Table 19.1-61—U.S. EPR Risk-Significant I&C Events based on RAW Importance - Level 2 Internal Flooding

ID	Description	Nominal Value	RAW
CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	1.0E-07	874.0
CL-PS-B-SWCCF	SW CCF of Protection System diversity group B	5.0E-06	331.0
CL-PS-A-SWCCF	SW CCF of Protection System diversity group A	5.0E-06	272.0
APU2 CCF NS-ALL	CCF of APU-2 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	243.0
ALU-A CCF NS-ALL	CCF of ALU-A Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	243.0
PAS	Process Automation System (PAS) Fails (Estimate)	1.0E-03	212.0
PZR PRES CCF-ALL	CCF of pressurizer (RCS) pressure sensors	8.4E-07	207.0

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
Sheet 1 of 4

Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
ESW Cooling Tower Structure, Division 1	N/A	FA-1URB-01	ESW Pump and UHS Fan Room, Division 1	PFA-ESW1	ESW cooling tower structure, Division 1
ESW Cooling Tower Structure, Division 2	N/A	FA-2URB-01	ESW Pump and UHS Fan Room, Division 2	PFA-ESW2	ESW cooling tower structure, Division 2
ESW Cooling Tower Structure, Division 3	N/A	FA-3URB-01	ESW Pump and UHS Fan Room, Division 3	PFA-ESW3	ESW cooling tower structure, Division 3
ESW Cooling Tower Structure, Division 4	N/A	FA-4URB-01	ESW Pump and UHS Fan Rooms, Division 4 and Dedicated Cooling Train	PFA-ESW4	ESW cooling tower structure, Division 4
Fuel Building		FA-UFA-05	Pump and Valve Rooms, Division 1	PFA-FB	Fuel Building
		FA-UFA-06	Cable Shaft, Division 1		
		FA-UFA-07	Pump and Valve Rooms, Division 4		
		FA-UFA-09	Cable Shaft, Division 4		
Reactor Building		FA-UJA-01	Reactor Building	PFA-CNTMT	Reactor Building

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
Sheet 2 of 4

Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
Safeguard Building 1		FA-1UJH-03	Pump Room, Division 1	PFA-SB 1-MECH	Pump room of Safeguard Building 1
		FA-1UJH-04 (cable floor sub area)	Cable Shaft and Cable Floor, Division 1	PFA-SB 1-AC	AC switchgear room, Division 1
		FA-1UJH-06	Switchgear Room, Division 1		
		FA-1UJH-04	DC Equipment Room, I&C Cabinets Room, Division 1	PFA-SB 1-DC	DC and I&C rooms, Division 1
		FA-1UJH-05	Battery Room, Division 1	PFA-BATT1	Battery room, Division 1
Safeguard Building 1 (Valve room)		FA-1UJH-03 (valve room sub area)	MFW/MS Valve Room, Division 1	PFA-VLVR1	MFW/MS valve room, Divisions 1 and 2
		FA-2UJH-10	MFW/MS Valve Room, Division 2		

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
Sheet 3 of 4

Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
Safeguard Building 2		FA-2UJH-03	Pump Room, Division 2	PFA-SB2-MECH	Pump room of Safeguard Building 2
		FA-2UJH-04 (cable floor sub area)	Cable Shaft and Cable Floor, Division 2	PFA-SB2-AC	AC switchgear room, Division 2
		FA-2UJH-05	Switchgear Room, Division 2		
		FA-2UJH-04	DC Equipment Room, I&C Cabinets Room, Division 2	PFA-SB2-DC	DC and I&C rooms, Division 2
		FA-2UJH-06	Battery Room, Division 2	PFA-BATT2	Battery room, Division 2
		FA-2UJH-04 (cable floor sub area)	Cable Floor for MCR	PFA-CSR	Cable Spreading Room
		FA-2UJH-07	Main Control Room	PFA-MCR	Main Control Room
Safeguard Building 3		FA-3UJH-03	Pump Room, Division 3	PFA-SB 3-MECH	Pump room of Safeguard Building 3
		FA-3UJH-04 (cable floor sub area)	Cable Shaft and Cable Floor, Division 3	PFA-SB 3-AC	AC switchgear room, Division 3
		FA-3UJH-05	Switchgear Room, Division 3		
		FA-3UJH-04	DC Equipment Room, I&C Cabinets Room, Division 3	PFA-SB 3-DC	DC and I&C rooms, Division 3
		FA-3UJH-06	Battery Room, Division 3	PFA-BATT3	Battery room, Division 3

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
Sheet 4 of 4

Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
Safeguard Building 4		FA-4UJH-03	Pump Room, Division 4	PFA-SB 4-MECH	Pump room of Safeguard Building 4
		FA-4UJH-04	Cable Shaft and Cable Floor, Division 4	PFA-SB 4-AC	AC switchgear room, Division 4
		FA-4UJH-06	Switchgear Room, Division 4		
		FA-4UJH-04	DC Equipment Room, I&C Cabinets Room	PFA-SB 4-DC	DC and I&C rooms, Division 4
		FA-4UJH-05	Battery Room, Division 4	PFA-BATT4	Battery room, Division 4
Safeguard Building 4 (Valve Room)		FA-4UJH-03 (valve room sub area)	MFW/MS Valve Room, Division 4	PFA-VLVR4	MFW/MS valve room, Divisions 3 and 4
		FA-3UJH-10	MFW/MS Valve Room, Division 3		
Switchgear Building	-13’	FA-UBA-01	SBO DG Cable Floors and Diesel Tank Rooms	PFA-SWGR	Switchgear Building
	0’	FA-UBA-02	Engine and SBO Control Rooms, Switchgear Room		
	13’	FA-UBA-03	Switchgear and Cable Rooms		
	24’	FA-UBA-04	Battery Room		
Transformer Yard	N/A	FA-UBE-01	Transformer 30BDT01	PFA-xF YARD	Transformer yard
	N/A	FA-UBE-05	Transformer 30BDT02		
Turbine Building	-23’ to 65’	FA-UMA-01	Turbine Building	PFA-TB	Turbine Building

Table 19.1-63—Basis for PFA Fire Frequencies
Sheet 1 of 2

PRA Fire Area (PFA)	PFA Description	The Basis for Fire Frequency Estimates Generic Location from RES/OERAB/S02-01 Component Frequencies from NUREG/CR-6850	Applied Correction Factor (CF)	PFA Fire Frequency (1/yr)
PFA-SB4-MECH	Pump Room of Safeguard Building 4	Aux. Building	CF to account for a larger number of pumps in the U.S. EPR	5.0E-03
PFA-SB4-AC	AC Switchgear Room of Safeguard Building 4	Switchgear Room	CF to account for an AC/ DC buses ratio and a larger number of buses in the U.S. EPR	1.0E-03
PFA-SB4-DC	DC Switchgear Room of Safeguard Building 4	Switchgear Room	CF to account for an AC/ DC buses ratio and a larger number of buses in the U.S. EPR	2.6E-04
PFA-SB2-AC	AC Switchgear Room of Safeguard Building 2	Switchgear Room	CF to account for an AC/ DC buses ratio and a larger number of buses in the U.S. EPR	1.0E-03
PFA-SB2-DC	DC Switchgear Room of Safeguard Building 2	Switchgear Room	CF to account for an AC/ DC buses ratio and a larger number of buses in the U.S. EPR	2.6E-04
PFA-FB	Fuel Building	Aux. Building	CF to account for a larger number of pumps in the U.S. EPR	5.0E-03
PFA-CSR	Cable Floor [Cable Spreading Room]	Cable Spreading Room	CF to account for an estimated percentage of fiber optic cables	4.2E-04
PFA-MCR	Main Control Room	Control Room	None	3.6E-03
PFA-ESW4	ESW Cooling Tower Structure, Division 4	SWS Pumphouse	CF to account for a larger number of ESW trains in the U.S. EPR	3.6E-03
PFA-BATT4	Safety Battery Room	Battery Room	CF to account for a larger number of batteries in the U.S. EPR	2.8E-04

Table 19.1-63—Basis for PFA Fire Frequencies
Sheet 2 of 2

PRA Fire Area (PFA)	PFA Description	The Basis for Fire Frequency Estimates Generic Location from RES/OERAB/S02-01 Component Frequencies from NUREG/CR-6850	Applied Correction Factor (CF)	PFA Fire Frequency (1/yr)
PFA-SWGR	Switchgear Building	Switchgear Room Battery Room	CF to account for a larger number of buses in the U.S. EPR	2.5E-03 + 5.6E-04 =3.1E-03
PFA-TB	Turbine Building	Turbine Building	None	4.1E-02
PFA-xF YARD	Transformer Yard	Transformer	Percentage of components in the PFA	7.2E-03
PFA-VLVR4	MFW/MS Valve Room, Train 4	Electric Motors, Pumps, Fans	Percentage of components in the PFA CF to account for a larger number of pumps in the U.S. EPR	2.6E-05
PFA-CNTMT	Containment, pressurizer area	Electric Motors	Percentage of components in the PFA	1.9E-05

Table 19.1-64—Fire Scenarios Description and Frequency Calculation
Sheet 1 of 3

Fire Scenario	Description	Effects on Mitigating Systems	Suppression Credited	Frequency (1/yr)	Distribution Type (parameter)	Basis for Frequency
Fire-SAB 14-AC	Fire in Switchgear Room of SB 4 (or 1)	All class 1E and non class 1E AC Buses in SB 4 unavailable.	No	2.0E-03	Beta (0.5, 250)	PRA FA frequency (2 buildings)
Fire-SAB 23-AC	Fire in Switchgear Room of SB2 (or 3)	All class 1E and non class 1E AC Buses in SB2 unavailable.	No	2.0E-03	Beta (0.5, 250)	PRA FA frequency (2 buildings)
Fire-SAB 14-DC	Fire in the DC Cabinets Room of SB 4 (or 1) - I&C rooms included	All class 1E and non class 1E DC and I&C Buses in SB 4 unavailable.	No	5.1E-04	Beta (0.5, 980)	PRA FA frequency (2 buildings)
Fire-SAB 23-DC	Fire in the DC Cabinets Room of SB2 (or 3) - I&C rooms included	All class 1E and non class 1E DC and I&C Buses in SB2 unavailable.	No	5.1E-04	Beta (0.5, 980)	PRA FA frequency (2 buildings)
Fire-SAB-MECH	Fire in the Pump Room of Any SB	EFWS4, CCWS4, CCW CH2, LHSI4, SAHR unavailable	No	2.0E-02	Beta (0.5, 25)	PRA FA frequency (4 buildings)
Fire-MS-VR	Fire on the top of SB 4 (or 1), in the MFW/MS valve room	Spurious opening of MSRT on SG4, increase in probability of MS isolation failure on SG3 (set to 0.1) & SG4 (set to 0.5)	No	5.2E-04	Beta (0.5, 960)	PRA FA frequency (2 buildings) * spurious actuation probability

Table 19.1-64—Fire Scenarios Description and Frequency Calculation
Sheet 2 of 3

Fire Scenario	Description	Effects on Mitigating Systems	Suppression Credited	Frequency (1/yr)	Distribution Type (parameter)	Basis for Frequency
Fire-FB	Fire in the FB	CVCS trains 1 and 2 and EBS trains 1 and 2 unavailable	No	5.0E-03	Beta (0.5, 100)	PRA FA frequency
Fire-TB	Fire in the TB	MFW and SSS unavailable	Automatic	4.1E-03	Beta (0.5, 120)	PRA FA frequency * Suppression
Fire-SWGR	Fire in the Switchgear Building	SBOs,12 hr battery and non-class 1E 2 hr battery, and all non class 1E buses unavailable.	No	3.1E-03	Beta (0.5, 160)	PRA FA frequency
Fire-BATT	Fire in one of the 4 Battery Rooms	Div 4 2-hr Battery unavailable	No	1.1E-03	Beta (0.5, 450)	PRA FA frequency
Fire-ESW	Fire in the ESW Building	UHS4 unavailable.	No	1.4E-02	Beta (0.5, 35)	PRA FA frequency (4 buildings)
Fire-xFYard	Fire in the Transformer Yard	Loss of 1 class 1E transformer.	No	7.2E-03	Beta (10.5, 70)	PRA FA frequency
Fire-CSR	Fire in the Cable Floor (Room under the MCR)	All Div 4 AC and DC Buses unavailable:	No	4.2E-04	Beta (10.5, 1200)	PRA FA frequency
Fire-MCR	Fire in the MCR	OP action transfer to RSS: failure results in CD; success transfers to LBOP with all HEPs doubled	Manual	3.6E-04	Beta (0.5, 1400)	PRA FA frequency * Suppression

Table 19.1-64—Fire Scenarios Description and Frequency Calculation
Sheet 3 of 3

Fire Scenario	Description	Effects on Mitigating Systems	Suppression Credited	Frequency (1/yr)	Distribution Type (parameter)	Basis for Frequency
Fire-PZR	Fire in the Pressurizer area	Primary Bleed unavailable	No	1.9E-05	Beta (0.5, 26000)	PRA FA frequency* spurious actuation probability

Table 19.1-65—U.S. EPR Initiating Event Contributions - Level 1 Internal Fires

FIRE IE	Description	Frequency (1/yr)	CDF (1/yr)	CDF (%)
IE Fire-SAB14-AC	Fire in Switchgear Room of Safeguard Building 4 (or 1)	2.0E-03	7.9E-08	43.6%
IE Fire-SAB23-AC	Fire in Switchgear Room of Safeguard Building 2 (or 3)	2.0E-03	5.1E-10	0.3%
IE Fire-SAB14-DC	Fire in the DC Cabinets Room of Safeguard Building 4 (or 1) - I&C rooms included	5.1E-04	1.8E-10	0.1%
IE Fire-SAB23-DC	Fire in the DC Cabinets Room of Safeguard Building 2 (or 3) - I&C rooms included	5.1E-04	2.2E-11	0.0%
IE Fire-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	2.0E-02	1.6E-08	8.9%
IE Fire-MS-VR	Fire in one of the 2 MF/MS valve rooms w/ spurious opening of 1 MSRIV	5.2E-04	3.4E-08	18.9%
IE Fire-FB	Fire in the Fuel Building	5.0E-03	4.2E-11	0.0%
IE Fire-TB	Fire in the Turbine Building	4.1E-03	5.0E-10	0.3%
IE Fire-SWGR	Fire in the Switchgear Building	3.1E-03	2.2E-08	11.9%
IE Fire-BATT	Fire in One of the 4 Battery Rooms	1.1E-03	3.8E-10	0.2%
IE Fire-ESW	Fire in the Essential Service Water Building	1.4E-02	9.5E-10	0.5%
IE Fire-xFYard	Fire in the transformer yard	7.2E-03	6.1E-11	0.0%
IE Fire-CSR	Fire in the CSR (Room under MCR)	4.2E-04	6.5E-10	0.4%
IE Fire-MCR	Fire in the Main Control Room	3.6E-04	2.5E-08	14.0%
IE Fire-PZR	Fire in the pressurizer compartment w/ spurious opening of 1 PSRV	1.9E-05	1.7E-09	0.9%
		Total:	1.8E-07	100.0%

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 1 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
1	1, 38, 41, 84-89	2.9E-08	16.5	16.5	**Sequence MSSV-16 /MSS-24: Fire MS-VR, MSIV ISO(3), OP RHR / RHR**		
					IE FIRE-MS-VR	Fire in One of Two MFW/MS Valve Rooms With Spurious Opening of 1 MSRIV	A fire in the MFW/MS valve room causes spurious opening of an MSRIV. MSIV 3 and 4 fail open due to the fire, leading to two steam generators blowing down simultaneously. Then failure to align RHR leads to core damage. A variant of this cutset has RHR (or its support systems) failing randomly.
					MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MFW/ MS Valve Room	
					MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MFW/ MS Valve Room	
					OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours.	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 2 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
2	2	2.5E-08	14.3	30.8	**Sequence FIRE-MCR-2: FIRE-MCR, OP RSS**		
					IE FIRE-MCR	Fire in the Main Control Room	A fire occurs in the MCR and the operators fail to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
					OPE-MCR-RSS-90M	Operators fail to transfer to the RSS in 90 min given a MCR fire	
3	3, 8, 63, 78	1.14E-08	6.5	37.3	**Sequence 31BDA-15: FIRE-SAB-MECH, MFW, SSS, EFW, PBL**		
					IE FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	As explained in Section 19.1.5.3.2.3, a fire 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 as explained in Section 19.1.5.3.2.3. PAS fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. PBL fails because of the 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	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 3 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
4	4-7, 9, 11-18, 20-22, 36,37, 42,77, 80-82, 90-97	3.9E-08	21.9	59.2	**Sequence 31BDA-32: FIRE-SAB14-AC, RCP LOCA, SSS, EFW, PBL**		
					IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. A loss of control power in Division 1 disables the PCD function. PBL fails because of the loss of Division 4. In variations of this cutset, failure of Electrical Division 1(or 2) comes from a consequential LOOP with Division 1 (or 2) EDG in preventive maintenance or randomly failing.
					CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
					PROB SEAL LOCA	Probability of seal LOCA Occurring Given a Loss of Seal Cooling	
					31BRA___RFR	ELEC, 480V to 24V DC Rectifier for 31BRA Control Power, Fails to Run	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 4 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
5	10, 33,40	2.7E-09	1.5	60.7	**Sequence 31BDA-32: FIRE-SAB14-AC, RCP LOCA, SSS, EFW, PBL**		
					IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. PCD fails because of a mechanical failure of the MSRIVs. PBL fails because of the loss of Division 4.
					CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
					PROB SEAL LOCA	Probability of seal LOCA Occurring Given a Loss of Seal Cooling	
					LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 5 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
6	23,25-30, 64-75, 98-103	1.3E-08	7.2	67.9	**Sequence LBOP-13: FIRE-SWGR, EFW, PBL**		
					IE FIRE-SWGR	Fire in the Switchgear Building	A fire in the switchgear building fails all non-safety power, disabling MFW, SSS and the HVAC maintenance train. Safety chillers failure in Division 1 and 4, and operator failure to recover leads to the loss of all ventilation. All EFW trains are lost and PBL also fails because of the loss of Division 1.
					QKA10GH001_FR_B-ALL	CCF of the Air-Cooled SCWS Chillers to Run	
					OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 6 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
7	24, 31,43,62, 79	2.9E-09	1.7	69.6	**Sequence 31BDA-19: FIRE-SAB14-AC, RCP LOCA, LHSI, SAHR**		
					IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. PCD and injection with MHSI are successful, but long term cooling of IRWST fails due to CCF of CCW MOVs to LHSI heat exchanger. The SAHRS is also unavailable for long term cooling because it is supplied from Division 4.
					CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
					PROB SEAL LOCA	Probability of seal LOCA Occurring Given a Loss of Seal Cooling	
					KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI Heat Exchanger Cooling MOVs.	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
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Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
8	32	7.1E-10	0.4	70.0	**Sequence SLOCA-16: FIRE-PZR, SSS, EFW, PBL**		
					IE FIRE-PZR	Fire in the Pressurizer Compartment with Spurious Opening of 1 PSRV	A fire in the pressurizer compartment induces a small LOCA. PCD fails because of CCF of the MSRIVs. The bleed function is disabled by the fire.
					LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 8 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
9	34, 35	1.3E-09	0.7	70.7	**Sequence MSSV-32: FIRE-MS-VR, MSIV ISO(4), EBS**		
					IE FIRE-MS-VR	Fire in One of Two MFW/MS Valve Rooms With Spurious Opening of 1 MSRIV	A fire in the MFW/MS valve room causes spurious opening of an MSRIV. MSIV 3 and 4 fail open due to the fire, and a third MSIV fails to close. Three steam generators blowing down simultaneously cause an overcooling event, and the operators fail to control reactivity by actuating the EBS.
					MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MFW/ MS Valve Room	
					MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MFW/ MS Valve Room	
					LBA10AA002PFC	MSS, Train 1 Main Steam Isolation Valve LBA10AA 002, Fails to Close on Demand	
					OPF-EBS-30M	Operator Fails to Manually Actuate EBS (SLB& ATWS)	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 9 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
10	39	5.7E-10	0.3	71	**Sequence LBOP-12: FIRE-SWGR, EFW, MHSI 01**		
					IE FIRE-SWGR	Fire in the Switchgear Building	A fire in the switchgear building fails all non-safety power, disabling MFW and SSS, and fails the 2 SBODGs. Consequential LOOP and CCF of all EDGs cause a total loss of AC power. Therefore no EFW is available for heat removal, no MHSI is available for feed and bleed.
					LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
					XKA10___DFR_D-ALL	CCF of EDGs to Run	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 10 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
11	44-61	8.5E-09	4.8	75.8	**Sequence 31BDA-32: FIRE-SAB14-AC, RCP LOCA, SSS, EFW, PBL**		
					IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. The simultaneous failure of two ALUs in Division 1 (or in Division 2), combined with the loss of all power from Division 4 prevents the MSRIVs from opening, therefore failing PCD. PBL fails because of the loss of Division 4.
					CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
					PROB SEAL LOCA	Probability of seal LOCA Occurring Given a Loss of Seal Cooling	
					CLF24EQ001LB03NS	Digital Output Fails (non Self-Monitored)	
					CLF24EQ002LB01NS	Digital Output fails (non self-monitored)	

Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Fire Events
Sheet 11 of 11

Group No	Cutset Numbers	Group Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
12	83	3.0E-10	0.2	76	**Sequence 31BDA-15: FIRE-CSR, MFW, SSS, EFW, PBL**		
					IE FIRE-CSR	Fire in the Cable Spreading Room (Room under Main Control Room)	A fire in the Cable Spreading Room is modeled as disabling Electrical Division 4, failing CH2. With SAC1 in maintenance, LOOP and operator failure to recover room cooling results in the loss of ventilation in Division 1, 2 and 3 as explained in Section 19.1.4.1.1.3. MFW and SSS are disabled by the LOOP, all EFW trains are lost because of the loss of ventilation. PBL fails because of the loss of Division 1.
					LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
					SAC01/QKA10 PM1	Normal SAC01/ QKA10 Train unavailable due to preventive maintenance	
					OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	

Table 19.1-67—U.S. EPR Risk-Significant Equipment based on FV Importance - Level 1 Fire Events

Rank	System	Component ID	Description	FV	RAW
1	ELEC	30XKA10/20/30/40	ELEC, Emergency Diesel Generator Train	0.030	1.6
2	ESWS	30PED10/20/30/ 40AN002	UHS, Cooling Tower Cooling Fan Train	0.030	3.5
3	SCWS	30QKA10/40GH001	SCWS, Chiller Unit Trains 1 and 4	0.026	23.1
4	CCWS	30KAA12/22/32/ 42AA005	CCWS, LHSI HTX CCW Cooling MOV Train	0.022	3.4
5	MSS	30LBA13/23/33/ 43AA001 30LBA10/20/30/AA002	MSS, Main Steam Relief Isolation Valve Train	0.017	1.0
6	EFWS	30LAS11/21/31/ 41AP001	EFWS, Motor Driven Pump Train	0.017	1.5
7	ESWS	30PEB20/30AP001	ESWS, Motor Driven Pump Trains 2 and 3	0.015	3.3
8	SIS/ RHRS	30JNG10/20/30AA006	LHSI, CL1, 2, or 3 Discharge Manual CHECK Valve Train	0.012	2.4
9	HVAC	30SAC31/32/34AN001/ 30SAC01/02/04AN001	SAC, Normal Air Exhaust/Supply Fan Train	0.010	20.9
10	SIS/ RHRS	30JND10AP001	MHSI, Motor Driven Pump	0.009	1.3
11	ESWS	30PEB20AA005	ESWS, Pump Discharge Isolation MOV	0.009	3.3
12	SCWS	30QKA10/40AP107	SCWS, Motor Driven Safety Chiller Pump Trains 1 and 4	0.008	22.5
13	SIS/ RHRS	30JNG13/23/33AA005	LHSI, CL First SIS Isolation Check Valve Train	0.008	2.4
14	ELEC	30XKA50	ELEC, SBO Diesel Generator Train	0.007	1.1
15	ELEC	31BDA/BDB/BDC 32BDB	ELEC, 6.9kV SWGR Train	0.006	261.3
16	SIS/ RHRS	30JND20/30AP001	MHSI, Motor Driven Pump Train	0.006	1.2
17	ELEC	31/32BMB	ELEC, 480V Load Center	0.006	242.3
18	ELEC	30BRW10BUW11/ 30BRW32BUW33	ELEC, 24V DC I&C Power Rack Train	0.006	240.2
19	ELEC	31/32BRA	ELEC, 480V MCC	0.006	233.0

Table 19.1-68—U.S. EPR Risk-Significant Equipment based on RAW Importance - Level 1 Fire Events

Rank	System	Component ID	Description	RAW	FV
1	ELEC	31/32/33/34BDA 31/32/33/34BDB 31/34BDC 31BDD	ELEC, 6.9kV SWGR Train	261.3	0.006
2	ELEC	31/32/33/34BMB 31BMD	ELEC, 480V Load Center	242.6	0.006
3	ELEC	30BRW10BUW11/ 30BRW32BUW33/ 30BRW52BUW53/ 30BRW70BUW71	ELEC, 24V DC I&C Power Rack	240.4	0.006
4	ELEC	31/32BRA	ELEC, 480V MCC	233.0	0.006
5	SCWS	30QKA10/20/30/ 40GH001	SCWS, Chiller Unit Train	23.1	0.026
6	SCWS	30QKA10/20/30/ 40AP107	SCWS, Motor Driven Safety Chiller Pump Train	22.5	0.008
7	HVAC	30SAC31/32/33/ 34AN001/ 30SAC01/02/03/ 04AN001	SAC, Normal Air Exhaust/Supply Fan	20.9	0.010
8	CCWS	30KAB10AA191/ 192/193/196	CCWS, CH Return Safety Valve Train	15.5	0.001

Table 19.1-69—U.S. EPR Risk-Significant Human Actions based on FV Importance - Level 1 Fire Events

Rank	Basic Event	Description	Nominal Value	FV	RAW
1	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.203	16.4
2	OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours	1.0E-03	0.155	154.3
3	OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	7.0E-05	0.143	2,043.0
4	OPF-XTDIV-NSC	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Division 3 During Non-SBO Conditions	5.0E-01	0.074	1.1
5	OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBODGs to Div 1 or 4 During Non-SBO Conditions	1.0E-01	0.017	1.2
6	OPF-EBS-30M	Operator Fails to Manually Actuate EBS (SLB & ATWS)	2.2E-02	0.013	1.6
7	OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	1.3E-01	0.012	1.1

Table 19.1-70—U.S. EPR Risk-Significant Human Actions based on RAW Importance - Level 1 Fire Events

Rank	Basic Event	Description	Nominal Value	RAW	FV
1	OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	7.0E-05	2,043.0	0.143
2	OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours	1.0E-03	154.3	0.155
3	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	16.4	0.203
4	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	3.9	0.001

Table 19.1-71—U.S. EPR Risk-Significant Common Cause Events based on RAW Importance - Level 1 Fire Events

Rank	System	ID	Description	RAW
1	HVAC	SAC31AN001EFR_D-ALL/ SAC01AN001EFR_D-ALL	CCF to Run Normal Air Exhaust/ Supply Fans	691.3
2	SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	688.3
3	SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	502.5
4	CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	403.0
5	ESWS	PED10AN002EFS_D-ALL	CCF to Start/Run Standby Cooling Tower Fans	402.9
6	SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start/Run	396.4
7	SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	375.4
8	IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	371.8
9	MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	343.4
10	EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start/Run	240.7
11	SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	236.4
12	ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety-related Batteries on Demand	168.9
13	MSS	LBA10AA002PFC_D-ALL	CCF to Close Main Steam Isolation Valves	72.8
14	SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run/Start	48.7
15	ESWS	PEB10AA004CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	48.5
16	ELEC	XKA10_____DFR_D-ALL	CCF of EDGs to Run/Start	47.8
17	ESWS	PEB10AP001EFR_B-ALL	CCF of ESWS/CCW Pumps 1 and 4 to Run (Normally Running)	43.2
18	ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start/Run (Standby)	29.2
19	HVAC	SAC61AH001EFS_D-ALL	CCF to Start EFW Pump Room Ventilation Fans	28.4

Table 19.1-72—U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance - Level 1 Fire Events

Rank	ID	Description	Nominal Value	RAW
1	CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	1.0E-07	11,760.0
2	CL-PS-B-SWCCF	SW CCF of Protection System diversity group B	5.0E-06	418.8
3	SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	372.7
4	ALU-B CCF SM-ALL	CCF of ALU-B Protection System Computer Processors (Self-Monitored)	9.0E-08	365.2
5	ALU-B CCF NS-ALL	CCF of ALU-B Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	361.5
6	CL-PS-A-SWCCF	SW CCF of Protection System diversity group A	5.0E-06	235.2
7	APU2 CCF NS-ALL	CCF of APU-2 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	162.0
8	ALU-A CCF NS-ALL	CCF of ALU-A Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	162.0
9	PAS	Process Automation System (PAS) Fails (Estimate)	1.0E-03	55.0
10	PZR PRES CCF-ALL	CCF of pressurizer (RCS) pressure sensors	6.7E-07	44.5
11	APU3 CCF NS-ALL	CCF of APU-3 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	44.5
12	APU3 CCF SM-ALL	CCF of APU-3 Protection System Computer Processors (Self-Monitored)	9.0E-08	30.5

Table 19.1-73—U.S. EPR Risk-Significant PRA Parameters - Level 1 Fire
Sheet 1 of 2

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	1.0E-01	0.177	2.6
MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	5.0E-01	0.185	1.2
CVCS VCT	CVCS Switchover to IRWST Required	1.0E-01	0.328	4.0
PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.434	2.7
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	0.019	1.3
EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.008	1.2
EDG PM2	EDG Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.020	1.5
LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.012	1.3
LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.006	1.1
LHSI PM3	LHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.009	1.2
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.0E-02	0.113	4.7
SAC02/QKA20 PM2	Normal SAC02/QKA20 Train Unavailable due to Preventive Maintenance	3.0E-02	0.021	1.7
SAC03/QKA30 PM3	Normal SAC03/QKA30 Train Unavailable due to Preventive Maintenance	3.0E-02	0.020	1.6
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.0E-02	0.033	2.1

Table 19.1-73—U.S. EPR Risk-Significant PRA Parameters - Level 1 Fire
Sheet 2 of 2

ID	Description	Nominal Value	FV	RAW
Offsite Power Related Events				
LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.014	297.5
LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.013	8.2
LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for Fire IEs Leading to a Controlled Shutdown	3.6E-04	0.113	314.8

Table 19.1-74—U.S. EPR Level 1 Fire Events Sensitivity Studies
Sheet 1 of 3

Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF
0	0	Base Case (Fire Events)	1.8E-07	0%
1		**Common Cause Assumption**		
	1a	Common cause events not considered	1.6E-07	-12%
	1b	EDGs & SBODGs in the same CC group	1.8E-07	1%
	1c	CC for I&C Software - recovery not credited	1.8E-07	0%
2		**LOOP Assumptions**		
	2a	No Credit was given for LOOP recoveries (DG MT also set back to 24 hours)	1.9E-07	6%
	2b	DG Mission Time set to 24 hours	1.9E-07	6%
	2c	SBO DG Mission Time set to 18 hours	1.8E-07	0%
	2d	Consequential LOOP events were not considered	1.5E-07	-12%
	2e	All Consequential LOOP values set to 5.3E-03 (value for LOCA)	4.7E-07	165%
3		**Assumptions on Electrical Dependencies**		
	3a	MSRT Realignment to One Power Train per Train	1.1E-07	-36%
	3b	For CVCS seal injection, assume that a switchover from the VCT to the IRWST is always required (Div1 & Div4 required)	7.0E-07	298%
	3c	UHS 4 assumed unavailable during SBO Conditions (no credit for SBO x-tie for dedicated ESW)	1.8E-07	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)	1.7E-07	-6%

Table 19.1-74—U.S. EPR Level 1 Fire Events Sensitivity Studies
Sheet 2 of 3

Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF
4		**Assumptions on HVAC Recoveries**		
	4a	Room heat-up was not considered	1.4E-07	-20%
	4b	Operator recovery of HVAC not credited	2.9E-06	1560%
	4c	Circular logic adjustment: Failure of HVAC 1 disables HVAC 2 (HVAC4 disables HVAC 3)	1.8E-07	1%
5		**Sensitivity to HEPs Values**		
	5a	All HEPs Set to 5% Value	7.0E-08	-60%
	5b	All HEPs Set to 95% Value	4.7E-07	168%
6		**Assumptions on Probabilities of an RCP LOCA**		
	6a	RCP Seal LOCA Probability - 1.0	4.8E-07	175%
	6b	RCP Seal LOCA Probability - 0.5	2.9E-07	65%
	6c	RCP Seal LOCA Probability - 0.1	1.4E-07	-22%
7		**Assumptions on Long Term Cooling Mission Time**		
	7a	SAHR Mission Time set to 36 hours	1.8E-07	0%
	7b	SAHR Mission Time set to 72 hours	1.8E-07	0%
8		**Preventive Maintenance Assumptions**		
	8a	Train 3 assumed to be in Preventive Maintenance for all year	4.4E-07	152%
	8b	W/o Preventive Maintenance	2.6E-07	47%
9		**Isolation of EFW Tank Leak**		
	9	EFW Isolation not possible	1.8E-07	0%
10		**Physical Separation of Non-safety Cables**		
	10	Fire in CSR kills Safety Train 4 and all Non-Safety Divisions	4.8E-07	172%

Table 19.1-74—U.S. EPR Level 1 Fire Events Sensitivity Studies
Sheet 3 of 3

Sensitivity Case Group	Case #	Sensitivity Case Description	SC CDF (1/yr)	Delta CDF
11		**Simultaneous Hot Shorts not Considered**		
	11	Simultaneous hot shorts not considered, therefore no inadvertent valve openings for PZR cubicle or MFW/MS valve room fire	1.4E-07	-20%
12		**Assumptions on MS isolation, given a Fire in MFW/MS Valve Room**		
	12a	MSIV3 & MSIV4 isolation not credited for a fire in MFW/MS valve room	7.8E-07	340%
	12b	MSIV3 and MSIV4 assumed to be separated by a fire barrier, for a fire in MFW/MS Valve Room	1.5E-07	-17%

Table 19.1-75—Level 2 Fire 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	2.9E-11	0.8%	0.0002
RC202	Containment fails before vessel breach due to isolation failure, melt released from vessel, with MCCI, melt not flooded ex vessel, with containment sprays	1.8E-15	0.00%	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	1.5E-13	0.00%	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	5.4E-13	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	4.2E-11	1.2%	0.0002
RC301	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, with containment sprays	3.4E-13	0.0%	0.0
RC302	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, without containment sprays	1.0E-11	0.3%	0.0001
RC303	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, with containment sprays	6.1E-10	16.9%	0.0034
RC304	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, without containment sprays	2.3E-09	63.5%	0.013

Table 19.1-75—Level 2 Fire Events Release Category Results - LRF
Sheet 2 of 2

RC702	Steam Generator Tube Rupture without Fission Product Scrubbing	6.2E-10	17.30%	0.0035
RC801	Interfacing System LOCA with Fission Product Scrubbing	0.0E+00	0.00%	0.0
RC802	Interfacing System LOCA without Fission Product Scrubbing but building credited	0.0E+00	0.00%	0.0
	Total LRF:	3.6E-09	100.0%	0.020

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 1 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of Events that Lead to CD and to Containment Failure
Fire RC201	1.90E-13	0.0053%	IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	Level 1: • A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. • Failure of TXS causes the loss of all automatic functions, failing MFW and EFW. • Loss of all source of SG feed leads to the need to do feed and bleed, but primary bleed cannot be performed because of the loss of Division 4.
			CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	
			L2FLCDES-TR1	Level 2 FLAG: TR1 CDES	Level 2: • Sequence enters CET1 High Pressure • Induced hot leg rupture depressurizes primary • Sequence enters CET Low Pressure • Automatic CI signal fails because of the loss of TXS. • Operator fails to initiate manual CI signal, with the Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open. • Operators recover the core with limited damage
			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	
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 2 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of Events that Lead to CD and to Containment Failure
Fire RC202	5.04E-16	0.0000%	IE FIRE-PZR	Fire in the Pressurizer Compartment with Spurious Opening of 1 PSRV	Level 1: • A fire in the pressurizer compartment induces a small LOCA • SW CCF disables SI signal, therefore MHSI does not inject. • Failure of the operators to perform FCD leads to CD.
			CL-PS-B-SWCCF	SW CCF of Protection System diversity group	
			OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	
			L2FLCDES-SL1	Level 2 FLAG: SL1 CDES	Level 2: • Sequence enters CET1 High Pressure • Primary stays pressurized until vessel failure • Sequence enters CET2 High Pressure • Automatic CI signal fails because of the loss of TXS. • Operator fails to initiate manual CI signal, with the Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open. • Pit damaged due to overpressure from complete circumferential rupture of the vessel • MCCI occurs due to early melt release from pit
			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	
			OPD-L2-CIH	Dependent operator failure to close containment isolation valves	
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 3 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of Events that Lead to CD and to Containment Failure
Fire RC203	8.54E-15	0.0002%	IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	Level 1: • A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. • Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. • A loss of control power in Division 1 disables the PCD function. PBL fails because of the loss of Division 4.
			31BRA_____RFR	ELEC, 480V to 24V DC Rectifier for 31BRA Control Power, Fails to Run	
			CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
			PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	
			OPE-FB-40M=Y	Operator tries to depressurize primary, but cannot	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 4 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of Events that Lead to CD and to Containment Failure
			L2FLCDES-SS	Level 2 FLAG: SS CDES	Level 2: • Sequence enters CET1 High Pressure • Primary stays pressurized until vessel failure • Sequence enters CET2 High Pressure • Two initially open 2" containment lines fail to isolate due to the loss of Division 1 and 4 power supplies. • Pit damaged due to overpressure from complete circumferential rupture of the vessel • MCCI occurs due to early melt release from pit • SAHRS sprays fail to control source term due to the loss of electrical trains 1 / 4
			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	
			KPL85 03/04 HPFL	Probability that GWP system fails on containment high pressure	
			PROB KTC10 05/06 OP	Probability that Containment Sump Line KTC is Open.	
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 5 of 16

Release Category	Freq /yr	LRF Fraction	Event Identifier	Event Description	Sequence of Events that Lead to CD and to Containment Failure
Fire RC204	3.15E-13	0.0087%	IE FIRE-PZR	Fire in the Pressurizer Compartment with Spurious Opening of 1 PSRV	Level 1: • A fire in the pressurizer compartment induces a small LOCA • SW CCF disables SI signal, therefore MHSI does not inject. • Failure of the operators to perform FCD leads to CD.
			CL-PS-B-SWCCF	SW CCF of Protection System diversity group	
			OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	
			L2FLCDES-SL1	Level 2 FLAG: SL1 CDES	Level 2: • Sequence enters CET1 High Pressure • Primary stays pressurized until vessel failure • Sequence enters CET2 High Pressure • Automatic CI signal fails because of the loss of TXS. • Operator fails to initiate manual CI signal, with the Containment Sweep Ventilation Small Flow Line Ventilation Valves initially open.
			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	
			OPD-L2-CIH	Dependent operator failure to close containment isolation valves	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC205	5.34E-12	0.1482%	IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	Level 1: • A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. • Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. • A loss of control power in Division 1 disables the PCD function. • PBL fails because of the loss of Division 4.
			31BRA_____RFR	ELEC, 480V to 24V DC Rectifier for 31BRA Control Power, Fails to Run	
			CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
			PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	
			OPE-FB-40M=Y	Operator tries to depressurize primary, but cannot	
			L2FLCDES-SS	Level 2 FLAG: SS CDES	Level 2: • Sequence enters CET1 High Pressure • Primary stays pressurized until vessel failure • Sequence enters CET2 High Pressure • Two initially open 2” containment lines fail to isolate due to the loss of Division 1 and 4 power supplies. • SAHRS sprays fail to control source term due to the loss of electrical trains 1 / 4
			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	
			KPL85 03/04 HPFL	Probability that GWP system fails on containment high pressure	
			PROB KTD10 24/15 OP	Probability that Non-Contaminated Sump line is open.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC301	1.26E-13	0.0035%	IE FIRE-MS-VR	Fire in One of Two MFW/MS Valve Rooms With Spurious Opening of 1 MSRIV	Level 1: • A fire in the MFW/MS valve room causes spurious opening of an MSRIV. • MSIV 3 and 4 fail open due to the fire, leading to two steam generators blowing down simultaneously. • Failure to align RHR leads to core damage.
			MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MFW/MS Valve Room	
			MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MFW/MS Valve Room	
			OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours.	
			L2FLCDES-TRD	Level 2 FLAG: TR1 CDES	Level 2: • 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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC302	6.45E-13	0.0179%	IE FIRE-MCR	Fire in the Main Control Room	Level 1: • A fire occurs in the MCR and the operators fail to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operators fail to transfer to the RSS in 90 min given a MCR fire	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: • 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 • Operators fail to spray to control source term
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC303	4.20E-10	11.6666%	IE FIRE-MS-VR	Fire in One of Two MFW/MS Valve Rooms With Spurious Opening of 1 MSRIV	Level 1: • A fire in the MFW/MS valve room causes spurious opening of an MSRIV. • MSIV 3 and 4 fail open due to the fire, leading to two steam generators blowing down simultaneously. • Failure to align RHR leads to core damage.
			MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MFW/MS Valve Room	
			MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MFW/MS Valve Room	
			OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours.	
			L2FLCDES-TRD	Level 2 FLAG: TRD CDES	Level 2: • Sequence enters CET1 High Pressure • Operators depressurize primary • Sequence enters CET Low Pressure • Containment fails before vessel rupture due to hydrogen flame acceleration
			L2FLCET1 HI PRESSURE	L2FLCET1 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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 304 -1	4.03E-10	11.1946%	IE FIRE-MCR	Fire in the Main Control Room	Level 1: • A fire occurs in the MCR and the operators fail to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operators fail to transfer to the RSS in 90 min given a MCR fire	
			L2FLCDES-TR	Level 2 FLAG: TR CDES	Level 2: • 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 • Operators fail to spray to control source term
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 304 -2	1.19E-10	3.2929%	IE FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	Level 1: • A fire 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 the 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: • 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 fire
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 304 -3, 4	1.71E-10	4.7411%	IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	Level 1: • A fire in the switchgear room of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. • Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. • A loss of control power in Division 1 or 2 disables the secondary cooldown function. • Primary Bleed fails because of the loss of Division 4.
			CVCS VCT	CVCS Switchover to IRWST May Not Be Required	
			PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	
			31BRA_____RFR or 32BRA_____RFR	ELEC, 480V to 24V DC Rectifier for 31BRA Control Power, Fails to Run	
			OPE-FB-40M=Y	Operator tries to initiate feed and bleed.	
			L2FLCDES-SS	Level 2 FLAG: SS CDES	Level 2: • 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 • SAHRS sprays fail to control source term due to the loss of electrical trains 1 / 4
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 304 -5,7	1.00E-10	2.7826%	IE FIRE-SAB14-AC	Fire in the Switchgear Room of Safeguard Building 1(or 4)	Level 1: • A fire in the switchgear room of SB 4 and a consequential LOOP result in the loss of CH2 and fails CVCS. • Seal cooling to RCP 4 is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA. • LOOP and EDG failure result in a loss of Division 2, failing the secondary cooldown function. • Operators fail to cross connect electrical trains 1 and 2 • Primary Bleed fails because of the loss of Division 4.
			LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
			OPF-XTDIV-NSC	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Division 3 During Non-SBO Conditions	
			CCWS/ESWS PM2 or EDG PM2	CCWS/ESWS train 2 in or EDG Train 2 in preventive maintenance	
			PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	
			OPE-FB-40M=Y	Operator tries to depressurize primary, but cannot	
			L2FLCDES-SS	Level 2 FLAG: SS CDES	Level 2: • 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 • SAHRS sprays fail to control source term due to the loss of electrical trains 1 / 4
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 304 -6	4.27E-11	1.1850%	IE FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	Level 1: • Fire in the pump room of SB 4 results in the loss of CCWS CH2. With SAC1 in maintenance, consequential LOOP and operator failure to recover room cooling results in the loss of ventilation in Division 1, 2 and 3 • LOOP fails MFW and SSS, all EFW trains are lost because of the loss of ventilation. PBL fails because of the loss of Division 1.
			LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
			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: • 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 fire
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 702-1,2	2.85E-10	7.9129%	IE FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	Level 1: ● A fire in the pump room of SB 4 results in the loss of CCWS CH2. ● Seal LOCA occurs on loss of seal injection or bearing cooling ● 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 the loss of Division 1.
			OPF-RCP-10M or OPF-RCP-30M	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: ● Induced steam generator tube rupture with secondary depressurized and feedwater unavailable
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2CP SS2"DIAM	Level 2 conditional probability: seal LOCA has 2" diameter	
			L2PH ISGTR-SS2D=Y	Induced SGTR. 2" LOCA, secondary depressurized	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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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
Fire RC 702-3,4	9.70E-11	2.6943%	IE FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	Level 1: ● A fire in the pump room of SB 4 results in the loss of CCWS CH2. ● Seal LOCA occurs on loss of seal injection or bearing cooling ● 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 the loss of Division 1.
			OPF-RCP-10M or OPF-RCP-30M	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: ● Induced steam generator tube rupture with secondary depressurized and feedwater unavailable
			L2FLCET1 HI PRESSURE	Level 2 FLAG: CET1 HI PRESSURE	
			L2CP SS6"DIAM	Level 2 conditional probability: seal LOCA has 0.6" diameter	
			L2PH ISGTR-SS6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	

Table 19.1-77—U.S. EPR Core Damage End States Contributions - Level 2 Internal Fires

CDES	LRF (1/yr)	Contribution (Total)
SS	1.2E-09	34%
TR1	6.5E-10	18%
SS1D	6.0E-10	17%
TRD	5.6E-10	15%
TR	4.4E-10	12%
AT	4.7E-11	1%
SS1	3.3E-11	1%
SL1	1.9E-11	1%
SSD	1.1E-11	0%
SL	2.9E-12	0%
TR1D	2.7E-12	0%
SL1D	2.2E-12	0%
SLD	2.5E-13	0%
Total	3.6E-09	100%

Table 19.1-78—U.S. EPR Initiating Events Contributions - Level 2 Internal Fires

FIRE IE	Description	Frequency (1/yr)	LRF (1/yr)	Contribution (Total)
IE FIRE-SAB14-AC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	2.0E-03	1.3E-09	36%
IE FIRE-SAB-MECH	Initiator - Fire in the Pump Room of Any Safeguard Building	2.0E-02	8.6E-10	24%
IE FIRE-MS-VR	Initiator - Fire in One of Two MF/MS Valve Rooms With Spurious Opening of 1 MSRIV	5.2E-04	6.0E-10	17%
IE FIRE-MCR	Initiator - Fire in the Main Control Room	3.6E-04	4.3E-10	12%
IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	3.1E-03	3.7E-10	10%
IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	1.9E-05	2.4E-11	1%
IE FIRE-CSR	Initiator - Fire in the Cable Spreading Room (Room Under Main Control Room)	4.2E-04	9.9E-12	0%
IE FIRE-TB	Initiator - Fire in the Turbine Building	4.1E-03	5.6E-12	0%
IE FIRE-BATT	Initiator - Fire in One of the Four Battery Rooms	1.1E-03	5.0E-12	0%
IE FIRE-SAB23-AC	Initiator - Fire in Switchgear Room of Safeguard Building 2 (or 3)	2.0E-03	3.9E-12	0%
IE FIRE-FB	Initiator - Fire in the Fuel Building	5.0E-03	3.9E-12	0%
IE FIRE-ESW	Initiator - Fire in the Essential Service Water Pump Building	1.4E-02	2.5E-12	0%
IE FIRE-SAB14-DC	Initiator - Fire in the DC Cabinets Room of Safeguard Building 1 (or 4) - I&C Rooms Included	5.1E-04	1.9E-12	0%
IE FIRE-XF YARD	Initiator - Fire in the Transformer Yard	7.2E-03	3.5E-13	0%
			3.6E-09	100%

Table 19.1-79—U.S. EPR Risk-Significant Phenomena Based on FV Importance - Level 2 Internal Fires

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	0.794	49.8
2	L2PH LOCA-DEPRESS=N	Level 2 phenomena. Small LOCA remains at high pressure.	1.0E+00	0.517	1.0
3	L2PH ISGTR-SS2D=Y	Induced SGTR. 2" LOCA, secondary depressurized	8.4E-01	0.130	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	0.120	1.0
5	L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	2.9E-01	0.042	1.1
6	L2PH VECF-FA(HL)	Very early flame acceleration loads fail containment following induced Hot Leg Rupture	1.3E-03	0.020	16.8
7	L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS, SL cases.	1.0E+00	0.015	1.0
8	L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	1.0E+00	0.014	1.0
9	L2PH CPIHLR-TR,TP=N	No induced hot leg rupture. Conditional probability given no ISGTR. TP, TR cases (sec not D)	5.0E-02	0.005	1.1

Table 19.1-80—U.S. EPR Risk-Significant Phenomena Based on RAW Importance-Level 2 Internal Fires

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	49.8	0.794
2	L2PH VECF-FA(HL)	Very early flame acceleration loads fail containment following induced Hot Leg Rupture	1.3E-03	16.8	0.020
3	L2PH VECF-H2DEF(H)	Very early CF due to hydrogen deflagration. High pressure CDES, in-vessel - PRV cycling phase	2.0E-06	16.0	0.000
4	L2PH VECF-H2DEF(HL)	V Early CF due to hydrogen deflagration. High pressure CDES with Induced Hot Leg Rupture	1.4E-04	15.0	0.002
5	L2PH STM EXP INV HP	Level 2 phenomena: containment failure due to in-vessel steam explosion. High pressure CET sequences	2.3E-05	13.8	0.000
6	L2PH STM EXP INV LP	Level 2 phenomena: containment failure due to in-vessel steam explosion. Low pressure CET sequences.	5.6E-06	10.8	0.000

Next File