02	4.1E-02	3.2E-02
RC304	1.0E+00	5.7E-02	3.6E-02	1.6E-01	4.6E-02	1.3E-02	4.5E-02	4.5E-02	3.5E-02
RC401	9.9E-01	8.9E-03	1.8E-02	1.5E-02	4.4E-03	6.6E-03	7.9E-05	4.5E-04	7.2E-03
RC402	9.8E-01	1.9E-02	4.4E-02	3.4E-02	5.9E-03	9.2E-03	1.1E-04	6.5E-04	1.0E-02
RC403	9.9E-01	8.8E-03	2.2E-02	1.4E-02	4.3E-03	6.6E-03	7.9E-05	4.5E-04	7.2E-03
RC404	1.0E+00	2.2E-02	5.9E-02	3.5E-02	5.9E-03	9.3E-03	1.1E-04	6.4E-04	1.0E-02
RC501	1.0E+00	7.6E-05	8.4E-05	1.5E-03	8.4E-06	5.5E-05	2.1E-07	1.5E-06	2.2E-05
RC502	1.0E+00	6.5E-04	1.4E-03	1.7E-02	8.5E-06	5.5E-05	2.1E-07	1.5E-06	3.5E-05
RC503	1.0E+00	7.1E-05	5.8E-05	9.1E-05	8.3E-06	5.4E-05	2.1E-07	1.4E-06	2.1E-05
RC504	1.0E+00	4.0E-04	7.3E-04	6.2E-02	8.3E-06	5.4E-05	2.1E-07	1.4E-06	2.1E-05
RC602	1.0E+00	6.5E-04	1.4E-03	1.7E-02	8.5E-06	5.5E-05	2.1E-07	1.5E-06	3.5E-05
RC702 (20-tube, creep induced)	9.6E-01	9.3E-01	9.2E-01	9.5E-01	8.6E-02	3.3E-01	3.4E-03	2.7E-02	2.1E-01

Table 19.1-20—Source Terms for Each Release Category
Sheet 2 of 2

Release Category	Fraction of Initial Core Inventory Released as a Total for Each Fission Product Group								
	XE/KR	I	Cs	Te	Sr	Ru	La	Ce	Ba
RC701 (1-tube, initiating event)	6.8E-01	1.1E-02	2.3E-03	1.4E-02	6.7E-05	1.7E-03	6.5E-06	4.6E-05	1.1E-03
RC702 (1-tube, initiating event)	6.8E-01	5.0E-01	1.0E-01	6.5E-01	3.0E-03	7.5E-02	2.9E-04	2.1E-03	4.7E-02
RC701 (1-tube, pressure induced)	9.3E-01	1.3E-02	4.8E-03	1.5E-02	8.7E-05	2.6E-03	6.0E-06	3.5E-05	1.1E-03
RC702 (1-tube, pressure induced)	9.3E-01	6.1E-01	2.1E-01	6.8E-01	3.9E-03	1.1E-01	2.7E-04	1.6E-03	5.1E-02
RC701 (2-tube, pressure induced)	9.9E-01	1.5E-02	7.7E-03	1.3E-02	3.5E-04	4.3E-03	2.0E-05	5.8E-05	2.0E-03
RC702 (2-tube, pressure induced)	9.9E-01	6.7E-01	3.5E-01	5.6E-01	1.6E-02	1.9E-01	9.0E-04	2.6E-03	9.1E-02
RC701 (5-tube, pressure induced)	9.9E-01	1.9E-02	1.7E-02	1.7E-02	1.5E-03	8.5E-03	8.2E-05	2.4E-04	5.8E-03
RC702 (5-tube, pressure induced)	9.9E-01	8.4E-01	7.7E-01	7.8E-01	6.7E-02	3.8E-01	3.7E-03	1.1E-02	2.6E-01
RC701 (10-tube, pressure induced)	1.0E+00	2.0E-02	2.0E-02	2.0E-02	1.9E-03	1.2E-02	7.4E-05	2.8E-04	7.2E-03
RC702 (10-tube, pressure induced)	1.0E+00	9.2E-01	9.1E-01	9.0E-01	8.3E-02	5.5E-01	3.3E-03	1.3E-02	3.2E-01
RC801	8.4E-01	1.7E-02	1.7E-02	1.7E-02	1.1E-03	7.2E-03	3.5E-05	2.5E-04	3.6E-03
RC802	8.4E-01	7.7E-01	7.7E-01	7.6E-01	4.9E-02	3.2E-01	1.6E-03	1.1E-02	1.6E-01

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