

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

Rank	ID	Description	Nominal Value	RAW
1	SG LVL CCG	Common Cause Failure of the SG Level Sensors (32)	4.9E-08	17,600.0
2	I/O MOD CCF	I/O Module Common Cause Failure	6.5E-06	608.0
3	ALU/APU SM-ALL	CCF of ALU and APU Protection System Computer Processors (Self-Monitored)	9.0E-08	606.0
4	CL-TXS-OSCCF	CCF of TXS Operating System or Other Common Software	1.0E-07	606.0
5	ALU/APU NS-ALL	CCF of ALU and APU Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	606.0
6	PAS	Process Automation System (PAS) Fails (Estimate)	1.0E-03	204.0
7	CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	1.0E-05	105.0
8	EFW FLOW CCF-ALL	CCF of EFW pump discharge flow sensors	2.7E-06	32.2

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
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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
Safeguard Building 1		FA-1UJH-03	Pump Room, Division 1	PFA-SB 1-MECH	Pump room of Safeguard Building 1 AC, DC and I&C switchgear rooms, Division 1
		FA-1UJH-04 (cable floor sub area)	Cable Shaft and Cable Floor, Division 1	PFA-SB 1-ELEC	
		FA-1UJH-06	Switchgear Room, Division 1		
		FA-1UJH-04	DC Equipment Room, I&C Cabinets Room, Division 1		
		FA-1UJH-05	Battery Room, Division 1	PFA-BATT1	Battery room, Division 1

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
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Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
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		
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-ELEC	AC, DC and I&C switchgear rooms, Division 2
		FA-2UJH-05	Switchgear Room, Division 2		
		FA-2UJH-04	DC Equipment Room, I&C Cabinets Room, 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

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
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Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
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-ELEC	AC, DC and I&C switchgear rooms, Division 3
		FA-3UJH-05	Switchgear Room, Division 3		
		FA-3UJH-04	DC Equipment Room, I&C Cabinets Room, Division 3		
		FA-3UJH-06	Battery Room, Division 3	PFA-BATT3	Battery room, Division 3
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-ELEC	AC, DC and I&C switchgear rooms, Division 4
		FA-4UJH-06	Switchgear Room, Division 4		
		FA-4UJH-04	DC Equipment Room, I&C Cabinets Room		
		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		

Table 19.1-62—U.S. EPR Fire Areas and Corresponding Fire Areas Modeled in the PRA (PFAs)
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Building	Elevation	Fire Area	Summarized Description of the Rooms Corresponding to the Fire Area	PRA Fire Area (PFA)	Simplified PFA Description
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
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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-ELEC	AC and DC Switchgear Rooms 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	1.3E-03
PFA-SB2-ELEC	AC and DC Switchgear Rooms 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	1.3E-03
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
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

**Table 19.1-63—Basis for PFA Fire Frequencies
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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-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 2**

Fire Scenario	Description	Effects on Mitigating Systems	Suppression Credited	Frequency (1/yr)	Distribution Type (parameter)	Basis for Frequency
Fire-SAB 14-ELEC	Fire in Switchgear Room of SB 4 (or 1)	All class 1E and non class 1E AC and DC Buses in SB 4 unavailable.	No	2.5E-03	Gamma (0.5)	PRA FA frequency (2 buildings)
Fire-SAB 23-ELEC	Fire in Switchgear Room of SB2 (or 3)	All class 1E and non class 1E AC and DC Buses in SB2 unavailable.	No	2.5E-03	Gamma (0.5)	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	Gamma (0.5)	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	Gamma (0.5)	PRA FA frequency (2 buildings) * spurious actuation probability
Fire-FB	Fire in the FB	CVCS trains 1 and 2 and EBS trains 1 and 2 unavailable	No	5.0E-03	Gamma (0.5)	PRA FA frequency
Fire-TB	Fire in the TB	MFW and SSS unavailable	Automatic	4.1E-03	Gamma (0.5)	PRA FA frequency * Suppression

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

Fire Scenario	Description	Effects on Mitigating Systems	Suppression Credited	Frequency (1/yr)	Distribution Type (parameter)	Basis for Frequency
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	Gamma (0.5)	PRA FA frequency
Fire-BATT	Fire in one of the 4 Battery Rooms	Div 4 2-hr Battery unavailable	No	1.1E-03	Gamma (0.5)	PRA FA frequency
Fire-ESW	Fire in the ESW Building	UHS4 unavailable.	No	1.4E-02	Gamma (0.5)	PRA FA frequency (4 buildings)
Fire-xFYard	Fire in the Transformer Yard	Loss of 1 class 1E transformer.	No	7.2E-03	Gamma (0.5)	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	Gamma (0.5)	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	Gamma (0.5)	PRA FA frequency * Suppression
Fire-PZR	Fire in the Pressurizer area	Primary Bleed unavailable	No	1.9E-05	Gamma (0.5)	PRA FA frequency* spurious actuation probability

Table 19.1-65—U.S. EPR Initiating Event Contributions - Level 1 Internal Fires (Contributing more than 1% to Internal Fire CDF)

IE	Description	IE Frequency (1/yr)	CDF (1/yr)	Contribution
FIRE-SAB14-ELEC	Fire in Switchgear Room of Safeguard Building 1 (or 4)	2.5E-03	1.3E-07	68.9%
FIRE-MCR	Fire in the Main Control Room	3.6E-04	2.6E-08	13.1%
FIRE-SAB-MECH	Fire in the Pump Room of Any Safeguard Building	2.0E-02	1.2E-08	6.0%
FIRE-MS-VR	Fire in One of the Two MF/MS Valve Rooms With Spurious Opening of 1 MSRIV	5.2E-04	8.3E-09	4.3%
FIRE-SWGR	Fire in the Switchgear Building	3.1E-03	7.8E-09	4.0%
FIRE-PZR	Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	1.9E-05	2.6E-09	1.3%
FIRE-ESW	Fire in the Essential Service Water Pump Building	1.4E-02	2.5E-09	1.3%
		Total:	2.0E-07	
		Total RS:	1.8E-07	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 1 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
1	1	2.52E-08	13.8	13.8	Sequence: FIRE-MCR-2: FIRE-MCR, OP RSS		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.
					IE FIRE-MCR	Initiator - Fire in the Main Control Room	
					OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	2, 3, 12, 13, 77, 78	5.64E-09 - 1.81E-10	7.7	21.5	Sequence: BDA-29: FIRE-SAB14-ELEC, RCP LOCA, EFW, PBL		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is disabled by a loss of 31BRA. These two failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by the fire in the area, and the failure to trip the RCP pump supply breaker in SWGR building, resulting in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables both partial cooldown and feed and bleed.
					31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
					RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.						

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	6-9, 31-34	2.27E-09 - 4.84E-10	6.0	27.5	Sequence: BDA-29: FIRE-SAB14-ELEC, RCP LOCA, EFW, PBL		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is disabled by a loss of 32BRA. These two failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by losing control power to the RCP pump breakers, and an operator failure to trip the RCP pumps, resulting in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed and bleed.
					32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
					FIRE SAB14 - DC	Percentage of Fires in SAB 4 DC Room	
					OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	
4	21-26, 38-43, 52-63, 87-92	5.95E-10 - 1.43E-10	5.0	32.5	Sequence: BDA-29: FIRE-SAB14-ELEC, RCP LOCA, EFW, PBL		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear room of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is in PM. This leads to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by the fire in the area, and the failure to trip the RCP pump supply breaker in SWGR building, resulting in a RCP pump seal LOCA. A failure of APUB1 disables MSRTs and partial cooldown, while a loss of Div4 disables ability to open feed & bleed valves.
					CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	
					CLE-APUB1-PM	Division 1 APU B1 in Preventive Maintenance	
					CLF23EQ001-APUB1-GRP	Acquisition and processing unit (APU) B1, Division 2 Rack/Module Group Fails	
					RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
					SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	4, 5, 19, 20, 29, 30, 79-82	2.82E-9 - 1.69E-10	4.7	37.2	Sequence: BDA-29: FIRE-SAB14-ELEC, RCP LOCA, EFW, PBL		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	A fire in switchgear rooms of SB 4 results in the loss of CH2 and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 (and all RCP pumps) is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA with a probability of 0.2. 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 AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
					CONF CH2 TO TB	Configuration 2: CH2 Supplying All RCP TB. Maintenance on CCW 2 Only.	
					CVCS VCT	CVCS Switchover to IRWST is required	
					PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	
6	37, 68-70, 84, 85, 93-100	3.21E-10 - 1.29E-10	1.3	38.4	Sequence: BDA-21: FIRE-SAB14-ELEC, RCP LOCA, LTC		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is in PM. This leads to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by the fire in the area, and the failure to trip the RCP pump supply breaker in SWGR building, resulting in a RCP pump seal LOCA. Fire disables LHSI4, CCW3 in PM disables LHSI3, while LHSI2 and LHSI1 are disabled by latent human errors. That results in a total loss of LHSI and LTC (given that SAHR is also disabled by the fire).
					CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	
					JNG10AA006MEC3	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006, Left in Wrong Position	
					JNG20AA006MEC3	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006, Left in Wrong Position	
					RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.						

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	10, 66	1.65E-09 - 2.04E-10	1.0	39.5	Sequence: BDA-21: FIRE-SAB14-ELEC, RCP LOCA, LTC		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is not available due to a failure to start SB CT fan. This leads to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by the fire in the area, and the failure to trip the RCP pump supply breaker in SWGR building, resulting in a RCP pump seal LOCA. CCF to start STANDBY CT fans results in failure of LTC (SAHR is disabled by fire).
					PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
					RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.						

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 8 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
8	36, 48, 64, 65, 75, 76	4.50E-10 - 1.81E-10	0.8	40.3	Sequence: BDA-29: FIRE-SAB14-ELEC, RCP LOCA, EFW, PBL		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is in PM. This leads to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by the fire in the area, and the failure to trip the RCP pump supply breaker in SWGR building, resulting in a RCP pump seal LOCA. EFW pumps 1 and 2 failed to run, EFW4 is disabled by the fire, while EWF3 is disabled by a loss of HVAC to division 3 (QKA chiller in Div.3 is cooled cy CCW CH2). PBL fails because of the loss of Div. 4
					CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	
					LAS11AP001EFR	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Run	
					LAS21AP001EFR	EFWS, Train 2 Motor Driven Pump LAS21AP001, Fails to Run	
					RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
					SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	
9	17, 18	6.62E-10	0.7	41.0	Sequence: BDA-21: FIRE-SAB14-ELEC, RCP LOCA, LTC		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of the running CCW Div.4 requires a switchover to the standby CCW pump which is not available due to a failure to start standby CT fan. This leads to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pump trips. That trip is also disabled by losing control power to the RCP pump breakers, and an operator failure to trip the RCP pumps, resulting in a RCP pump seal LOCA. LTC is disabled by failure of standby CT fans to start (SAHR is disabled by fire).
					FIRE SAB14 - DC	Percentage of Fires in SAB 4 DC Room	
					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)						

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
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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	16, 83	8.24E-10 - 1.65E-10	0.5	41.6	Sequence: BDA-21: FIRE-SAB14-ELEC, RCP LOCA, LTC		
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	A fire in the switchgear rooms of SB 4 results in the loss of CH2 that supplies TB cooling and prevents CVCS to switch suction to IRWST. Seal cooling to RCP 4 (and all RCP pumps) is lost and RCP 4 leakoff valves fail to close on loss of Division 4, resulting in a seal LOCA with a probability of 0.2. LTC is disabled by failure of standby CT fans to start (SAHR is disabled by fire).
					CONF CH2 TO TB	Configuration 2: CH2 Supplying All RCP TB. Maintenance on CCW 2 Only.	
					CVCS VCT	CVCS Switchover to IRWST is required	
					PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
					PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 11 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
11	35	4.50E-10	0.2	41.8	Sequence: BDA-18: FIRE-SAB14-ELEC, MFW, SSS, EFW, PBL		Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. I/O MOD failure fail entire PS. While DAS backs up PS actuations, it does not backup control functions. The operator action fails long-term control of EFW/MSRT for EFW level control, failing EFW. PBL fails because of the loss of Div. 4
					IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	
					I/O MOD CCF	I/O Module Common Cause Failure	
					OPF-EFW-MSRT-CNTL	Operator Fails to Control EFW/MSRT for Long-Term Cooling Given PS Failure	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 12 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
12	15, 28, 44-46	8.54E-10 - 2.92E-10	1.3	43.1	Sequence: MSSV-19: FIRE-MS-VR, MSIV ISO(3), RHR		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 of standby CT fans to start disables RHR cooling.
					IE FIRE-MS-VR	Initiator - Fire in One of Two MF/MS Valve Rooms With Spurious Opening of 1 MSRIV	
					MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	
					MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	
					PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 13 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
13	11	1.43E-09	0.8	43.8	Sequence: MSSV-20: FIRE-MS-VR, MSIV ISO(3), OP RHR		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.
					IE FIRE-MS-VR	Initiator - Fire in One of Two MF/MS Valve Rooms With Spurious Opening of 1 MSRIV	
					MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	
					MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	
					OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 14 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
14	49-51, 72-74	2.49E-10 - 1.88E-10	0.7	44.6	Sequence: LBOP-16: FIRE-SWGR, EFW, PBL		
					IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	A fire in the switchgear building disables MFW, SSS and Primary Depressurization Valves. CCF of EFW pumps disables SG cooling, while the failure of one PRZ safety valve disables bleed function (3 valves required)
					JEF10AA193RFO	PZR, Pressurizer Safety Relief Valve JEF10AA193, Fails to Open on Demand	
					LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	
15	27	5.83E-10	0.3	44.9	Sequence: LBOP-16: FIRE-SWGR, EFW, PBL		
					IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	A fire in the switchgear building fails all non-safety power, disabling MFW,SSS, PDVs, and fails the 2 SBODGs. Consequential LOOP and CCF of all EDGs cause a total station blackout (loss of all AC power).
					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 Internal Fire Events
(Top 100 Events)
Sheet 15 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
16	14, 67, 71, 86	8.76E-10 - 1.46E-10	0.8	45.6	Sequence: SLOCA-10: FIRE-PZR, EFW, PBL		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.
					IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	
					LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	

**Table 19.1-66—U.S. EPR Important Cutset Groups - Level 1 Internal Fire Events
(Top 100 Events)
Sheet 16 of 16**

Group No	Cutset Numbers	Cutset Frequencies	Contribution to CDF (%)		Sequence Type and a Representative Cutset		Sequence Description
			Group	Cumulative	Event Identifier	Event Description	
17	47	2.82E-10	0.2	45.8	Sequence: BDA-17: FIRE-SAB-MECH, MFW, SSS, EFW, MHSI FB, LHSI		A fire in the pump room of safeguard building, disables all pumps in Div 4. EDGs in Div 2 & 3 fail to run, while EDG Div.1 is in preventive maintenance. Alternative alignment of Div1 (when EDG is in PM) prevents Div 1 SBO DG to be aligned to EUPS Div 1. These events lead to a total station blackout.
					IE FIRE-SAB-MECH	Initiator - Fire in the Pump Room of Any Safeguard Building	
					EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	
					LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for Fire IEs Leading to a Controlled Shutdown	
					XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	
					XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	

Table 19.1-67—U.S. EPR Risk-Significant Components based on FV Importance - Level 1 Internal Fire Events
Sheet 1 of 3

Rank	System US	Component ID	Component Description	FV	RAW
1	ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	0.279	7.8
2	ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.133	3.0
3	ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	0.098	5.2
4	ELEC	32BRA	ELEC, 480V MCC 32BRA	0.095	699.4
5	ELEC	31BRA	ELEC, 480V MCC 31BRA	0.095	697.8
6	SIS/RHR	30JNG10AP001	LHSI, Train 1 Motor Driven Pump JNG10AP001	0.074	9.6
7	EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.068	3.2
8	EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	0.062	3.0
9	CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	0.059	9.8
10	SIS/RHR	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	0.049	7.1
11	UHS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	0.048	9.9
12	ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	0.038	7.8
13	UHS	30PED30AA010	UHS, Cooling Tower Train 3 Spray MOV PED30AA010	0.038	7.8
14	ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.037	1.4
15	EFWS	30LAS31AP001	EFWS, Train 3 Motor Driven Pump LAS31AP001	0.034	1.2
16	SIS/RHR	30JNA10AA101	RHR, LHSI Train 1 HTX Bypass MOV JNA10AA101	0.030	9.6
17	CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	0.030	4.4
18	EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	0.029	1.1
19	ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.028	1.5

Table 19.1-67—U.S. EPR Risk-Significant Components based on FV Importance - Level 1 Internal Fire Events
Sheet 2 of 3

Rank	System US	Component ID	Component Description	FV	RAW
20	SIS/RHR	30JNG20AP001	LHSI, Train 2 Motor Driven Pump JNG20AP001	0.026	4.3
21	UHS	30PED20AA010	UHS, Cooling Tower Train 2 Spray MOV PED20AA010	0.023	5.2
22	ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	0.023	5.2
23	CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	0.023	7.2
24	SIS/RHR	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	0.022	3.7
25	UHS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	0.019	4.5
26	UHS	30PED20AN001	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001	0.019	4.5
27	CCWS	30KAA22AA013	CCWS, Train 2 LHSI Pump Seal Cooler MOV KAA22AA013	0.019	4.4
28	MSS	30LBA23AA001	MSS, Train 2 MSRIV LBA23AA001	0.017	1.7
29	CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001	0.015	4.7
30	MSS	30LBA33AA001	MSS, Train 3 MSRIV LBA33AA001	0.014	1.0
31	MSS	30LBA13AA001	MSS, Train 1 MSRIV LBA13AA001	0.013	1.7
32	ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	0.012	1.1
33	MSS	30LBA43AA001	MSS, Train 4 MSRIV LBA43AA001	0.012	1.0
34	SIS/RHR	30JNA20AA101	RHR, LHSI Train 2 HTX Bypass MOV JNA20AA101	0.012	4.3
35	RCS	30JEB30AP001-BKR	ELEC, 13.8kV SWGR 33BDE Circuit Breaker to RCP JEB30AP001	0.011	5.5
36	RCS	30JEB40AP001-BKR	ELEC, 13.8kV SWGR 34BDE Circuit Breaker to RCP JEB40AP001	0.011	5.4
37	SIS/RHR	30JNG13AA005	LHSI, MHSI/LHSI Train 1 First SIS Isolation Check Valve JNG13AA005	0.009	6.3
38	CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	0.009	1.2
39	ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	0.008	1.1
40	CCWS	30KAA42AA005	CCWS, Train 4 to LHSI HTX 40 Cooling MOV KAA42AA005	0.008	1.0

**Table 19.1-67—U.S. EPR Risk-Significant Components based on FV
Importance - Level 1 Internal Fire Events
Sheet 3 of 3**

Rank	System US	Component ID	Component Description	FV	RAW
41	SIS/RHR	30JNG23AA005	LHSI, MHSI/LHSI Train 2 First SIS Isolation Check Valve JNG23AA005	0.007	3.4
42	EFWS	30LAR11AA105	EFWS, Train 1 SG Level Control MOV LAR11AA105	0.007	2.9
43	EFWS	30LAR11AA103	EFWS, Train 1 SG Pressure Control MOV LAR11AA103	0.007	2.9
44	EFWS	30LAR21AA105	EFWS, Train 2 SG Level Control MOV LAR21AA105	0.006	2.8
45	EFWS	30LAR21AA103	EFWS, Train 2 SG Pressure Control MOV LAR21AA103	0.006	2.8
46	UHS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	0.006	9.0
47	SIS/RHR	30JND10AP001	MHSI, Train 1 Motor Driven Pump JND10AP001	0.005	1.3

**Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 1 of 10**

Rank	System US	Component ID	Component Desc	RAW	FV
1	ELEC	32BRA	ELEC, 480V MCC 32BRA	699.4	0.095
2	ELEC	31BRA	ELEC, 480V MCC 31BRA	697.8	0.095
3	ELEC	2BRU012BRA	ELEC, Inverter 32BRU01 to 480V MCC 32BRA Circuit Breaker	346.1	0.002
4	ELEC	1BRU011BRA	ELEC, Inverter 31BRU01 to 480V MCC 31BRA Circuit Breaker	345.6	0.002
5	ELEC	31BDA	ELEC, 6.9kV Switchgear 31BDA	172.3	0.004
6	ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	157.1	0.004
7	ELEC	1BDA_1BDC1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	138.7	0.001
8	ELEC	1BDA_1BDC2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	138.7	0.001
9	ELEC	32BDA	ELEC, 6.9kV SWGR 32BDA	121.3	0.003
10	ELEC	31BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	101.6	0.002
11	ELEC	32BRW32BUW33	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33	101.6	0.002
12	ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	100.4	0.002
13	ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	100.4	0.002
14	ELEC	31BMB	ELEC, 480V Load Center 31BMB	100.4	0.002
15	ELEC	1BDC_1BDB2	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	75.5	0.001
16	ELEC	1BDC_1BDB1	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	75.5	0.001
17	ELEC	1BMT021BMB	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker	75.5	0.001
18	ELEC	1BDB1BMT02	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker	75.5	0.001
19	ELEC	33BUC	ELEC, 1E 250V DC Switchboard 33BUC	63.2	0.001
20	ELEC	32BDB	ELEC, 6.9kV SWGR 32BDB	60.8	0.001
21	ELEC	32BMT02	ELEC, 6.9kV-480V Transformer 32BMT02	60.8	0.001
22	ELEC	32BMB	ELEC, 480V Load Center 32BMB	60.8	0.001

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 2 of 10

Rank	System US	Component ID	Component Desc	RAW	FV
23	ELEC	2BDB2BMT02	ELEC, 6.9kV SWGR 32BDB to Transformer 32BMT02 Circuit Breaker	48.9	0.000
24	ELEC	2BDA_2BDB2	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	48.9	0.000
25	ELEC	2BDA_2BDB1	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	48.9	0.000
26	ELEC	2BMT022BMB	ELEC, Transformer 32BMT02 to 480V Load Center 32BMB Circuit Breaker	48.9	0.000
27	ESWS	30PEB10AP001	ESWS, Train 1 Motor Driven Pump PEB10AP001	30.2	0.004
28	CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	27.2	0.003
29	ELEC	31BNB02	ELEC, 480V MCC 31BNB02	24.4	0.001
30	ELEC	31BNT01	ELEC, Constant Voltage Transformer 31BNT01	24.4	0.001
31	ELEC	31BMD	ELEC, 480V Load Center 31BMD	18.1	0.000
32	ELEC	31BDD	ELEC, 6.9kV SWGR 31BDD	18.1	0.000
33	ELEC	31BMT04	ELEC, 6.9kV-480V Transformer 31BMT04	18.1	0.000
34	SIS/RHR	30JNG10AC001	LHSI, LHSI Train 1 HTX JNG10AC001	18.1	0.000
35	ELEC	1BNT011BNB02	ELEC, Transformer 31BNT01 to 480V MCC 31BNB02 Circuit Breaker	17.2	0.000
36	ELEC	1BMB1BNT01	ELEC, 480V Load Center 31BMB to Transformer 31BNT01 Circuit Breaker	17.2	0.000
37	ELEC	31BRW12BUW13	ELEC, 24V DC I&C Power Rack 31BRW12/31BUW13	16.1	0.000
38	CCWS	30KAA10BB001	CCWS, Train 1 Surge Tank KAA10BB001	14.9	0.000
39	CCWS	30KAA10AA112	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112	13.3	0.000
40	ELEC	1BMT041BMD	ELEC, Transformer 31BMT04 to 480V Load Center 31BMD Circuit Breaker	13.3	0.000
41	ELEC	1BDD1BMT04	ELEC, 6.9kV SWGR 31BDD to Transformer 31BMT04 Circuit Breaker	13.3	0.000
42	UHS	30PED10AA010	UHS, Cooling Tower Train 1 Spray MOV PED10AA010	13.3	0.000

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 3 of 10

Rank	System US	Component ID	Component Desc	RAW	FV
43	UHS	30PED10AA011	UHS, Cooling Tower Train 1 Bypass Line MOV PED10AA011	13.3	0.000
44	CCWS	30KAA10AC001	CCWS, Train 1 HTX 10 KAA10AC001	13.3	0.000
45	ESWS	30PEB10AA002	ESWS, Train 1 Pump Recirc MOV PEB10AA002	13.3	0.000
46	ELEC	1BDA_1BDD2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	13.3	0.000
47	ELEC	1BDA_1BDD1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	13.3	0.000
48	ESWS	30PEB10AA005	ESWS, Train 1 Pump Discharge Isolation MOV, PEB10AA005	13.3	0.000
49	ESWS	30PEB10AA204	ESWS, Train 1 Pump Discharge Check Valve PEB10AA204	12.4	0.000
50	CCWS	30KAA10AA004	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004	12.4	0.000
51	UHS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	9.9	0.048
52	CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	9.8	0.059
53	SIS/RHR	30JNG10AP001	LHSI, Train 1 Motor Driven Pump JNG10AP001	9.6	0.074
54	SIS/RHR	30JNA10AA101	RHR, LHSI Train 1 HTX Bypass MOV JNA10AA101	9.6	0.030
55	UHS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	9.0	0.006
56	ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	7.8	0.279
57	ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	7.8	0.038
58	UHS	30PED30AA010	UHS, Cooling Tower Train 3 Spray MOV PED30AA010	7.8	0.038
59	CCWS	30KAA12AA011	CCWS, Train 1 from LHSI HTX 10 Cooling Manual Valve KAA12AA011	7.6	0.001
60	SCWS	30QKC10AA027	SCWS, LHSI Pump 10 Sealing Fluid Cooling Manual Valve QKC10AA027	7.6	0.001

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 4 of 10

Rank	System US	Component ID	Component Desc	RAW	FV
61	SCWS	30QKC10AA026	SCWS, LHSI Pump 10 Motor Cooling Manual Valve QKC10AA026	7.6	0.001
62	ELEC	31BUC	ELEC, 1E 250V DC Switchboard 31BUC	7.5	0.000
63	CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	7.2	0.023
64	RCS	30JEF10CP801	PZR pressure (NR) sensor	7.2	0.001
65	RCS	30JEF10CP803	PZR pressure (NR) sensor	7.2	0.001
66	RCS	30JEF10CP805	PZR pressure (NR) sensor	7.2	0.001
67	ELEC	33BTD01	ELEC, 250V 1E 2-hr Battery 33BTD01	7.2	0.003
68	SIS/RHR	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	7.1	0.049
69	IRWST	30JNK10AT001	IRWST, SIS Sump Strainer to MHSI/LHSI Train 1 Pumps JNK10AT001	6.9	0.003
70	SIS/RHR	30JNG13AA005	LHSI, MHSI/LHSI Train 1 First SIS Isolation Check Valve JNG13AA005	6.3	0.009
71	ELEC	32BNB02	ELEC, 480V MCC 32BNB02	6.3	0.001
72	ELEC	33BRW52BUW53	ELEC, 24V DC I&C Power Rack BRW52/BUW53	5.7	0.000
73	ELEC	33BNB02	ELEC, 480V MCC 33BNB02	5.6	0.001
74	RCS	30JEB30AP001-BKR	ELEC, 13.8kV SWGR 33BDE Circuit Breaker to RCP JEB30AP001	5.5	0.011
75	CCWS	30KAA12AA012	CCWS, Train 1 from LHSI HTX 10 Discharge Check Valve KAA12AA012	5.4	0.000
76	RCS	30JEB40AP001-BKR	ELEC, 13.8kV SWGR 34BDE Circuit Breaker to RCP JEB40AP001	5.4	0.011
77	ELEC	34BDA	ELEC, 6.9kV SWGR 34BDA	5.4	0.000
78	SIS/RHR	30JNG10AA009	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009 (CIV)	5.3	0.000
79	SIS/RHR	30JNG10AA011	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA011	5.3	0.000
80	SCWS	30QKC10AA028	SCWS, Train 1 Discharge of LHSI Pump Seal Cooler Check Valve QKC10AA028	5.3	0.000
81	SIS/RHR	30JNG10AA004	LHSI, Train 1 Min Flow MOCV JNG10AA004	5.3	0.000

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 5 of 10

Rank	System US	Component ID	Component Desc	RAW	FV
82	ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	5.2	0.098
83	ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	5.2	0.023
84	UHS	30PED20AA010	UHS, Cooling Tower Train 2 Spray MOV PED20AA010	5.2	0.023
85	CCWS	30KAA30AA007	CCWS, Pump 30 Cooling Manual Valve KAA30AA007	5.1	0.001
86	CCWS	30KAA30AA005	CCWS, Discharge from CCW HTX 30 Manual Valve KAA30AA005	5.1	0.001
87	CCWS	30KAA30AA008	CCWS, Pump 30 Cooling Manual Valve KAA30AA008	5.1	0.001
88	CCWS	30KAA30AA011	CCWS, Pump 30 Suction from CCST Manual Valve KAA30AA011	5.1	0.001
89	CCWS	30KAA30AA018	CCWS, Pump 30 Discharge Manual Valve KAA30AA018	5.1	0.001
90	CCWS	30KAA30AA140	CCWS, Pump 30 Cooling Manual Valve KAA30AA140	5.1	0.001
91	CCWS	30KAA30AA015	CCWS, Pump 30 Suction Manual Valve KAA30AA015	5.1	0.001
92	ESWS	30PEB30AA009	ESWS, Train 3 Manual Valve PEB30AA009	5.1	0.001
93	ESWS	30PEB30AA029	ESWS, Train 2 Manual Valve PEB30AA029	5.1	0.001
94	ESWS	30PEB30AA007	ESWS, Train 3 Manual Valve PEB30AA007	5.1	0.001
95	ESWS	30PEB30AA027	ESWS, Train 2 Manual Valve PEB30AA027	5.1	0.001
96	ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	5.1	0.000
97	CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001	4.7	0.015
98	ELEC	32BUC	ELEC, 1E 250V DC Switchboard 32BUC	4.5	0.000
99	ELEC	33BRA	ELEC, 480V MCC 33BRA	4.5	0.000
100	UHS	30PED20AN001	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001	4.5	0.019

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
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Rank	System US	Component ID	Component Desc	RAW	FV
101	UHS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	4.5	0.019
102	CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	4.4	0.030
103	CCWS	30KAA22AA013	CCWS, Train 2 LHSI Pump Seal Cooler MOV KAA22AA013	4.4	0.019
104	SIS/RHR	30JNG20AP001	LHSI, Train 2 Motor Driven Pump JNG20AP001	4.3	0.026
105	SIS/RHR	30JNA20AA101	RHR, LHSI Train 2 HTX Bypass MOV JNA20AA101	4.3	0.012
106	ELEC	32BRW30BUW31	ELEC, 24V DC I&C Power Rack 32BRW30/32BUW31	4.3	0.000
107	ELEC	31BTD01	ELEC, 250V 1E 2-hr Battery 31BTD01	4.3	0.002
108	ELEC	33BDA	ELEC, 6.9kV SWGR 33BDA	3.9	0.000
109	ELEC	32BNT01	ELEC, Constant Voltage Transformer 32BNT01	3.9	0.000
110	ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	3.8	0.000
111	ELEC	34BMB	ELEC, 480V Load Center 34BMB	3.8	0.000
112	ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	3.8	0.000
113	SIS/RHR	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	3.7	0.022
114	CCWS	30KAA20AA008	CCWS, Pump 20 Cooling Manual Valve KAA20AA008	3.7	0.001
115	ESWS	30PEB20AA027	ESWS, Train 2 Manual Valve PEB20AA027	3.7	0.001
116	ESWS	30PEB20AA009	ESWS, Train 2 Manual Valve PEB20AA009	3.7	0.001
117	ESWS	30PEB20AA007	ESWS, Train 2 Manual Valve PEB20AA007	3.7	0.001
118	CCWS	30KAA20AA007	CCWS, Pump 20 Cooling Manual Valve KAA20AA007	3.7	0.001
119	CCWS	30KAA20AA140	CCWS, Pump 20 Cooling Manual Valve KAA20AA140	3.7	0.001
120	ESWS	30PEB20AA029	ESWS, Train 2 Manual Valve PEB20AA029	3.7	0.001

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
Sheet 7 of 10

Rank	System US	Component ID	Component Desc	RAW	FV
121	CCWS	30KAA20AA011	CCWS, Pump 20 Suction from CCST Manual Valve KAA20AA011	3.7	0.001
122	CCWS	30KAA20AA018	CCWS, Pump 20 Discharge Manual Valve KAA20AA018	3.7	0.001
123	CCWS	30KAA20AA015	CCWS, Pump 20 Suction Manual Valve KAA20AA015	3.7	0.001
124	CCWS	30KAA20AA005	CCWS, Discharge from CCW HTX 20 Manual Valve KAA20AA005	3.7	0.001
125	CCWS	30KAA22AA007	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA007	3.6	0.001
126	CCWS	30KAA22AA010	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA010	3.6	0.001
127	CCWS	30KAA22AA011	CCWS, Train 2 from LHSI HTX 20 Cooling Manual Valve KAA22AA011	3.6	0.001
128	CCWS	30KAA22AA116	CCWS, LHSI Pump 20 Motor Cooling Manual Valve KAA22AA116	3.6	0.001
129	CCWS	30KAA22AA127	CCWS, LHSI Pump 20 Sealing Fluid Cooling Manual Valve KAA22AA127	3.6	0.001
130	HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	3.4	0.001
131	HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	3.4	0.001
132	SIS/RHR	30JNG23AA005	LHSI, MHSI/LHSI Train 2 First SIS Isolation Check Valve JNG23AA005	3.4	0.007
133	IRWST	30JNK10AT002	IRWST, SIS Sump Strainer to MHSI/LHSI Train 2 Pumps JNK10AT002	3.2	0.002
134	ELEC	33BMT02	ELEC, 6.9kV-480V Transformer 33BMT02	3.2	0.000
135	ELEC	33BMB	ELEC, 480V Load Center 33BMB	3.2	0.000
136	ELEC	33BDB	ELEC, 6.9kV SWGR 33BDB	3.2	0.000
137	EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	3.2	0.068
138	ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	3.0	0.133
139	EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	3.0	0.062

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
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Rank	System US	Component ID	Component Desc	RAW	FV
140	ELEC	4BDA_4BDC1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	2.9	0.000
141	ELEC	4BDA_4BDC2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	2.9	0.000
142	EFWS	30LAR11AA103	EFWS, Train 1 SG Pressure Control MOV LAR11AA103	2.9	0.007
143	EFWS	30LAR11AA105	EFWS, Train 1 SG Level Control MOV LAR11AA105	2.9	0.007
144	ESWS	30PEB30AA204	ESWS, Train 3 Pump Discharge Check Valve, PEB30AA204	2.9	0.000
145	CCWS	30KAA30AA004	CCWS, Train 3 Discharge from CCW HTX 30 Check Valve KAA30AA004	2.8	0.000
146	ELEC	34BRA	ELEC, 480V MCC 34BRA	2.8	0.000
147	EFWS	30LAR21AA105	EFWS, Train 2 SG Level Control MOV LAR21AA105	2.8	0.006
148	EFWS	30LAR21AA103	EFWS, Train 2 SG Pressure Control MOV LAR21AA103	2.8	0.006
149	ELEC	BDT01	ELEC, Aux Transformer 30BDT01	2.8	0.000
150	CLCWS	30PGB19AA191	CLCWS, Safety Valve PGB19AA191	2.8	0.000
151	EFWS	30LAR11CF801	EFW pump 1 discharge flow sensor	2.7	0.005
152	ELEC	34BNT01	ELEC, Constant Voltage Transformer 34BNT01	2.7	0.000
153	ELEC	34BNB02	ELEC, 480V MCC 34BNB02	2.7	0.000
154	EFWS	30LAR21CF801	EFW pump 2 discharge flow sensor	2.6	0.005
155	HVAC	30SAC01AA004	SAC, Div 1 Recirculation Motor Operated Damper SAC01AA004	2.6	0.000
156	SCWS	30QKC10AA101	SCWS, Return from SAC Div 1 MOV QKC10AA101	2.6	0.000
157	EFWS	30LAR11AA001	EFWS, Train 1 Pump Suction Manual Valve LAR11AA001	2.5	0.000
158	ESWS	30PEB20AA204	ESWS, Train 2 Pump Discharge Check Valve, PEB20AA204	2.5	0.000
159	EFWS	30LAR21AA001	EFWS, Train 2 Pump Suction Manual Valve LAR21AA001	2.5	0.000
160	ELEC	33BNT01	ELEC, Constant Voltage Transformer 33BNT01	2.5	0.000

Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW Importance - Level 1 Internal Fire Events
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Rank	System US	Component ID	Component Desc	RAW	FV
161	SIS/RHR	30JNG20AA004	LHSI, Train 2 Min Flow MOCV JNG20AA004	2.5	0.000
162	SIS/RHR	30JNG20AA011	LHSI, LHSI Pump 20 Discharge Check Valve JNG20AA011	2.5	0.000
163	CCWS	30KAA22AA014	CCWS, Train 2 Discharge of LHSI Pump Seal Cooler Check Valve KAA22AA014	2.5	0.000
164	SIS/RHR	30JNG20AA009	LHSI, LHSI Pump 20 Discharge Check Valve JNG20AA009 (CIV)	2.5	0.000
165	CCWS	30KAA22AA012	CCWS, Train 2 Discharge of LHSI HTX Check Valve KAA22AA012	2.5	0.000
166	CCWS	30KAA20AA004	CCWS, Train 2 Discharge from CCW HTX 20 Check Valve KAA20AA004	2.5	0.000
167	ELEC	33BRW50BUW51	ELEC, 24V DC I&C Power Rack 33BRW50/33BUW51	2.5	0.000
168	CCWS	30KAB30AA191	CCWS, RCP Thermal Barrier to CCWS CH1 Return Safety Valve KAB30AA191	2.4	0.000
169	CCWS	30KAB60AA191	CCWS, CVCS HP Cooler 1 Return Safety Valve KAB60AA191	2.4	0.000
170	CCWS	30KAB10AA192	CCWS, CCWS CH1 Return Safety Valve KAB10AA192	2.4	0.000
171	CCWS	30KAB10AA193	CCWS, FPCS Train 1 Cooling Header Safety Valve KAB10AA193	2.4	0.000
172	CCWS	30KAA10AP006A	CCWS, Hydraulic Valve KAA10AA006 Hydraulic Pump KAA10AP006A	2.3	0.001
173	CCWS	30KAA10AP010A	CCWS, Hydraulic Valve KAA10AA010 Hydraulic Pump KAA10AP010A	2.3	0.001
174	ELEC	BDT01_1BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 31BDA Circuit Breaker	2.2	0.001
175	MSS	30LCS71AC001	FW HP, Reheat 2 Condensate Cooler 1 LCS71AC001	2.1	0.000
176	FWS	30LAD72AC001	FWS, HP Heater LAD72AC001	2.1	0.000
177	FWS	30LAD71AC001	FWS, HP Heater LAD71AC001	2.1	0.000
178	FWS	30LAD62AC001	FWS, HP Heater LAD62AC001	2.1	0.000
179	FWS	30LAD61AC001	FWS, HP Heater LAD61AC001	2.1	0.000

**Table 19.1-68—U.S. EPR Risk-Significant Components based on RAW
Importance - Level 1 Internal Fire Events
Sheet 10 of 10**

Rank	System US	Component ID	Component Desc	RAW	FV
180	MSS	30LCS72AC001	FW HP, Reheat 2 Condensate Cooler 2 LCS72AC001	2.1	0.000
181	EFWS	30LAR11AA002	EFWS, Train 1 Pump Discharge Check Valve LAR11AA002	2.1	0.000
182	EFWS	30LAR11AA007	EFWS, Train 1 Check Valve (Containment) LAR11AA007	2.1	0.000
183	EFWS	30LAR21AA007	EFWS, Train 2 Containment Check Valve LAR21AA007	2.1	0.000
184	EFWS	30LAR21AA002	EFWS, Train 2 Pump Discharge Check Valve LAR21AA002	2.1	0.000
185	SIS/RHR	30JNG30AC001	LHSI, LHSI Train 3 HTX JNG30AC001	2.0	0.000
186	ELEC	33BDD	ELEC, 6.9kV SWGR 33BDD	2.0	0.000
187	ELEC	33BMD	ELEC, 480V Load Center 31BMD	2.0	0.000
188	ELEC	33BMT04	ELEC, 6.9kV-480V Transformer 33BMT04	2.0	0.000

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

Rank	Basic Event	Description	Nominal Value	FV	RAW
1	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	0.284	7.8
2	OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	7.0E-05	0.138	1,970.1
3	OPF-XTIE BC	Operator Fails to Align Backup Battery Charger to BUC Bus	5.0E-01	0.027	1.0
4	OPF-RCP-10M	Operator Fails to Trip RCPs on a Loss of Seal Injection	6.0E-02	0.010	1.2
5	OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	5.5E-05	0.008	147.4
6	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.2E-02	0.008	1.6
7	OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBO DGs During Non-SBO Conditions	1.0E-01	0.006	1.1

Table 19.1-70—U.S. EPR Risk-Significant Human Actions based on RAW Importance - Level 1 Internal 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	1,970.1	0.138
2	OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	5.5E-05	147.4	0.008
3	OPF-EFW-6H	Operator Fails to Manually Align EFW Tanks Within 6 Hrs	2.0E-05	42.3	0.001
4	OPF-RCP-30M	Operator Fails to Trip RCPs on a Loss of Bearing Cooling	4.0E-02	7.8	0.284
5	OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	3.8E-04	3.6	0.001

Table 19.1-71—U.S. EPR Risk-Significant Common Cause Events based on RAW Importance - Level 1 Internal Fire Events
Sheet 1 of 2

Rank	System	ID	Description	Normal Value	RAW
1	EFWS	LAS11AP001EFS/FR_D-ALL	CCF of EFWS Pumps to Start/Run	1.0E-05	984.3
2	ESWS	PED10AN002EFS/FR_F-ALL	CCF to Start/Run Standby Cooling Tower Fans (At Power)	3.3E-05	912.8
3	ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	1.6E-07	631.5
4	SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	4.1E-06	368.5
5	CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	289.0
6	IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-06	274.4
7	SIS/RHRS	JNG10AP001EFS/FR_D-ALL	CCF of LHSI Pumps to Start/Run	1.7E-06	259.8
8	SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	232.7
9	MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	4.6E-05	209.9
10	SIS/RHRS	JNA10AA001EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	146.9
11	HVAC	SAC01/31AN001EFR_B-ALL	CCF to Run Normal Air Supply/Exhaust Fans (Trains 1 & 4)	5.1E-06	65.3
12	ESWS	PEB10AA204CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	4.5E-07	63.2
13	ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	8.1E-05	62.5
14	CCWS	KAA20AP001EFS_B-ALL	CCF of CCWS Pumps 2 and 3 to Start (Standby)	5.5E-05	57.5
15	ELEC	XKA10____DFR/FS_D-ALL	CCF of EDGs to Run/Start	1.0E-04	53.5
16	ESWS	PEB10AP001EFR_B-ALL	CCF of ESWS Pumps 1 and 4 to Run (Normally Running)	1.9E-06	44.2

Table 19.1-71—U.S. EPR Risk-Significant Common Cause Events based on RAW Importance - Level 1 Internal Fire Events
Sheet 2 of 2

Rank	System	ID	Description	Normal Value	RAW
17	ESWS	PEB20AP001EFR_B-ALL	CCF of ESWS Pumps 2 and 3 to Run (Standby)	1.9E-06	41.9
18	CCWS	KAA20AP001EFR_B-ALL	CCF of CCWS Pumps 2 and 3 to Run (Standby)	9.6E-07	34.8
19	CCWS	KAA10AP001EFR_B-ALL	CCF of CCWS Pumps 1 and 4 to Run (Normally Running)	9.6E-07	29.7

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

Rank	ID	Description	Nominal Value	RAW
1	SG LVL CCG	Common Cause Failure of the SG Level Sensors (32)	4.9E-08	14,552.0
2	SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	1,068.4
3	EFW FLOW CCF-ALL	CCF of EFW pump discharge flow sensors	2.7E-06	957.8
4	I/O MOD CCF	I/O Module Common Cause Failure	6.5E-06	675.4
5	ALU/APU NS-ALL	CCF of ALU and APU Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	601.0
6	ALU/APU SM-ALL	CCF of ALU and APU Protection System Computer Processors (Self-Monitored)	9.0E-08	540.5
7	CL-TXS-OSCCF	CCF of TXS Operating System or Other Common Software	1.0E-07	540.5
8	SG PRESS CCG	Common Cause Failure of the SG Pressure Sensors (16)	2.5E-08	506.4
9	CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	1.0E-05	211.6
10	CL-PS-A-SWCCF	CCF of Protection System Diversity Group A Application Software	1.0E-05	73.2
11	CL-PS-EDG-SWCCF	CCF of EDG Start Function in PS Diversity Groups A&B Software	1.0E-05	47.9
12	BUS UV CCF-ALL	CCF of 6.9KV bus undervoltage sensors	4.3E-06	43.6

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

Rank	ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters					
1	RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	2.0E-01	0.462	2.8
2	SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	1.0E-01	0.330	4.0
3	FIRE SAB14 - DC	Percentage of Fires in SAB 4 DC Room	2.0E-01	0.134	1.5
4	PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.117	1.5
5	CVCS VCT	CVCS Switchover to IRWST is required	1.0E-01	0.104	1.9
6	MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	5.0E-01	0.027	1.0
7	MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	1.0E-01	0.027	1.2
8	SUP UHS NS	Failure of the Ultimate Heat Sink (Non-Safety)	2.8E-05	0.000	2.1
9	1MV-FTO	Failure of Any EFW X-Tie MV to Open (Disabling Connection to One EFW Tank)	4.0E-05	0.000	5.7
Maintenance Parameters					
1	CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	1.0E-01	0.232	3.1
2	EDG PM3	EDG Train 3 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.106	3.0
3	CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	1.0E-01	0.068	1.6
4	LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	5.0E-02	0.051	2.0
5	CLF-APUB1-PM	Division 2 APU B1 in Preventive Maintenance	3.0E-02	0.033	2.1
6	CLE-APUB1-PM	Division 1 APU B1 in Preventive Maintenance	3.0E-02	0.033	2.1
7	CLG-APUB1-PM	Division 3 APU B1 in Preventive Maintenance	3.0E-02	0.032	2.0
8	LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	5.0E-02	0.017	1.3
9	EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	5.0E-02	0.014	1.3

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

Rank	ID	Description	Nominal Value	FV	RAW
10	EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	5.0E-02	0.006	1.1
Offsite Power Related Events					
1	LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for Fire IEs Leading to a Controlled Shutdown	3.6E-04	0.033	93.5
2	LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.013	8.1
3	LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.003	68.7

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

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			
	1b	EDGs & SBODGs in the same CC group	1.8E-07	1%
2	LOOP Assumptions			
	2a	No Credit was given for LOOP recoveries (DG MT also set back to 24 hours)	1.9E-07	7%
	2b	DG Mission Time set to 24 hours	1.9E-07	7%
	2c	SBO DG Mission Time set to 18 hours	1.8E-07	0%
	2d	Consequential LOOP events were not considered	1.7E-07	-4%
3	Assumptions on Electrical Dependencies			
	3a	MSRT Realignment to One Power Train per Train	1.4E-07	-22%
	3b	For CVCS seal injection, assume that a switchover from the VCT to the IRWST is always required (Div1 & Div4 required)	3.6E-07	97%
	3c	UHS 4 assumed unavailable during SBO Conditions (no credit for SBO x-tie for dedicated ESW)	1.8E-07	0%
4	Assumptions on HVAC Recoveries			
	4a	Room heat-up was not considered	1.8E-07	-1%
	4b	Operator recovery of HVAC not credited	6.4E-07	250%
5	Sensitivity to HEPs Values			
	5a	All HEPs Set to 5% Value	8.8E-08	-52%
	5b	All HEPs Set to 95% Value	6.4E-07	250%

Table 19.1-74—U.S. EPR Level 1 Fire 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	2.7E-07	50%
	6b	RCP Seal LOCA Probability - 0.5	2.2E-07	18%
	6c	RCP Seal LOCA Probability - 0.1	1.7E-07	-6%
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 2 assumed to be in Preventive Maintenance for all year	2.4E-07	32%
	8b	W/o Preventive Maintenance	8.5E-07	-53%
9	I&C Software and Hardware Common Cause			
	9a	Increase I&C CC parameters by factor of 10; include operator dependency	2.2E-07	20%
	9b	Increase I&C CC parameters by factor of 100	2.9E-07	60%
10	Physical Separation of Non-safety Cables			
	10	Fire in CSR kills Safety Train 4 and all Non-Safety Divisions	1.8E-07	0%
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	1.8E-07	-4%
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	3.2E-07	77%
	12b	MSIV3 and MSIV4 assumed to be separated by a fire barrier, for a fire in MFW/MS Valve Room	1.8E-07	-3%

Table 19.1-75—Level 2 Fire Events Release Category Results - LRF
Sheet 1 of 3

Internal Fire Release Category	Description	Internal Fire RC Frequency	Contribution to Internal Fire LRF	Conditional Containment Failure Probability
RC201	Containment fails before vessel breach due to isolation failure, melt retained in vessel	4.39E-11	0.60%	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 spray	1.02E-14	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 spray	1.85E-10	2.54%	0.0010
RC204	Containment fails before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex vessel with containment spray	2.97E-14	0.00%	0.0
RC205	Containment failures before vessel breach due to isolation failure, melt released from vessel, without MCCI, melt flooded ex vessel without containment spray	2.22E-09	30.60%	0.0122
RC206	Small containment failure due to failure to isolate 2" or smaller lines	1.95E-08	n/a	0.1067
RC301	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, with containment spray	5.47E-14	0.00%	0.0
RC302	Containment fails before vessel breach due to containment rupture, with MCCI, melt not flooded ex vessel, without containment spray	2.80E-12	0.04%	0.0

Table 19.1-75—Level 2 Fire Events Release Category Results - LRF
Sheet 2 of 3

Internal Fire Release Category	Description	Internal Fire RC Frequency	Contribution to Internal Fire LRF	Conditional Containment Failure Probability
RC303	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, with containment spray	5.44E-12	0.07%	0.0
RC304	Containment fails before vessel breach due to containment rupture, without MCCI, melt flooded ex vessel, without containment spray	6.88E-11	0.95%	0.0004
RC401	Containment failures after breach and up through debris quench due to containment rupture, with MCCI, without debris flooding, with containment spray	7.63E-14	0.00%	0.0
RC402	Containment failures after breach and up through debris quench due to containment rupture, with MCCI, without debris flooding, without containment spray	1.52E-11	0.21%	0.0001
RC403	Containment failures after breach and up through debris quench due to containment rupture, without MCCI, with debris flooding, with containment spray	2.26E-11	0.31%	0.0001
RC404	Containment failures after breach and up through debris quench due to containment rupture, without MCCI, with debris flooding, without containment spray	1.03E-09	14.20%	0.0056
RC501	Long term containment failure after debris quench due to rupture, with MCCI, without debris flooding, with containment spray	1.35E-13	n/a	0.0
RC502	Long term containment failure after debris quench due to rupture, with MCCI, without debris flooding, without containment spray	6.30E-11	n/a	0.0003

Table 19.1-75—Level 2 Fire Events Release Category Results - LRF
Sheet 3 of 3

Internal Fire Release Category	Description	Internal Fire RC Frequency	Contribution to Internal Fire LRF	Conditional Containment Failure Probability
RC503	Long term containment failure after debris quench due to rupture, without MCCI, with debris flooding, with containment spray	1.32E-10	n/a	0.0007
RC504	Long term containment failure after debris quench due to rupture, without MCCI, with debris flooding, without containment spray	2.07E-08	n/a	0.1130
RC601	Long term containment failure due to basemat failure, without debris flooding, with containment sprays	0.00E+00	n/a	0.0
RC602	Long term containment failure due to basemat failure, without debris flooding, without containment spray	5.33E-09	n/a	0.0291
RC701	Steam Generator Tube Rupture with Fission Product Scrubbing	0.00E+00	n/a	0.0
RC702	Steam Generator Tube Rupture without Fission Product Scrubbing	3.67E-09	50.47%	0.0201
RC801	Interfacing System LOCA with Fission Product Scrubbing	0.00E+00	n/a	0.0
RC802	Interfacing System LOCA without Fission Product Scrubbing but with building deposition credited	0.00E+00	0.00%	0.0
Fire LRF:		7.27E-09	100.00%	0.0398
RS Fire LRF:		7.27E-09		

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC201	2.60E-11	0.36%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables partial cooldown and operator fails to initiate feed and bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> Sequence enters CET LO PRESSURE Depressurization is failed due to a loss of electrical Divisions 1 and 4 Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure In-vessel recovery is successful leading to RC201
			L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS, SL cases.	
			L2PH INVREC(S-DEP)=Y	In-vessel recovery success - hot leg rupture or operator depressurization during seal/ small LOCA DES	
			L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	
RC202	8.55E-15	0.00%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: A fire in the pressurizer compartment induces a small LOCA. PCD signal fails due to SW CCF. The bleed function is disabled by the fire.
			CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			DAS-PS-BETA-CNMT	Beta factor for SWCCF between PS and DAS containment isolation functions	Level 2: <ul style="list-style-type: none"> • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of I&C signal and failure of operator backup manual signal followed by a containment annulus venting failure. • no pit overpressure failure in case where complete circumferential failure of the vessel does not occur • dependent operator failure to open the MOVs on the passive flooding lines leading to significant MCCI (debris not flooded) • SAHRS sprays are successful
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
			OPD-L2-SAHRSPF-HIGH	Operator fails to open MOVs to enable passive cooling -high dependency	
			OPF-L2-CI-30M	Operators Fails to Initiate Manual Containment Isolation Signal	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	2.23E-11	0.31%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure no pit overpressure failure in case where complete circumferential failure of the vessel does not occur Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays significant MCCI occur following failure of the MOVs on the passive flooding lines to open
			JMQ42AA005FFO	SAHR, Melt Spreading Area Flood Valve JMQ42AA005, Fails to Open on Demand	
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)				

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	5.64E-13	0.01%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure in case where complete circumferential failure of the vessel does not occur • Loss of electrical Divisions 1 and 4 leads failure of SAHRS sprays • significant MCCI occurs with successful opening of the MOVs on the passive flooding lines (residual probability of the phenomena to occur with adequate system function)
			L2PH CCI	Level 2 phenomena: significant MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	3.93E-13	0.01%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables partial cooldown and operator fails to initiate feed and bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Sequence enters CET LO PRESSURE • Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure following ex-vessel steam explosion • Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays • significant MCCI occur due to operator failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS,SL cases.	
			L2PH INVREC(S-DEP)=N	In-vessel recovery fails - hot leg Rupture or operator depressurization during seal/ small LOCA DES	
			L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			OPD-L2-SAHRSPF-LOW	Operator fails to open MOVs to enable passive cooling - low dependency	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

**Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	5.66E-12	0.08%	IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	Level 1: A fire in the switchgear building fails all non-safety power, disabling MFW, SSS, PDVs. The loss of HVAC in Safeguard Buildings 1 & 4 disables the running CCWS trains. Operator fails to switch to standby CCW trains causing total loss of HVAC.
			OPF-CCWS TR SO	Operator Fails to Switch CH Supply to Standby CCW Train Before A Loss of the Running Train	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			SAC31AN001EFR_B-ALL	CCF to Run Normal Air Exhaust Fans (Trains 1 & 4)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> Sequence enters CET LO PRESSURE Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure no pit overpressure failure following ex-vessel steam explosion Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	
RC203	6.56E-13	0.01%	IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	Level 1: A fire in the switchgear building fails all non-safety power, disabling MFW, SSS, PDVs and fails the 2 SBODGs. Consequential LOOP and CCF of all EDGs causes a total stations blackout (loss of all AC power)
			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 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Sequence enters CET LO PRESSURE • Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure following ex-vessel steam explosion • Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays • significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	4.79E-12	0.07%	IE FIRE-XF YARD	Initiator - Fire in the Transformer Yard	Level 1: A fire in the transformer yard disables normal supply to safety divisions 1 & 3 and failure of 1E 2-hr batteries disables fast transfer to alternate supply. Failure to recover HVAC disables division 2 which results in failure of I&C.
			BTD01_BAT__ST_D-134	CCF of Safety Related Batteries on Demand	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> Sequence enters CET LO PRESSURE Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure no pit overpressure failure following ex-vessel steam explosion Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)				

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	5.16E-12	0.07%	IE FIRE-SAB-MECH	Initiator - Fire in the Pump Room of Any Safeguard Building	Level 1: A fire in the pump room of safeguard building, disables all pumps in Div. 4. Failure of div 1 exhaust fan causes loss of HVAC in div 1. Failure of operator to switch to standby CCW trains upon loss of the running trains causes total loss of HVAC.
			OPF-CCWS TR SO	Operator Fails to Switch CH Supply to Standby CCW Train Before A Loss of the Running Train	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			SAC05 PM5	Maintenance SAC Safety System Train 5 Unavailable due to Preventive Maintenance	
			SAC31AN001EFR_B-ALL	CCF to Run Normal Air Exhaust Fans (Trains 1 & 4)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> ● Sequence enters CET LO PRESSURE ● Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence ● Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure ● no pit overpressure failure following ex-vessel steam explosion ● Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays ● significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	1.12E-12	0.02%	IE FIRE-SAB23-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 2 (or 3)	Level 1: A fire in switchgear room of Safeguard Building 2 disables electrical division 2 and, because of EDG maintenance alignment, electrical division 1. Failure of HVAC supply fan with maintenance train unavailable results in loss of HVAC to division 4 and failure of running CCWS pump. Operator fails to switch to standby CCW pump causing loss of CH2 and total loss of HVAC.
			EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance (Alt. Feed Alignment)	
			OPF-CCWS TR SO	Operator Fails to Switch CH Supply to Standby CCW Train Before A Loss of the Running Train	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	
			SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	
			SAC08 PM8	Maintenance SAC Safety System Train 8 Unavailable due to Preventive Maintenance	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Sequence enters CET LO PRESSURE • Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure following ex-vessel steam explosion • Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays • significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC203	3.02E-13	0.00%	IE FIRE-CSR	Initiator - Fire in the Cable Spreading Room (Room Under Main Control Room)	Level 1: A fire in the cable spreading room disables all the control power and I&C for division 4. With a consequential LOOP and the failure of the division 1 1E 2-hr battery prevents the starting of EDG 1 and the fire prevents the starting of EDG 4. With the loss of power to the running CCWS trains, a switchover to the standby CCW trains is required but unavailable due to the loss of power. This results in a total loss of HVAC.
			31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	
			LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	
			OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> Sequence enters CET LO PRESSURE Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure no pit overpressure failure following ex-vessel steam explosion Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays significant MCCI occur due electrical failure to open the MOVs on the passive flooding lines
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	
			L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	
RC204	1.71E-14	0.00%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: A fire in the pressurizer compartment induces a small LOCA. PCD signal fails due to SW CCF. The bleed function is disabled by the fire.
			CL-PS-B-SWCCF	CCF of Protection System Diversity Group B Application Software	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			DAS-PS-BETA-CNMT	Beta factor for SWCCF between PS and DAS containment isolation functions	Level 2: <ul style="list-style-type: none"> • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of I&C signal and failure of operator backup manual signal followed by a containment annulus venting failure. • no pit overpressure failure in case where complete circumferential failure of the vessel does not occur • Successful opening of the MOVs on the passive flooding lines • SAHRS sprays are successful
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
			OPF-L2-CI-30M	Operators Fails to Initiate Manual Containment Isolation Signal	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC205	2.11E-09	29.05%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			31BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> ● Sequence enters CET LO PRESSURE with successful depressurization ● Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure ● no pit overpressure failure in case where complete circumferential failure of the vessel does not occur ● Loss of electrical Divisions 1 and 4 leads failure of SAHRS sprays ● No MCCI occurs with successful opening of the MOVs on the passive flooding lines
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC205	1.75E-11	0.24%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			31BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • High pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • containment failure due to vessel rocketing in high pressure scenarios following complete vessel breach • No pit overpressure failure in case where complete circumferential failure of the vessel does not occur • Loss of electrical Divisions 1 and 4 leads failure of SAHRS sprays • No MCCI occurs with successful opening of the MOVs on the passive flooding lines Note: in this case two different containment failures are modeled (containment isolation and containment rupture) and the sequence led to containment rupture, because the source term is more conservative.
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC205	2.39E-11	0.33%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables partial cooldown and operator fails to initiate feed and bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> ● Low pressure sequence ● Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence ● Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure ● no pit overpressure failure following ex-vessel steam explosion ● Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays ● No MCCI with successful opening of the MOVs on the passive flooding lines ● In-vessel recovery failed due to phenomenological process
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS, SL cases.	
			L2PH INVREC(S-DEP)=N	In-vessel recovery fails - hot leg Rupture or operator depressurization during seal/ small LOCA DES	
			L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC205	7.71E-13	0.01%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables partial cooldown and operator fails to initiate feed and bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Low pressure sequence • Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure following ex-vessel steam explosion • Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays • No MCCI with successful opening of the MOVs on the passive flooding lines • Operator failed to enter OSSA and start safety injection
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS,SL cases.	
			L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			OPD-L2-ENTEROSSA-LOW	Operator Fails to Enter OSSA - low dependency	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC205	5.40E-13	0.01%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 31BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 31BRA in addition to the loss of Div. 4 disables partial cooldown and operator fails to initiate feed and bleed.
			31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	
			OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
			JMM23 01/02 SCFL	Probability that Secondary Containment/Annulus Venting Fails	Level 2: <ul style="list-style-type: none"> • Low pressure sequence • Hot leg rupture occurs precluding creep induced SGTR and leading to a low pressure sequence • Large containment isolation failure because the leak off system lines are open and fail to close due to loss of electrical Divisions 1 and 4 followed by a containment annulus venting failure • no pit overpressure failure following ex-vessel steam explosion • Loss of electrical Divisions 1 and 4 leads to failure of SAHRS sprays • No MCCI with successful opening of the MOVs on the passive flooding lines • Operator failed to start safety injection to cool corium and complete
			L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	
			L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS,SL cases.	
			L2PH ISGTR-SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	
			OPF-L2-STRTSIHLR-4H	Operator fails to start SI to cool corium in-vessel following Induced Hot Leg Rupture	
			P JMM23 01/02 OP-P	Probability that Leak Off System Line JMM23 is Open (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC301	3.67E-14	0.00%	IE FIRE-MS-VR	Initiator - Fire in One of Two MF/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 to open due to the fire leading to two steam generators to blow down simultaneously. Then failure to align RHR leads to core damage.
			MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	
			MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	
			OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Very early containment failure due to hydrogen flame acceleration loads ● Extensive MCCI with failed basemat flooding due to failure of operator to open the MOVs on basemat flooding ● No ex-vessel steam explosion pit failure ● Operator failures to open the MOVs on the passive flooding lines and failure to start LHSI in-vessel cooling ● Successful SAHRS sprays
			L2PH STMEXP EXV=N	Level 2 Phenomena: Steam explosion avoided in dry pit sequences	
			L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	
			OPD-L2-SAHRSPF-LOW	Operator fails to open MOVs to enable passive cooling - low dependency	
			OPD-L2-STRTSI-HIGH	Operator fails to start LHSI for in-vessel cooling - high dependency	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC302	3.91E-13	0.01%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH STM EXP INV HP	Level 2 phenomena: containment failure due to in-vessel steam explosion. High pressure CET sequences	Level 2: <ul style="list-style-type: none"> High pressure sequence Very early failure of containment due to in-vessel steam explosion
RC303	6.30E-13	0.01%	IE FIRE-MS-VR	Initiator - Fire in One of Two MF/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 to open due to the fire leading to two steam generators to blow down simultaneously. Then failure to align RHR leads to core damage.
			MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	
			MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	
			OPE-RHR-L12H	Operator Fails to Initiate RHR (Longer than 12 Hours)	
			L2PH INVREC(T-DEP)=Y	In-vessel recovery success - hot leg rupture or operator depressurization during transient CDES	Level 2: <ul style="list-style-type: none"> High pressure sequence Very early failure of containment due to flame acceleration loads In-vessel recovery successful
			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	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC304	1.59E-11	0.22%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Very early failure of containment due to flame acceleration loads ● No pit overpressure failure without complete circumferential failure of the vessel ● No significant MCCI
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	
			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	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC401	8.76E-15	0.00%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: 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	
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to vessel rocketing ● No pit overpressure failure with complete circumferential failure of the vessel ● Successful SAHRS sprays
			L2PH CCI	Level 2 phenomena: significant MCCI, no system failures	
			L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC402	5.46E-13	0.01%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			JMQ42AA005FFO	SAHR, Melt Spreading Area Flood Valve JMQ42AA005, Fails to Open on Demand	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to vessel rocketing ● No pit overpressure failure with complete circumferential failure of the vessel ● Successful SAHRS sprays ● Significant MCCI with failed passive flooding flood valves
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	
			L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	
L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs				

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC403	1.07E-11	0.15%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: 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	
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to vessel rocketing ● No pit overpressure failure with complete circumferential failure of the vessel ● Successful SAHRS sprays ● No significant MCCI with successful passive flooding flood valves
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	2.52E-10	3.47%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to vessel rocketing ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	3.63E-11	0.50%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH EARLYCF DEF(H)L	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case. - leak	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early leak of containment at the time of vessel failure due to hydrogen deflagration ● No pit overpressure failure without complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	3.63E-11	0.50%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH EARLYCF FA(HP)	Loads from accelerated flame at vessel failure fails containment. High pressure case.	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to flame acceleration ● No pit overpressure failure without complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	1.66E-11	0.23%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH ERLYCF DCH(HP)L	Containment fails due to DCH loads at vessel failure - Leak	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early leak of containment at the time of vessel failure due to direct containment heating ● No pit overpressure failure without complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	1.16E-11	0.16%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH EARLYCF FA(HP)L	Loads from accelerated flame at vessel failure fails containment. High pressure case. leak	Level 2: <ul style="list-style-type: none"> • High pressure sequence • Early leak of containment at the time of vessel failure due to flame acceleration • No pit overpressure failure without complete circumferential failure of the vessel • No significant MCCI with successful passive flooding flood valves • Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	1.54E-12	0.02%	IE FIRE-MCR	Initiator - Fire in the Main Control Room	Level 1: A fire occurs in the MCR and the operator fails to evacuate and transfer control of the plant to the Remote Shutdown Station in time to prevent core damage.
			OPE-MCR-RSS-90M	Operator Fails to Transfer to the RSS in 90 Mins Given A MCR Fire	
			L2PH EARLYCF DEF(H)	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case.	Level 2: <ul style="list-style-type: none"> • High pressure sequence • Early failure of containment at the time of vessel failure due to hydrogen deflagration • No pit overpressure failure without complete circumferential failure of the vessel • No significant MCCI with successful passive flooding flood valves • Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	2.88E-10	3.97%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to circumferential vessel failure ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	2.47E-11	0.34%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2PH EARLYCF DEF(H)L	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case. - leak	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early leak of containment at the time of vessel failure due to hydrogen deflagration loads ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	2.47E-11	0.34%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2PH EARLYCF FA(HP)	Loads from accelerated flame at vessel failure fails containment. High pressure case.	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early failure of containment at the time of vessel failure due to hydrogen flame acceleration ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	8.58E-12	0.12%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2PH ERLYCF DCH(HP)L	Containment fails due to DCH loads at vessel failure - Leak	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early leak of containment at the time of vessel failure due to direct containment heating ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC404	6.00E-12	0.08%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is disabled by a loss of 32BRA. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. Loss of 32BRA in addition to the loss of Div. 4 disables both partial cooldown and feed & bleed.
			32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2PH EARLYCF FA(HP)L	Loads from accelerated flame at vessel failure fails containment. High pressure case. leak	Level 2: <ul style="list-style-type: none"> ● High pressure sequence ● Early leak of containment at the time of vessel failure due to hydrogen flame acceleration loads ● No pit overpressure failure with complete circumferential failure of the vessel ● No significant MCCI with successful passive flooding flood valves ● Failed SAHRS sprays
			L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	
			L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC702	7.31E-11	1.01%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: A fire in the pressurizer compartment induces a small LOCA. CCF of the common suction strainers results in the loss of all injection.
			JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	
			L2CP SS2"DIAM	Level 2 conditional probability: Seal LOCA has 2" diameter	Level 2: <ul style="list-style-type: none"> Creep induced steam generator rupture following a 2 inch diameter seal or small LOCA with a secondary depressurization
			L2PH ISGTR-SS2D=Y	Induced SGTR. 2" Seal LOCA (Pwr)	
RC702	5.09E-11	0.70%	IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	Level 1: A fire in the pressurizer compartment induces a small LOCA. CCF of the common suction strainers results in the loss of all injection.
			JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	
			L2CP SL0.6"DIAM	Level 2 conditional probability: Small LOCA has 0.6" diameter	Level 2: <ul style="list-style-type: none"> Creep induced steam generator rupture following a 0.6 inch diameter seal LOCA with a secondary depressurization
			L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC702	1.91E-10	2.63%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. CCF of the standby UHS fans results in the loss of CCW CH2 loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. The CCF of the standby UHS fans also results in the loss of injection and long term cooling of the IRWST.
			MHSI PM1	MHSI Train 1 Unavailable due to Preventive Maintenance	
			PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2CP SS2"DIAM	Level 2 conditional probability: Seal LOCA has 2" diameter	
			L2PH ISGTR-SS2D=Y	Induced SGTR. 2" Seal LOCA (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
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Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC702	1.00E-10	1.38%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. CCF of the standby UHS fans results in the loss of CCW CH2 loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. The CCF of the standby UHS fans also results in the loss of injection and long term cooling of the IRWST.
			MHSI PM1	MHSI Train 1 Unavailable due to Preventive Maintenance	
			PED10AN002EFS_F-ALL	CCF to Start Standby Cooling Tower Fans (At Power)	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2CP SL0.6"DIAM	Level 2 conditional probability: Small LOCA has 0.6" diameter	
			L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 50 of 51

Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC702	2.34E-10	3.22%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is maintenance. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. CCF of the common discharge injection valve results in the loss of all injection.
			CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	
			JNG13AA005CFO_D-123	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2CP SS2"DIAM	Level 2 conditional probability: Seal LOCA has 2" diameter	
			L2PH ISGTR-SS2D=Y	Induced SGTR. 2" Seal LOCA (Pwr)	

Table 19.1-76—Level 2 Fire Events Significant Cutsets and Sequences
Sheet 51 of 51

Release Category	Freq/yr	Contribution to LRF (%)	Event Identifier	Event Description	Sequence of events that lead to CD and to Containment Failure
RC702	1.29E-10	1.78%	IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	Level 1: Fire in switchgear rooms of Safeguard Building 4 disables electrical Div. 4. Loss of running CCW Div. 4 requires switchover to the standby CCW pump which is maintenance. These failures lead to a loss of CCW CH2 and a loss of cooling to the RCP pumps 3 & 4 motor bearings requiring the pumps to trip. The trip is disabled by a fire in the area and failure to trip RCP pump supply breaker in the SWGR building results in a RCP pump seal LOCA. CCF of the common discharge injection valve results in the loss of all injection.
			CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	
			JNG13AA005CFO_D-123	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	
			RCP TRIP - FIRE	RCP Failure to Trip - Fire Related	
			SWGR RCP BRK	Failure to Trip Breakers in Switchgear Building.	
			L2CP SL0.6"DIAM	Level 2 conditional probability: Small LOCA has 0.6" diameter	
			L2PH ISGTR-SS0.6D=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	3.9E-09	54.1%
SSD	2.6E-09	35.6%
TR	5.8E-10	8.0%
SLD	1.4E-10	1.9%
SL	1.8E-11	0.3%
TRD	9.6E-12	0.1%
AT	2.6E-15	0.0%
Total	7.3E-09	100%

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

Flood IE	Description	Frequency	LRF (1/yr)	Contribution (Total)
IE FIRE-SAB14-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 1 (or 4)	2.5E-03	6.4E-09	88%
IE FIRE-MCR	Initiator - Fire in the Main Control Room	3.6E-04	3.7E-10	5%
IE FIRE-PZR	Initiator - Fire in the Pressurizer Compartment With Spurious Opening of 1 PSRV	2.0E-02	1.8E-10	2%
IE FIRE-SAB-MECH	Initiator - Fire in the Pump Room of Any Safeguard Building	1.9E-05	1.6E-10	2%
IE FIRE-SWGR	Initiator - Fire in the Switchgear Building	3.1E-03	7.8E-11	1%
IE FIRE-ESW	Initiator - Fire in the Essential Service Water Pump Building	1.4E-02	7.1E-11	1%
IE FIRE-SAB23-ELEC	Initiator - Fire in Switchgear Room of Safeguard Building 2 (or 3)	2.5E-03	2.2E-11	<1%
IE FIRE-MS-VR	Initiator - Fire in One of Two MF/MS Valve Rooms With Spurious Opening of 1 MSRV	5.2E-04	9.7E-12	<1%
IE FIRE-XF YARD	Initiator - Fire in the Transformer Yard	7.2E-03	9.4E-12	<1%
IE FIRE-CSR	Initiator - Fire in the Cable Spreading Room (Room Under Main Control Room)	4.2E-04	5.1E-12	<1%
IE FIRE-BATT	Initiator - Fire in One of the Four Battery Rooms	1.1E-03	1.1E-12	<1%
IE FIRE-TB	Initiator - Fire in the Turbine Building	4.1E-03	5.6E-13	<1%
IE FIRE-FB	Initiator - Fire in the Fuel Building	5.0E-03	8.1E-14	<1%
		Total	7.3E-09	100%

Table 19.1-79—U.S. EPR Risk-Significant Phenomena Based on FV Importance - Level 2 Internal Fires
Sheet 1 of 2

Rank	ID	Description	Nominal Value	FV	RAW
1	L2PH NO CCI	Level 2 phenomena: NO MCCI, no system failures	1.0E+00	0.461	1.0
2	L2PH PF-VF NO-CBV=N	Level 2 phenomena. Pit overpressure failure (not CBV case)	1.0E+00	0.353	1.0
3	L2PH ISGTR-SS2D=Y	Induced SGTR. 2" Seal LOCA (Pwr)	7.9E-01	0.300	1.1
4	L2PH ISGTR-SS0.6D=Y	Induced SGTR occurs. 0.6" LOCAs, secondary side depressurized	5.5E-01	0.195	1.2
5	L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	1.0E-02	0.110	11.9
6	L2PH PF-VF CBV=N	Pit overpressure at high pressure vessel failure fails melt plug given CBV occurs	1.0E+00	0.110	1.0
7	L2PH CCI-DRY	Significant MCCI occurs, debris not flooded. P = 1.0	1.0E+00	0.027	1.0
8	L2PH CP STMEXP	Probability of ex-vessel steam explosion given a wet pit.	1.0E+00	0.024	1.0
9	L2PH STMEXP EX=N	Level 2 phenomena: Pit damage given ex-vessel steam explosion	1.0E+00	0.024	1.0
10	L2PH ISGTR-TR=N	Induced SGTR. Transients, secondary not depressurized	1.0E+00	0.018	1.0
11	L2PH CPIHLR-TR,TP=Y	Induced hot leg rupture. Conditional probability given no ISGTR. TR, TRD, TP, TPD cases.	9.5E-01	0.017	1.0
12	L2PH EARLYCF FA(HP)	Loads from accelerated flame at vessel failure fails containment. High pressure case.	1.4E-03	0.015	11.1
13	L2PH EARLYCF DEF(H)L	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case. - leak	1.4E-03	0.014	10.9
14	L2PH CPIHLR-SS,SL=Y	Induced hot leg rupture. Conditional probability, given no SGTR. SS,SL cases.	1.0E+00	0.014	1.0

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

Rank	ID	Description	Nominal Value	FV	RAW
15	L2PH ISGTR- SS,SL=N	No ISGTR in SL, SS cases with secondary pressurized	1.0E+00	0.013	1.0
16	L2PH ISGTR- TRD=Y	Induced SGTR. Transient, secondary depressurized.	3.8E-01	0.010	1.0
17	L2PH VECF- FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	6.3E-04	0.008	13.9
18	L2PH ERLYCF DCH(HP)L	Containment fails due to DCH loads at vessel failure - Leak	6.6E-04	0.006	10.5
19	L2PH INVREC(S -DEP)=Y	In-vessel recovery success - hot leg rupture or operator depressurization during seal/small LOCA DES	5.0E-01	0.005	1.0
20	L2PH INVREC(S -DEP)=N	In-vessel recovery fails - hot leg Rupture or operator depressurization during seal/small LOCA DES	5.0E-01	0.005	1.0

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

Rank	ID	Description	Nominal Value	RAW	FV
1	L2PH VECF-FA(H)	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences)	6.3E-04	13.9	0.008
2	L2PH STM EXP INV HP	Level 2 phenomena: containment failure due to in-vessel steam explosion. High pressure CET sequences	1.6E-05	13.8	0.000
3	L2PH STM EXP INV LP	Level 2 phenomena: containment failure due to in-vessel steam explosion. Low pressure CET sequences.	5.6E-06	11.9	0.000
4	L2PH CBV HP	Complete circumferential rupture of vessel (gives vessel rocket in HP sequences)	1.0E-02	11.9	0.110
5	L2PH EARLYCF FA(HP)	Loads from accelerated flame at vessel failure fails containment. High pressure case.	1.4E-03	11.1	0.015
6	L2PH EARLYCF DEF(H)L	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case. - leak	1.4E-03	10.9	0.014
7	L2PH ERLYCF DCH(HP)L	Containment fails due to DCH loads at vessel failure - Leak	6.6E-04	10.5	0.006
8	L2PH EARLYCF FA(HP)L	Loads from accelerated flame at vessel failure fails containment. High pressure case. leak	4.6E-04	10.4	0.004
9	L2PH EARLYCF DEF(H)	Loads from hydrogen deflagration at vessel failure fails containment. High pressure case.	6.1E-05	9.4	0.001
10	L2PH ERLYCF DCH(HP)	Containment fails due to DCH loads at vessel failure - Rupture	3.1E-05	9.1	0.000
11	L2PH VECF-H2DEF(H)L	V early CF due to hydrogen deflagration. High pressure CDES, in-vessel - PRV cycling phase - leak	2.0E-06	9.0	0.000
12	L2PH VECF-H2DEF(HL)L	V Early CF due to hydrogen deflagration.High pressure CDES with Induced Hot Leg Rupture - leak	2.8E-04	8.8	0.002
13	L2PH VECF-FA(H)L	Very early containment failure due to H2 Flame Acceleration (Hi pressure sequences) - leak	1.8E-07	6.8	0.000
14	L2PH VECF-H2DEF(HL)	V Early CF due to hydrogen deflagration.High pressure CDES with Induced Hot Leg Rupture	3.0E-06	3.5	0.000

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