Request for Additional Information No. 14, Revision 0

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AREVA NP Inc.
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SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19
SPLA Branch

Question 19-125:

Provide the frequencies of each sequence leading to core damage in both the internal events and shutdown models (for example, by annotating the event trees in Appendices 19A and 19B). For the “significant” sequences (i.e., with a sequence frequency greater than 1 percent of internal events or shutdown core damage frequency (CDF) or those that have an aggregate contribution of 95 percent of CDF when ranked by frequency), describe the scenario that each sequence represents.

Response to Question 19-125:

In this PRA application, the “significant” CDF sequences are defined as those sequences with a sequence frequency greater than 1 percent of internal events or shutdown CDF. Based on this definition, the frequencies of each sequence leading to core damage in both the at power (internal events, internal fires, internal floods) and shutdown models are provided only for the initiating events contributing to more than one percent to the CDF at power (as shown in U.S. EPR FSAR Tier 2 Table 19.1-103) and the CDF at shutdown (as shown in the U.S. EPR FSAR Tier 2 Table 19.1-90).

All “significant” sequences, with a sequence frequency greater than one percent of internal events CDF at power, are shown in U.S. EPR FSAR Tier 2 Table 19-125-1. For each sequence, U.S. EPR FSAR Tier 2 Table 19-125-1 gives event tree, sequence number, event tree sequence identifier and the sequence frequency. It also connects the sequence to the corresponding cutset group in U.S. EPR FSAR Tier 2 Table 19.1-7 (U.S. EPR FSAR Tier 2 Table 19.1-41 for floods, U.S. EPR FSAR Tier 2 Table 19.1-66 for fires), which gives a detailed description of the sequence, or, if there is no such group gives an additional description of the sequence.

All “significant” sequences, with a sequence frequency greater than one percent of shutdown CDF, are shown in U.S. EPR FSAR Tier 2 Table 19-125-2. For each sequence, U.S. EPR FSAR Tier 2 Table 19-125-2 gives event tree, sequence number, corresponding initiating event, event tree sequence identifier and the sequence frequency. It also connects the sequence to the corresponding cutset group in the U.S. EPR FSAR Tier 2 Table 19.1-92, which gives a detailed description of the sequence, or, if there is no such group, gives an additional description of the sequence.

This additional analysis shows that the cutset grouping presented in the U.S. EPR FSAR Tier 2 Tables 19.1-7, 19.1-41, 19.1-66 and 19.1-92 adequately represents the important sequences from the PRA, while providing an additional level of detail.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-125-1—Core Damage Sequences at Power Higher Than 1 Percent of Total CDF (≥ 5.3E-09/yr)

Event Tree	Seq. Num	RS Sequence ID	Seq. Freq (1/yr)	Sequence Description		
				Table Number	Group Number	Additional Description
INTERNAL EVENTS						
ATWS	12	ATWS-PSR	9.36E-09	19.1-7	17	
GT	14	GT-MFW-SSS-EFW-MHSI 01	6.78E-09	19.1-7	20, 21	
GT	15	GT-MFW-SSS-EFW-PBL	2.02E-08	19.1-7	18, 19	
LOOP	11	LOOP-REC LOOP-EFW-LHSI-SAHR	6.39E-09			LOOP, not recovered, with failure of EFW, feed and bleed fails by lack of long term heat removal (no LHSI or SAHRS)
LOOP	14	LOOP-REC LOOP-EFW-PBL	8.58E-08	19.1-7	1, 2	
LOOP	29	LOOP-RCP LOCA-REC LOOP-EFW-PBL	5.38E-09			LOOP, not recovered, followed by a RCP LOCA, a failure of EFW & feed and bleed (due to a “bleed” failure)
LOOP	30	LOOP-RCP LOCA-REC LOOP-EFW-OP FB	5.48E-09			LOOP, not recovered, followed by a RCP LOCA, a failure of EFW & feed and bleed (due to an operator failure)
LOOP	44	LOOP-EDG-REC LOOP-EFW	1.12E-08	19.1-7	5, 6	
LOOP	45	LOOP-EDG-REC LOOP-SBO	1.66E-08	19.1-7	4	
LOOP	52	LOOP-EDG-RCP LOCA-REC LOOP-EFW	5.31E-09			An SBO event, followed by a RCP LOCA, and a failure of EFW

Table 19-125-1—Core Damage Sequences at Power Higher Than 1 Percent of Total CDF (≥ 5.3E-09/yr)

Event Tree	Seq. Num	RS Sequence ID	Seq. Freq (1/yr)	Sequence Description		
				Table Number	Group Number	Additional Description
LOOP	53	LOOP-EDG-RCP LOCA-REC LOOP-OP FCD	7.24E-09	19.1-7	7	
LOOP	56	LOOP-EDG-I&C	5.63E-09	19.1-7	3	
SGTR	18	SGTR-SG ISO-OP RHR	9.72E-09	19.1-7	16	
SLBI	17	SLBI-FW ISO-EFW	6.78E-09			A SLBI event, followed by a failure of FW isolation and EFW (F&B not credited)
SLBI	30	SLBI-MSIV ISO-FW ISO-RHR	6.49E-09			A SLBI event, followed by a failure of one MSIV isolation (2 SG blowing down) and EFW (F&B not credited)
SLBI	40	SLBI-MSIV ISO(3)-FW ISO	1.04E-08	19.1-7	15	
SLOCA	17	SLOCA-SSS-EFW-OP FB	1.95E-08	19.1-7	9, 10	
SLOCA	20	SLOCA-MHSI-ACC	6.24E-09	19.1-7	11	
SLOCA	34	SLOCA-MHSI-OP FCD	1.73E-08	19.1-7	8	
FLOODING EVENTS						
FLD-ANN ALL	2	FLD-ANN ALL-PROB ANNULUS	9.72E-09	19.1-41	1	
LOCCW	17	IE FLD-SAB14 FB-RCP LOCA-LHSI-SAHR	8.66E-09	19.1-41	8	
LOCCW	31	IE FLD-SAB14 FB-RCP LOCA-MHSI-SAHR	8.98E-09	19.1-41	6	

Table 19-125-1—Core Damage Sequences at Power Higher Than 1 Percent of Total CDF (≥ 5.3E-09/yr)

Event Tree	Seq. Num	RS Sequence ID	Seq. Freq (1/yr)	Sequence Description		
				Table Number	Group Number	Additional Description
FIRE EVENTS						
31BDA	15	IE FIRE-SAB-MECH-MFW-SSS-EFW-PBL	1.25E-08	19.1-66	3	
31BDA	19	IE FIRE-SAB14-AC-RCP LOCA-LHSI-SAHR	1.72E-08	19.1-66	7	
31BDA	32	IE FIRE-SAB14-AC-RCP LOCA-SSS-EFW-PBL	5.78E-08		4, 5, 11	
31BDA	33	IE FIRE-SAB14-AC-RCP LOCA-SSS-EFW-OP FB	7.52E-09	19.1-66		Similar to the sequence above: Fire in SB 4 (or 1), followed by an RCP LOCA, and failures of SSS, EFW and feed and bleed (due to operator failure)
LBOP	13	IE FIRE-SWGR-EFW-PBL	2.16E-08	19.1-66	6	
MSSV	24	IE FIRE-MS-VR-MSIV ISO(3)-OP RHR	2.73E-08	19.1-66	1	

Table 19-125-2—Core Damage Sequences during Shutdown Higher Than 1 Percent of Total SD CDF (≥ 5.8E-10/yr)

Event Tree	Seq. Num	Initiating Event	RS Sequence ID	Seq. Freq (1/yr)	Sequence Description		
					Table Number	Group No.	Additional Description
SD LOCA C	29	IE LOCA CBD	MHSISD-SAHRSD	1.31E-09			LOCA during POS CBD, followed by a failure of MHSI and long term cooling with SAHR (long term cooling with LHSI not credited if MHSI failed)
SD LOCA C	29	IE LOCA CBU	MHSISD-SAHRSD	6.49E-10			LOCA during POS CBU, followed by a failure of MHSI and long term cooling with SAHR (long term cooling with LHSI not credited if MHSI failed)
SD LOCA C	30	IE LOCA CBD	MHSISD-LHSISD	6.07E-09	19.1-92	13	
SD LOCA C	30	IE LOCA CBU	MHSISD-LHSISD	3.04E-09	19.1-92	13	
SD LOCA D E	3	IE LOCA DD	MHSISD-LHSISD	1.35E-09	19.1-92	14	
SD LOCA D E	3	IE LOCA DU	MHSISD-LHSISD	3.08E-09	19.1-92	14	
SD RHR C	12	IE RHR CAD	EFWSD-LHSISD-SAHRSD	6.84E-10	19.1-92	9	
SD RHR C	12	IE RHR CBD	EFWSD-LHSISD-SAHRSD	9.23E-10	19.1-92	9	
SD RHR C	12	IE RHR CBU	EFWSD-LHSISD-SAHRSD	6.85E-10	19.1-92	9	
SD RHR C	15	IE RHR CAD	EFWSD-MHSISD-LHSISD-SAHRSD	4.51E-09	19.1-92	5,6,7,8	
SD RHR C	15	IE RHR CAU	EFWSD-MHSISD-LHSISD-SAHRSD	2.99E-09	19.1-92	5,6,7,8	

Table 19-125-2—Core Damage Sequences during Shutdown Higher Than 1 Percent of Total SD CDF (≥ 5.8E-10/yr)

Event Tree	Seq. Num	Initiating Event	RS Sequence ID	Seq. Freq (1/yr)	Sequence Description		
					Table Number	Group No.	Additional Description
SD RHR C	15	IE RHR CBD	EFWSD-MHSISD-LHSISD-SAHRSD	6.04E-09	19.1-92	5,6,7,8	
SD RHR C	15	IE RHR CBU	EFWSD-MHSISD-LHSISD-SAHRSD	4.51E-09	19.1-92	5,6,7,8	
SD RHR C	16	IE RHR CBD	EFWSD-PBLSD	6.40E-10	19.1-92	12	
SD RHR D	3	IE RHR DU	MHSISD-LHSISD	1.19E-09	19.1-92	10,11	
SD RHR ISLOCA E	2	IE RHR ISLOCA E	RHR ISLOCA SD	7.92E-10	19.1-92	15	
SD ULD CB	3	IE ULD CBD D	ISOLSD-OP ISOLSD	7.18E-09	19.1-92	2	
SD ULD CB	39	IE ULD CBD D	ISOLSD-MHSISD-LHSISD	6.72E-10	19.1-92	4	
SD ULD D	3	IE ULD DU D	ISOLSD-OP ISOLSD	7.18E-09	19.1-92	1	
SD ULD D	6	IE ULD DU D	ISOLSD-MHSISD-LHSISD	6.74E-10	19.1-92	3	

Question 19-126:

Further information is needed on significant equipment and operator actions for all elements of the U.S. EPR probabilistic risk assessment (PRA). Specifically:

1. The tables of importance measures in Chapter 19 of the Final Safety Analysis Report (FSAR) appear not to include all "significant" equipment failures and operator actions above the thresholds referred to on page 19.1-54 of the FSAR. For example, Table 19.1-8 includes several failures with a risk achievement worth (RAW) greater than two that are not included in Table 19.1-9. Amend all relevant tables to include all entries above these thresholds.
2. The tables appear to group components from multiple trains. Are the listed importance measures the highest of any component in the group? If asymmetric modeling results in significantly different importance measures for components within a group, present the components separately in the tables and discuss the assumptions that result in the difference.
3. The tables refer to components rather than basic events that represent specific failure modes. Discuss how the importance measures account for the contribution of all modeled failure modes of the components.

Response to Question 19-126:

Response to Question 19-126(1):

The structures, systems and components (SSC) importance tables in U.S. EPR FSAR Tier 2 Chapter 19 do not include all of the SSC with RAW larger than 2 or Fussell-Vesely (FV) larger than 0.005. Instead, the tables were condensed to the top SSC for the purpose of presentation. The complete list of equipment failures and operator actions with RAW greater than 2 or FV greater than 0.005 was used in PRA applications where the importance ranking was used (e.g., the reliability assurance program (RAP)). Note that this reduction was only done in the SSC tables (with many components close to the ranking threshold). In the tables including human actions, instrumentation and control (I&C) common cause events and parameters ranking, such reduction was not necessary. Appendix A provides supporting information for each importance table in U.S. EPR FSAR Tier 2 Section 19.1. See Table 19-126-1 for a description of Appendix A. The supporting information tables include the basic event importance ranking printouts from the Risk Spectrum® model. In the case of the SSC ranking, the backup tables also include component rankings. The basis for this ranking will be discussed in the Response to Questions 19-126(2) and 19-126(3) as appropriate.

Response to Question 19-126(2):

The tables group components from the multiple trains, when such grouping is appropriate. For example, the RAW importance measure is expected to be the same for each component from the same train, or between the symmetric trains (any variations could be contributed to the standard PRA software limitations). Similarly, FV importance measures are expected to be the same for the same components (with the same failure rates) within the symmetric trains. Also, SSC common cause (CC) groups are grouped for the trains or components, which are expected to have the same RAW. For example, CC groups for pump failure to start and pump failure to

run are presented together. The presented importance measures are always the highest of any component in the group.

Response to Question 19-126(3):

When asymmetric design or modeling results in significantly different importance measures for components, the components are presented separately in the tables, as in U.S. EPR FSAR Tier 2 FSAR Tables 19.1.8 and 19.1-9. In these SSC tables, trains 1 and 4 are often separated in ranking from trains 2 and 3, or for isolation failures train 4 is separated. The reasons for these asymmetries are discussed below.

The main design features that result in the asymmetric ranking differences are as follows:

- Station blackout diesel generators (SBODG) directly supply selected trains in Divisions 1 and 4.
- Severe accident heat removal system (SAHRS) train is supplied from Division 4.
- Chemical and volume control system (CVCS) and extra borating system (EBS) trains are supplied from Division 1 and 4.

The main modeling assumptions that result in the asymmetric ranking differences are as follows:

- All breaks, LOCAs and steam line breaks (SLB), are assumed to occur in Train 4 at power; LOCAs are assumed to occur in train 1 in shutdown.
- Train 1 and 4 of component cooling water/essential service water (CCW/ESW) are assumed to be operating.
- In shutdown, running residual heat removal (RHR) trains are assumed to be 1, 2 and 3 or 1 and 2; RHR train 4 is assumed to be aligned in the low head safety injection (LHSI) mode.

The SSC importance tables refer to components rather than basic events that represent specific failure modes. The importance measures account for the contribution of all modeled failure modes as defined in NEI 00-04, Rev. 0, “10 CFR 50.69 SSC Categorization Guideline,” July 2005:

- The FV importance measure of a component is considered to be the sum of the FV importance measures for that component’s basic event and common cause event failure modes.
- The RAW importance of a component is considered the maximum of the RAW values computed for basic events involving failure modes of that component. The risk significance of the RAW values of common cause events is considered separately (using a different criterion) from the basic events that reflect an individual component.

As discussed in the FSAR, based on NEI guidance, the importance measure criteria used to identify candidate risk significance are:

1. Sum of FV for all basic events modeling the SSC of interest, including common cause events ≥ 0.005.
2. Maximum of component basic event RAW values ≥ 2.

3. Maximum of applicable common cause events RAW values ≥ 20.

This ranking approach realistically presents importance measures associated with a component and makes sure that components with multiple low failure probability failure modes are accounted for. This can be seen in Appendix A (see Table 19-126-1), where significantly more components show in SSC FV ranking than in the corresponding basic events ranking, within the same FV limits. Since FV importance measures are directly proportional to failure rates/probabilities associated with failure modes, a relative failure mode ranking is also directly proportional to the associated failure rate/probability value.

SSC rankings by RAW importance measures should be the same for each failure mode (as discussed previously; any differences are attributed to the standard PRA software limitations). This applies to the SSC common cause group rankings; therefore failure modes are not presented in these tables.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-126-1—Supporting Information for Importance Tables in the U.S. EPR FSAR Chapter 19

App A Page Header	FSAR Table Supported	Description
Level 1 Internal Events		
19.1-8b	19.1-8	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on FV Importance – Level 1 Internal Events
19.1-8b2	19.1-8	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on FV Importance – Level 1 Internal Events
19.1-9b	19.1-9	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on RAW Importance – Level 1 Internal Events
19.1-9b2	19.1-9	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on RAW Importance – Level 1 Internal Events
19.1-10b	19.1-10	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on FV Importance – Level 1 Internal Events
19.1-11b	19.1-11	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on RAW Importance – Level 1 Internal Events
19.1-12b	19.1-12	Supporting Information Table for U.S. EPR Risk-Significant Common Cause Events based on RAW Importance – Level 1 Internal Events
19.1-13b	19.1-13	Supporting Information Table for U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance – Level 1 Internal Events
19.1-14b	19.1-14	Supporting Information Table for U.S. EPR Risk-Significant PRA Parameters – Level 1 Internal Events
Level 1 Flooding		
19.1-42b	19.1-42	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on FV Importance – Level 1 Flooding
19.1-42b2	19.1-42	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on FV Importance – Level 1 Flooding
19.1-43b	19.1-43	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on RAW Importance – Level 1 Flooding
19.1-43b2	19.1-43	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on RAW Importance – Level 1 Flooding
19.1-44b	19.1-44	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on FV Importance – Level 1 Flooding
19.1-45b	19.1-45	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on RAW Importance – Level 1 Flooding

Table 19-126-1—Supporting Information for Importance Tables in the U.S. EPR FSAR Chapter 19

App A Page Header	FSAR Table Supported	Description
19.1-46b	19.1-46	Supporting Information Table for U.S. EPR Risk-Significant Common Cause Events based on RAW – Level 1 Flooding
19.1-47b	19.1-47	Supporting Information Table for U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance – Level 1 Flooding
19.1-48b	19.1-48	Supporting Information Table for U.S. EPR Risk-Significant PRA Parameters – Level 1 Flooding
Level 1 Fire Events		
19.1-67b	19.1-67	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on FV Importance – Level 1 Fire Events
19.1-67b2	19.1-67	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on FV Importance – Level 1 Fire Events
19.1-68b	19.1-68	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on RAW Importance – Level 1 Fire Events
19.1-68b2	19.1-68	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on RAW Importance – Level 1 Fire Events
19.1-69b	19.1-69	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on FV Importance – Level 1 Fire Events
19.1-70b	19.1-70	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on RAW Importance – Level 1 Fire Events
19.1-71b	19.1-71	Supporting Information Table for U.S. EPR Risk-Significant Common Cause Events based on RAW Importance – Level 1 Fire Events
19.1-72b	19.1-72	Supporting Information Table for U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance – Level 1 Fire Events
19.1-73b	19.1-73	Supporting Information Table for U.S. EPR Risk-Significant PRA Parameters – Level 1 Fire
Level 1 Shutdown		
19.1-93b	19.1-93	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on FV Importance – Level 1 Shutdown
19.1-93b2	19.1-93	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on FV Importance – Level 1 Shutdown
19.1-94b	19.1-94	Supporting Information Table for U.S. EPR Risk-Significant Equipment based on RAW Importance – Level 1 Shutdown
19.1-94b2	19.1-94	Supporting Information Table for U.S. EPR Risk-Significant Basic Events based on RAW Importance – Level 1 Shutdown

Table 19-126-1—Supporting Information for Importance Tables in the U.S. EPR FSAR Chapter 19

App A Page Header	FSAR Table Supported	Description
19.1-95b	19.1-95	Supporting Information Table for U.S. EPR Risk-Significant Human Actions at Shutdown based on FV Importance – Level 1 Shutdown
19.1-96b	19.1-96	Supporting Information Table for U.S. EPR Risk-Significant Human Actions based on RAW Importance – Level 1 Shutdown
19.1-97b	19.1-97	Supporting Information Table for U.S. EPR Risk-Significant Common Cause Events based on RAW Importance – Level 1 Shutdown
19.1-98b	19.1-98	Supporting Information Table for U.S. EPR Risk-Significant Common Cause I&C Events based on RAW Importance – Level 1 Shutdown
19.1-99b	19.1-99	Supporting Information Table for U.S. EPR Risk-Significant PRA Parameters – Level 1 Shutdown

Question 19-127:

(Follow-up to Question 19-03) Discuss whether the maintenance assumptions outlined in the response to Question 19-03 were applied to all equipment modeled in the PRA. If maintenance was excluded or reduced for certain equipment, provide the associated assumptions and discuss how the assumed conditions will be maintained in the as-to-be-operated plant (e.g., by adding them to Table 19.1-102 of the FSAR).

Response to Question 19-127:

The maintenance assumptions outlined in the Response to Question 19-03 were applied to all mechanical equipment modeled in the PRA. Maintenance duration was reduced to corrective maintenance only for the extra borating system (EBS) trains because it was assumed that preventive maintenance would not be performed on the EBS at power.

Maintenance of the protection system (PS) components is treated differently from the other systems due to the specificity of the digital instrumentation and control (I&C).

- No preventive maintenance is assumed. The TelepermXS (TXS) manufacturer recommends very little preventive maintenance on the protection system components in general, and none on the components modeled in the PRA.
- Corrective maintenance is not explicitly treated, but it is incorporated in the failure data model by using a mean time to repair (MTTR) unavailability model. A 24 hour MTTR is used for modules and subracks, which are easily replaceable, while sensors, which are less accessible, use a longer MTTR.

The digital I&C fault tolerance minimizes the impact of taking a component out for maintenance. When an input to a PS processor is inhibited, the coincidence logic downstream adapts automatically. For example, if the coincidence logic is 2-out-of-4 and one channel is inhibited, the logic changes to 2-out-of-3. If another channel fails, the fault tolerant logic (in the software) adjusts the coincidence to 1-out-of-2. This is conservatively not modeled in the PRA, which requires a 2-out-of-4 logic all the time.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-128:

(Follow-up to Question 19-10) Provide additional justification related to the statement in response to Question 19-10 that the change to medium dependence between post-maintenance testing and independent verification is "not significant (less than 5% impact on the total CDF)." The importance measure tables in Chapter 19 do not appear to include any specific maintenance-related pre-initiator human errors. Please list the basic events that were included in determining that the impact is not significant, and the Fussell-Vesely (FV) and risk achievement worth (RAW) importance measures for each. Provide the results of a sensitivity study in which complete dependence is assumed as suggested by the ASEP method. In addition, justify using a medium dependence derived from the Technique for Human Error Rate Prediction (THERP) human reliability analysis (HRA) method in an analysis based on the Accident Sequence Evaluation Program (ASEP) method.

Response to Question 19-128:

The Response to Question 19-10 that the change to medium dependence between post-maintenance testing and independent verification is "not significant (less than 5% impact on the total CDF)", is not based on the FV importance measure for any individual basic events, but on the FV importance measure for the associated failure parameter (that is also an output from the Risk Spectrum® software). The associated failure parameter and its FV importance measures at power and at shutdown are given below:

> Parameter "########MEC1": FV (at power, all events): 0.006 ; FV (at shutdown): 0.009

With the original assumption on the complete dependence this parameter medium value would be 3E-04, instead of 7E-05 (mean 8E-04 vs. 2E-04); a four times increase in the value. Based on this increase and the parameter FV value, the core damage frequency (CDF) increase was estimated at 2 percent for power (4 percent at shutdown). As part of this response, two sensitivity cases (at power and at shutdown) have been run with the original (complete dependence) value for "MEC1" (8E-04 mean), the results are presented below:

- Increase in the total CDF at power—3 percent.
- Increase in the total CDF at shutdown—3 percent.

This confirms the validity of the previous estimate (<5 percent) based on the parameter's FV value.

Note: In the structures, systems, and components (SSC) importance rankings, a pre-accident error was considered as a failure mode associated with a specific component. The ranking of only few basic events associated with the pre-accident human error probabilities (HEP) (with RAW larger than 2) can be found in Appendix A.

A medium dependency derived from the THERP method was used in the pre-accident HEP analysis based on the ASEP method, because the relevant dependency discussion in the ASEP HRA procedure refers to the THERP method, (i.e., NUREG/CR-1278) and directly states that using "zero" and "high/complete" dependency only, and not using low and moderate dependency, "results in increased conservatism" (see NUREG/CR-4772, Table 5-1, Bullet 9c, page 5-9).

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-129:

(Follow-up to Question 19-04) The table provided in response to Question 19-04 includes a sump strainer plugging failure rate of 5E-7 per hour (/hr). NUREG/CR-6928 cites a strainer plugging failure rate of 7.8E-6/hr, more than an order of magnitude higher. Given the high importance of sump strainer common-cause failure (CCF) in the U.S. EPR design, justify this lower failure rate.

Response to Question 19-129:

Sump strainer plugging failure rate of 5E-07/hour is derived from the EG&G (Reference 1) recommended strainer plugging failure rate of 5E-06/yr, modified by a 0.1 factor to take credit for the U.S. EPR advanced design features that make strainer plugging very unlikely. That design is summarized below:

To prevent plugging of the in-containment refueling water storage tank (IRWST) suction sumps, three levels of filters are provided: trash racks retain the largest debris before they reach the IRWST, retaining baskets stop smaller debris at the IRWST inlets. Trash racks and baskets are arranged so that water continues to flow into the IRWST even if these inlet filters are clogged. The third level of retention is provided by strainers arranged above each of the four safety injection systems (SIS) sumps, above the severe accident heat removal system (SAHRS) sump and the chemical and volume control system (CVCS) sump. This is also summarized in the U.S. EPR FSAR Tier 2 Section 19.1.4.1.1.3. Also, see Reference 2 for more information on sump strainer design features.

References for Question 19-129:

1. EGG-SSRE-8875, S.A. Eide, S.V. Chmilewski, and T.D. Swantz, “Generic Component Failure Database for Light Water and Liquid Sodium Reactor PRAs,” EG&G Idaho, 1990.
2. ANP-10293, U.S. EPR Design Features to Address GSI-191, February 2008.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-130:

Discuss whether failure of digital instrumentation and control (I&C) equipment caused by a loss of cooling was modeled in the U.S. EPR PRA. If the digital I&C design can accommodate loss of cooling, this is a significant assumption about a design feature that should be preserved in the FSAR (e.g., by adding the assumption and its disposition to Table 19.1-102).

Response to Question 19-130:

Failure of digital I&C equipment caused by a loss of cooling was not modeled explicitly in the PRA. However, a loss of ventilation to a Safeguard Building (SB), and failure of the subsequent recovery actions, is modeled to result in a complete loss of the divisional DC buses that power the I&C cabinets, therefore causing a failure of I&C equipment due to loss of power.

As discussed in the Response to Question 19-73, the Teleperm XS (TXS) components can operate at temperatures up to 45°C (113°F) for unlimited time periods, and have been tested for limited periods of time up to 50°C (122°F). The SB heatup calculation that was used to estimate the time available for recovery used 122°F as the threshold for unacceptable heatup for any room in the SB electrical division. Therefore, the time assumed for failure of the entire division adequately represents failure of the divisional I&C due to loss of cooling.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-131:

(Follow-up to Question 19-19) Provide additional information on how decay heat loads were calculated for each shutdown plant operating state (POS). The derivation described in response to Question 19-19 may be appropriate for determining initiating event frequencies for each POS. In a real outage, the time of entrance into a given POS may be earlier than the sum of the estimated POS durations, because the durations were extended based on multiple outage types and estimated plant availability. If decay heat loads were based on the POS duration, justify this treatment.

Response to Question 19-131:

The shutdown PRA is done for estimated average shutdown duration and time line, and does not correspond to any specific outage. The estimates for the decay heat (DH) time in different POSs are defined in Table 19-131-1.

As shown in Table 19-131-1 times longer than 8 days (192 hours) were not credited. Also, as stated in the U.S. EPR FSAR Section 19.1.6.2.5, decay heat was considered constant for each POS and equal to the decay heat at the start of the POS.

For a specific outage, entrances to different POS could occur earlier and therefore with higher decay heat loads. However, any difference would not be significant enough to change the important conclusions from the shutdown PRA, because:

1. Conservative assumptions in the decay heat modeling: decay heat for each POS is based on the POS starting time; the lowest decay heat that was considered corresponds to decay heat at eight days after a trip; average fuel burnup of 62 GWd/MT is assumed for the entire active fuel volume; 5 percent enriched fuel is assumed.
2. The changes in the decay heat curve after four days are slow, less than 10 percent per day.
3. Operator actions are based on larger time intervals and are not sensitive to small changes in decay heat.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-131-1—Decay Heat Time Line in Shutdown

POS	Start of POS (SD Day)	DH Time (after a SD) (hrs])	Used DH Time (hrs)
CAD	0	8	8
CBD	1.5	44	44
DD	3.5	92	92
E	4.0	104	104
DU	17.0	416	192
CBU	18.5	452	192
CAU	20.0	488	192

Question 19-132:

Justify the exclusion of inadvertent boron dilution as an initiating event in the shutdown PRA.

Response to Question 19-132:

Inadvertent boron dilution events are not included as initiating events in the shutdown PRA because their likelihood to cause severe core damage is considered to be very low. This conclusion is based on the following:

- Potential for boron dilution is considered unlikely.
- There are multiple automatic signals and isolation of dilution sources that would preclude these events.
- There are mitigating systems, like the extra borating system (EBS), that would prevent a development of these events.
- Even if these events are to occur, the reactivity excursion is expected to be slow evolving and self regulating.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-133:

Describe the sequence of events that must occur to use emergency feedwater (EFW) and main steam relief for secondary cooling after loss of the residual heat removal system (RHRS), either as an initiating event or following a loss-of-coolant accident (LOCA) or uncontrolled level drop. Page 19.1-162 states that automatic reset of the P13 permissive is needed for automatic emergency feedwater (EFW) operation in POS C. How long will the required temperature and pressure increase take after a loss of RHR? Can the EFW system and main steam relief be actuated manually before P13 resets? If so, is this manual action modeled in the PRA? If not, discuss the impact of the time delay, temperature and pressure increase, and any associated mode changes on subsequent plant response. Provide the input parameters (including temperature, pressure, and decay heat load) used to calculate operator action timing after the various losses of RHRS in all POS.

Response to Question 19-133:

The following sequences in the shutdown PRA model represent sequences where residual heat removal (RHR) is failed either as part of the initiating event or as a subsequent failure. EFW is credited, and the sequence does not lead to core damage.

Event Tree - SD LOCA C – Sequences 2, 3, 15, 16:
LOCA occurs
MHSI succeeds
Either RHR is unavailable OR operator fails to align RHR
EFW succeeds
LHSI succeeds OR SAHRS succeeds for long term cooling

Event Tree - SD RHR C – Sequence 1
Loss of RHR occurs
No transient LOCA
EFW succeeds

Event Tree - SD ULD CB – Sequences 4, 20
Uncontrolled level drop occurs
Isolation of CVCS Low Pressure Reducing Station fails
MHSI succeeds
Either RHR is unavailable OR operator fails to align RHR
EFW succeeds
Operator isolates CVCS low pressure reducing station – long term

The P13 permissive inhibits the steam generator (SG) level signal when the wide range hot leg temperature is less than 212°F. It is manually actuated and resets automatically. This reset is modeled as it is required for the automatic operation of EFW during plant operating state (POS) CA and CB.

Manual actuation of the EFW system is not credited.

The shutdown core damage frequency (CDF) is insensitive to the length of time required for the primary coolant temperature and pressure to reset the P13 relay. This is because heat transfer

to the steam generator is not credited in human error probability (HEP) (time to uncover) calculations.

The shutdown CDF is insensitive to changes in POS due to plant heatup and pressurization as a result of losing RHR. Time to uncover the core is calculated assuming a loss of all cooling, and it accounts for the changes in the pressure.

The input parameters (including temperature, pressure, and decay heat load) used to calculate operator action timing after the various losses of RHRS in all POS, are summarized in Table 19-133-1. Note that those parameters (levels) are associated with the losses of cooling, and not with LOCAs or level drops.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-133-1—Input Parameters to Calculate Operator Action Timing after a Loss of Cooling in Each POS

POS	RCS Initial Temperature (°F)	RCS Final Temperature (°F)	RCS Initial Pressure (psia)	RCS Final Pressure (psia)	No. of SGs	No. of RCPs	Time After Plant Trip (hours)	Decay Heat (MW)	Total Heat (MW)	RCS + PZR Level	Time to Start Boil (minutes)	Operator Action
CAd	212	356	15	145	0	2	8	37.1	57.8	mid-loop	15	NA
CBd	131	356	15	145	0	0	44	23.4	23.4	mid-loop	58	OPF-RHR-CBD
Dd	131	212	15	15	0	0	92	18.4	18.4	mid-loop	27	OPF-RHR-DD
E	131	212	15	15	0	0	104	17.3	17.3	mid-loop	28	NA
Du	131	212	15	15	0	0	192	13.2	13.2	mid-loop	37	OPF-RHR-DU
CBu	131	356	15	145	0	0	192	13.2	13.2	mid-loop	103	OPF-RHR-CBU
CAu	212	356	145	145	0	4	192	13.2	54.6	mid-loop	16	OPF-RHR-CAU

Question 19-134:

Discuss the differences in modeling, assumptions, and equipment and operator dependencies that result in the different significance of heating, ventilation, and air conditioning (HVAC) failures to the shutdown PRA compared to the at-power PRA. Specifically, the operator action to align a maintenance train (OPF-SAC-1H) is far more significant at shutdown (RAW of 96.6 compared to 3.4) and all other HVAC-related failures are much less significant at shutdown.

Response to Question 19-134:

The two major causes of the different significance of HVAC failure basic events at power and in shutdown are listed below:

- The at-power risk is dominated by the loss of offsite power (LOOP) initiator and consequential LOOPs. Adding the contribution of the LOOP initiator to core damage frequency (CDF) and consequential LOOP events results in a total contribution of over 65 percent, as opposed to 37 percent in shutdown. Also, LOOP contributes 95 percent to sequences at power where loss of HVAC occurs and only 23 percent to loss of HVAC sequences in shutdown. During a LOOP, the HVAC maintenance train is unavailable and the operator action to align it becomes irrelevant.
- Emergency feedwater (EFW) ventilation dependencies also contribute to that difference. As can be seen in the U.S. EPR FSAR Figure 19-1.2, EFW room ventilation depends only on the Safety Chilled Water System (SCWS) while switchgear room cooling depends on either the safety HVAC system that is cooled by the SCWS or the non-safety maintenance HVAC system which is cooled by the operational chilled water system (OCWS). Therefore, if ventilation is lost in a Safeguard Building (SB), the operator action to align the maintenance train would enable recovery of the electrical division but not of the EFW pump. The emergency feedwater system (EFWS) is one of the more important systems at power but one of lesser importance in shutdown. Therefore the operator action to align the maintenance HVAC train is more important in shutdown than at power.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-135:

Provide an assessment of the impact on the shutdown PRA results of the HVAC modeling uncertainty case, as described in FSAR Section 19.1.4.1.2.7.

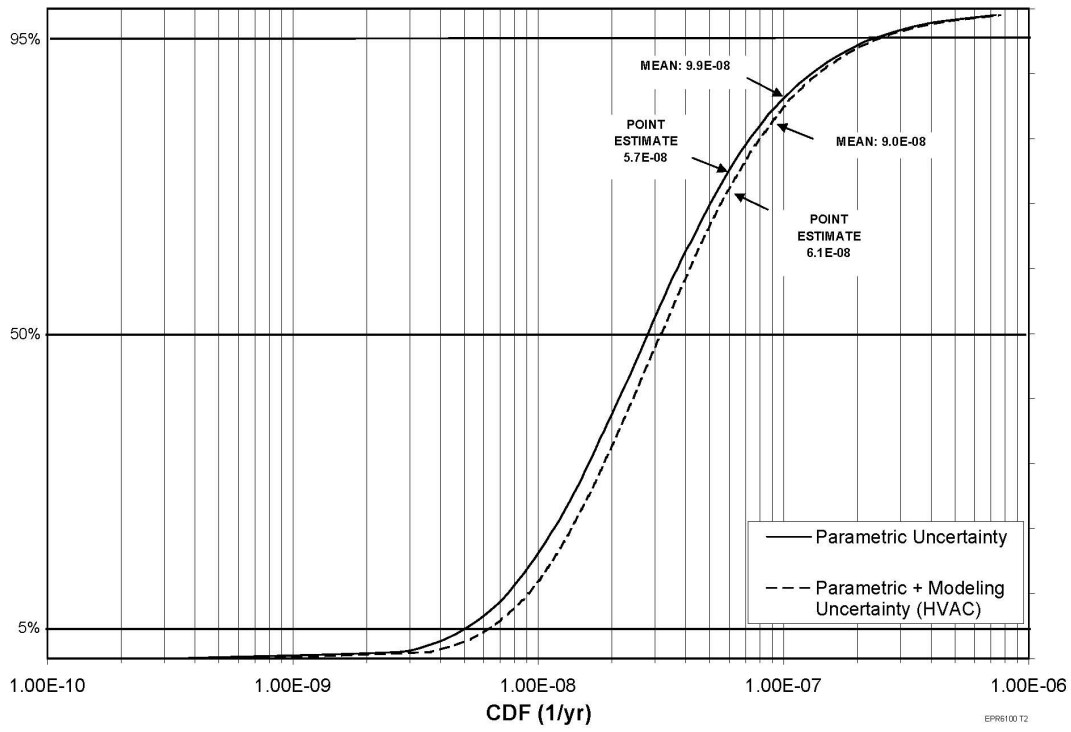
Response to Question 19-135:

The HVAC modeling uncertainty case in shutdown is illustrated in Figure 19-135-1. The input parameters for this run are defined in the response to RAI 2 Question 19-46 (Case 3). As illustrated in the figure, an inclusion of the HVAC modeling uncertainty results in a core damage frequency (CDF) point estimate/mean value change of less than 10 percent.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Figure 19-135-1—Shutdown Events Uncertainty Analysis including HVAC Modeling Uncertainty



Question 19-136:

Provide a more detailed discussion of why the assumption on unavailability of the ultimate heat sink (UHS) in station blackout (SBO) conditions has a more significant impact on the shutdown CDF than on the at-power CDF. The FSAR states that the impact could be explained by a high loss-of-offsite-power (LOOP) contribution to shutdown CDF, but LOOP contributes 37 percent of shutdown risk (page 19.1-164), compared to nearly 50 percent at power (page 19.1-51).

Response to Question 19-136:

The UHS in SBO conditions has a more significant impact on the shutdown core damage frequency (CDF) than on the at-power CDF, because in the shutdown (SD) PRA only limited credit is given to the emergency feedwater (EFW), two trains in CAD, CAU, CBD, CBU and none in other plant operating states (POS) (also discussed in the Response to Question 19-137); therefore, in the event of the loss of offsite power (LOOP) and/or station blackout (SBO), EFW is more likely to fail, or is not available, and the only heat sink would be the UHS.

The discussion in the FSAR refers to a relative importance of this event; no attempt was made to compare power and SD results.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-137:

Discuss why failure of an EFW storage tank, which is an important contributor to at-power CDF because it disables all EFW, is not a significant contributor to shutdown risk (i.e., is not included in the tables of important equipment).

Response to Question 19-137:

Passive failure of an emergency feedwater (EFW) storage tank has a high risk achievement worth (RAW) at-power, as shown in U.S. EPR FSAR Tier 2 Table 19.1-9, because it is an unlikely event that has high consequences. The emergency feedwater system (EFWS) is credited as a mitigating system for almost all at-power initiating events, therefore a passive failure of an EFW storage tank, which if not isolated would disable the entire EFWS, is a significant contributor to the risk at-power.

In shutdown, the EFWS is of lesser importance than at power. EFW is credited in plant operating states (POS) CA and CB (two trains only), as a backup to the residual heat removal system (RHRS), and not considered in POS D or E. Therefore the risk significance of an EFW storage tank failure significantly decreases in shutdown.

The percentage contribution of an EFW storage tank failure to the core damage frequency (CDF), whether it is at power or in shutdown, is not significant due to the very low probability of this event (Fussell-Vesely (FV)=2E-05 at-power; a negligible FV in shutdown).

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-138:

(Follow-up to Question 19-20) Section 19.1.5.2.2.5 of the FSAR states that the essential service water system (ESWS) and demineralized water system (DWS) are automatically isolated if the safeguard or fuel building sumps detect a large flooding event. Are these sensors and isolation signals assumed operable during shutdown? If so, discuss the administrative controls that ensure that the automatic isolation occurs following a flood during shutdown.

Response to Question 19-138:

The PRA credits automatic isolation of the ESWS and the demineralized water distribution system (DWDS) on high sump level as one of the features that make a very large flooding event (i.e., extending above ground level) very unlikely, and as such screened out from the internal flooding analysis. A description of this isolation feature is given in U.S. EPR FSAR Tier 2 Section 3.4.3.4.

Sensors and isolation signals that will perform this function are also assumed operable during shutdown. COL item 19.1-9 listed in U.S. EPR FSAR Tier 2 Table 1.8-2 is provided to confirm that significant PRA assumptions on system modeling remain valid.

It should be noted that if automatic isolation fails or is unavailable, a large flooding event in the Safeguard Building (SB) can be arrested before it spreads above elevation +0 ft by manually isolating the ESWS or shutting down the pump (without the pump the equilibrium level between the UHS basin and the SB is below elevation 0 ft-0 inches). During shutdown, due to the maintenance activities in the plant, such an event will be quickly detected.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-139:

(Follow-up to Question 19-20) The response to Question 19-20 states that, for certain areas, there are "a limited number or points where separation between two areas could be jeopardized and for these areas … the impact on the PRA mitigating systems is very similar." To what specific fire areas does this statement refer? Provide further justification for the statement that the impact is similar. If there are doors or other removable fire barriers between these fire areas, discuss how these barriers will be controlled during shutdown.

Response to Question 19-139:

The statement in Response to Question 19-20 referred to a limited number of cases in which a fire barrier separating PRA fire areas includes a fire-rated door. These fire areas are listed in Table 19-139-1 along with the description of the interface between them. It should be noted that the statement only applies to Safeguard Building (SB) fire areas. The other buildings are treated as a single fire area in the PRA.

The statement made regarding the similar impact on mitigating systems of a fire in the DC switchgear room and AC switchgear room meant that equipment from the same division would be affected by a fire in one or the other room. The impact on the AC switchgear room has more significant consequences and would envelop the impact on the DC switchgear room.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-139-1—PRA Fire Areas Separated by a Door

PRA Fire Area 1	PRA Fire Area 2	Interface between Areas	Elevation
Safeguard Building 1			
PFA-SB1-MECH	PFA-SB1-AC	Fire-rated door between cable shaft and pump room	-16 ft
PFA-SB1-DC	PFA-SB1-AC	Fire-rated door between DC switchgear room and cable floor	+15 ft
PFA-BATT1	PFA-SB1-AC	Fire-rated door between battery room and cable floor	+15 ft
PFA-SB1-DC	PFA-SB1-AC	Fire-rated door between I&C cabinet room and AC switchgear room	+27 ft
Safeguard Building 2			
PFA-SB2-DC	PFA-SB2-AC	Fire-rated door between I&C cabinet room and AC switchgear room	+27 ft
Safeguard Building 3			
PFA-SB3-DC	PFA-SB3-AC	Fire-rated door between I&C cabinet room and AC switchgear room	+27 ft
Safeguard Building 4			
PFA-SB4-MECH	PFA-SB4-AC	Fire-rated door between cable shaft and pump room	-16 ft
PFA-SB4-DC	PFA-SB4-AC	Fire-rated door between DC switchgear room and cable floor	+15 ft
PFA-BATT4	PFA-SB4-AC	Fire-rated door between battery room and cable floor	+15 ft
PFA-SB4-DC	PFA-SB4-AC	Fire-rated door between I&C cabinet room and AC switchgear room	+27 ft

Question 19-140:

Discuss the analysis of the operator action to align a standby RHRS train in all applicable POS. How does the assessment account for the different actions needed to align a standby train initially in low head safety injection (LHSI) mode versus residual heat removal (RHR) mode? How is the operator action timing derived in each POS?

Response to Question 19-140:

The shutdown PRA model assumes that the RHR train four is aligned in the LHSI mode in all plant operating states (POS) but CAD, while the other RHR trains are aligned in the RHR mode. However, no difference in the action to align/start a standby RHR train was modeled. This was based on the following assumptions:

- Diagnosis human error probability (HEP) is the same for both alignment modes.
- Action HEP is not significantly affected because both alignment actions could be performed from the main control room (MCR), without a significant difference in time required.

In POS where a switch of the RHR pump alignment is necessary, more than five minutes are available for the action itself (in addition to diagnosis time).

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-141:

Describe how pre-initiator human errors are modeled in the shutdown PRA.

Response to Question 19-141:

Pre-initiator human errors are modeled in the shutdown PRA the same as in the at-power PRA. This is conservative because although many maintenance actions are performed during shutdown, recovery of the pre-initiator human errors is easier with the maintenance crew present in the Safeguard Buildings (SBs).

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-142:

1. Provide a more detailed discussion of accident sequences initiated by an uncontrolled level drop in various POS.
2. Specifically, how is spurious opening of the low-pressure reducing station motor-operated valves (MOV) while in mid-loop (i.e., failure to maintain water level) treated differently from failures to stop a controlled drain to mid-loop (i.e., overdrain)?
3. How is the OPF-ULD basic event different from the OPF-ISOCSLPRS basic event?

Response to Question 19-142:

Response to Question 19-142(1):

Accident sequences initiated by an uncontrolled level drop (ULD) are similar in state CB and D; if isolation of the event fails the event is treated as a LOCA in shutdown. The ULD specific functional events, and differences in the LOCA responses, are described below.

Functional Event : SD ULD CB or SD ULD D—This event represents the initiating events described in the Response to Question 19-142(2); fault trees for these events include both, failures of the chemical and volume control system (CVCS) low pressure reducing valve (KBA14AA106) to close or remain closed, and the operator error during the drain down. These different failure modes are modeled in the function events (top events)

Functional Event: ISOLSD—This event models automatic closure of redundant motor operated valves (MOVs) (KBA14AA004 and 106) at level < min1 (Auto Isolation at Min 1). Since the low pressure reducing valve KBA14AA106 failure is involved with the initiating event, it is neglected in this model (assumed to have failed). If this isolation is successful, the level drop is prevented from going to mid-loop and normal residual heat removal (RHR) operation is not affected (sequence goes to success since RHR is unaffected).

If isolation fails, the following automatic actions occur:

- An automatic safety injection system (SIS) is actuated at mid-loop level (< min2). This automatically starts medium head safety injection (MHSI) and provides makeup to the reactor pressure vessel (RPV). This is modeled with MHSI.
- Also at min 2, the operating RHR trains will receive a protective trip. Even with MHSI success it is assumed that the RHR pumps are tripped and must be manually started. The protective trip function is modeled in the low head safety injection (LHSI) event. Note: The protective trip of RHR also automatically starts MHSI (not credited).

Differences in the LOCA responses: If this isolation fails, the event sequence response is the same as in LOCA events, except that the severe accident heat removal system (SAHRS) train is only required when primary feed and bleed is credited since the LOCA is outside containment.

Functional Event: OP ISOLSD—It is assumed the operators must eventually isolate letdown in the long-term. Otherwise, there is a potential to lose the in-containment refueling water storage tank (IRWST) outside containment. It is possible that high volume control tank (VCT) level would automatically open the “Coolant Storage”MOV and divert letdown to the coolant storage

tanks. Since letdown flow is in the 50 to 500 gpm range, it would take more than 8 hours to divert a half of the IRWST and cause loss of safety injection suction. Additionally, there are numerous isolation valves that can be utilized such as the MOVs in the RHR connection, the coolant storage or the chemical and volume control system (CVCS) letdown path. There is also significant time to perform these actions locally. As a result, it is assumed that the operator action will dominate this event and valve failures are neglected.

Response to Question 19-142(2):

As stated in the question, the following initiating events are treated differently:

- Initiating Events: SD ULD CBD D and SD ULD DU D: Failures to stop an uncontrolled drain (overdrain) to midloop, in states CBD and DU, is modeled as a failure on demand, once per each plant operating states (POS). This includes an operator action (OPF-ULD) to isolate the CVCS low-pressure reducing station, or a failure of the CVCS low-pressure reducing station MOV to close on demand.
- Initiating Events: SD ULD CBD MT and SD ULD DU MT: Spurious opening of the low-pressure reducing station MOV while in mid-loop, in states DD, CBD, DU and CBU, is modeled as a time dependent failure of the CVCS low-pressure reducing station MOV to stay closed during corresponding POS duration.

Response to Question 19-142(3):

OPF-ULD action, as described above, is an operator failure to stop overdrain in the process of draining to mid-loop. It is a failure on demand, and it was estimated at 1E-02/demand. This human action represents the initiating events described previously, SD ULD CBD D and SD ULD DU D.

OPE-ISOCSLPRS action is a long-term action to isolate the CVCS low-pressure reducing station and to prevent a loss of the IRWST inventory outside containment; more than eight hours are available; human error probability (HEP) is evaluated to be 5.5E-05. This human action represents the functional event described above, OP ISOLSD.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-143:

Define which failures (e.g., spurious operation of particular valves) are included in the assessment of RHRS flow diversions at shutdown. If any failures are screened out, justify their exclusion. How much time does the operator have to isolate flow diversions in each POS?

Response to Question 19-143:

The following failures were not screened out for flow diversions.

- JNG10AA001 suction motor operated valve (MOV) from in-containment refueling water storage tank (IRWST)—spurious operation or internal rupture of this MOV results in draining the reactor coolant system (RCS) to the IRWST.
- JNA10AA191 hot leg safety valve—spurious operation of this safety valve (SV) results in draining the RCS to the IRWST.
- JNG10AA003 mini flow motor operated check valve—spurious operation or internal rupture of this valve results in draining the RCS to the IRWST.
- JNG10AA004 mini flow motor operated check valve—spurious operation or internal rupture of this valve results in draining the RCS to the IRWST.
- JND10AA003 check valve injection path from medium head safety injection (MHSI)—spurious rupture of this check valve (CV) results in draining the RCS to the IRWST.

The time available for the manual isolation of flow diversion and associated human error probability (HEP) for operator failure to isolate are provided for each POS in Table 19-143-1.

Operator isolation is not credited if less than 25 minutes is available.

The following paths were screened out as summarized below:

- JNG15AA002 MOV to chemical and volume control system (CVCS) is screened because this is a 1-inch line and there is a second normally closed valve in series.
- JNG10AA601 MOV to sampling is screened because this a 1-inch line to sampling.
- JNG10AA192 injection safety valve is screened because this is a 1-inch line downstream of the low head safety injection (LHSI) minflow orifice.
- Train 3 and 4 connection to the low pressure reducing station is modeled as an uncontrolled level drop (ULD) initiating event during mid-loop.
- Drain connections are screened as they are less than 1-inch manual valves.
- The accumulator injection line to the cold leg is screened because there is a check valve and closed MOV during shutdown.
- The emergency boration connection to the cold leg has at least two valves in series that would have to spuriously open.

FSAR Impact:

The FSAR will not be changed as a result of this question.

Table 19-143-1—RHR Flow Diversion Paths, Associated Times and Human Error Probabilities for Manual Isolation

	POS CA		POS CB/D		POS E	
Flow Diversion Paths	**Time to Isolate (min)**	**Operator Failure to Isolate (HEP)**	**Time to Isolate (min)**	**Operator Failure to Isolate (HEP)**	**Time to Isolate (min)**	**Operator Failure to Isolate (HEP)**
JNG10AA001	1.3	1.0	0.3	1.0	28	1.1E-02
JNA10AA191	50	2.0E-03	2.9	1.0	320	5.5E-05
JNG10AA003	110	2.0E-03	4.2	1.0	680	5.5E-05
JNG10AA004	110	2.0E-03	4.2	1.0	680	5.5E-05
JND10AA003	112	2.0E-03	4.3	1.0	700	5.5E-05

Question 19-144:

Explain the meaning of the “SA-ESWS UHS4 SBO” basic event listed on page 19.1-396. Does this basic event represent a loss of the entire dedicated severe accident ESWS train? How was the failure probability derived, and what assumptions were made in the derivation?

Response to Question 19-144:

“SA-ESWS UHS4 SBO” basic event represents a loss of the entire dedicated severe accident emergency service water (ESW) system train, given a station blackout (SBO) event. It is an undeveloped event assigned a probability of 0.1. It is based on an estimate of the operator action to connect the dedicated ESW pump to the SBO-backed Division 4 bus (equipment unavailability is a negligible contributor to this value).

FSAR Impact:

The FSAR will not be changed as a result of this question.

Question 19-145:

Several equipment and operator failures in Tables 19.1-93 and 19.1-95 have RAW values of "1E-NA." Discuss the meaning of this indication. If any of the failure events do have finite RAW values, amend the tables as needed.

Response to Question 19-145:

"1E-NA" is a typographical error which should correctly read "IE-NA" signifying "Initiating Event – Not Applicable" to denote a component for which its failure is also considered as an initiating event; hence, due to software limitations, the calculated risk achievement worth (RAW) value is not valid.

FSAR Impact:

U.S. EPR FSAR Tier 2, Tables 19.1-93 and 19.1-95 will be revised as described in the response and indicated on the enclosed FSAR markup.

APPENDIX A

Response to Question 19-126: Supporting Information for Importance Tables in the U.S. EPR FSAR Chapter 19

t19.1-8b

System	Component ID	Description	FV	RAW
ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.187	2.5
ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.187	2.5
ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	0.170	2.0
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	0.168	18.7
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	0.167	18.5
ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.166	1.9
ELEC	30XKA80	ELEC, SBO Diesel Generator XKA80	0.058	1.8
ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	0.058	1.8
ELEC	34BTD01_BAT	ELEC, 250V 1E 2-hr Battery 34BTD01	0.050	23.0
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	0.049	21.7
SIS/RHRS	30JND40AP001	MHSI, MHSI Train 4 Motor Driven Pump JND40AP001	0.044	1.4
SIS/RHRS	30JND10AP001	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001	0.043	1.3
EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.042	3.3
EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	0.041	3.3
SIS/RHRS	30JND30AP001	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001	0.041	1.3
SIS/RHRS	30JND20AP001	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001	0.040	1.2
MSS	30LBA40AA002	MSS, Train 4 Main Steam Isolation Valve LBA40AA002	0.034	14.8
ELEC	32BTD01_BAT	ELEC, 250V 1E 2-hr Battery 32BTD01	0.031	1.8
ELEC	33BTD01_BAT	ELEC, 250V 1E 2-hr Battery 33BTD01	0.031	1.8
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	0.028	1.1
SIS/RHRS	30JNG43AA005	LHSI, CL4 First SIS Isolation Check Valve JNG43AA005	0.028	1.2
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	0.027	1.3
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	0.027	1.3
MSS	30LBA13AA001	MSS, Train 1 MSRIV LBA13AA001	0.026	1.0
MSS	30LBA33AA001	MSS, Train 3 MSRIV LBA33AA001	0.026	1.0
MSS	30LBA23AA001	MSS, Train 2 MSRIV LBA23AA001	0.026	1.0

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System	Component ID	Description	FV	RAW
MSS	30LBA43AA001	MSS, Train 4 MSRIV LBA43AA001	0.026	1.0
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	0.020	17.8
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	0.020	18.0
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	0.020	18.0
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	0.020	17.3
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	0.019	17.5
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	0.019	17.5
EFWS	30LAS31AP001	EFWS, Train 3 Motor Driven Pump LAS31AP001	0.018	1.6
EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	0.018	1.6
MSS	30LBA10AA002	MSS, Train 1 Main Steam Isolation Valve LBA10AA002	0.015	1.0
MSS	30LBA20AA002	MSS, Train 2 Main Steam Isolation Valve LBA20AA002	0.015	1.0
MSS	30LBA30AA002	MSS, Train 3 Main Steam Isolation Valve LBA30AA002	0.015	1.0
MSS	30LBA43AA101	MSS, Train 4 MSRCV LBA43AA101	0.012	4.4
RCS	30JEB10AA010	RCP, RCP1 Leakoff Isolation MOV JEB10AA010	0.011	4.2
RCS	30JEB10AA020	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020	0.011	4.2
RCS	30JEB20AA010	RCP, RCP2 Leakoff Isolation MOV JEB20AA010	0.011	4.2
RCS	30JEB20AA020	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020	0.011	4.2
RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	0.010	3.9
RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	0.010	3.9
RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	0.010	3.9
RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	0.010	3.9
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	0.010	2.6
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	0.010	2.6
ESWS	30PED30AN002	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002	0.009	1.3
ESWS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	0.009	1.3
CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	0.009	1.3

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System	Component ID	Description	FV	RAW
CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	0.009	1.2
MSS	30LBA33AA716	MSS, Train 3b MSRIV Pneumatic Pilot Valve LBA33AA716	0.009	1.0
MSS	30LBA33AA717	MSS, Train 3b MSRIV Pneumatic Pilot Valve LBA33AA717	0.009	1.0
HVAC	30SAC03AN001	SAC, Normal Air Supply Fan SAC03AN001	0.009	1.5
HVAC	30SAC33AN001	SAC, Normal Air Exhaust Fan SAC33AN001	0.009	1.5
MSS	30LBA43AA716	MSS, Train 4b MSRIV Pneumatic Pilot Valve LBA43AA716	0.009	1.0
HVAC	30SAC02AN001	SAC, Normal Air Supply Fan SAC02AN001	0.009	1.4
HVAC	30SAC32AN001	SAC, Normal Air Exhaust Fan SAC32AN001	0.009	1.4
ESWS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	0.008	1.1
ESWS	30PED40AN002	UHS, Cooling Tower Train 4 Cooling Fan PED40AN002	0.008	1.1
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	0.008	1.1
CCWS	30KAA42AA005	CCWS, Train 4 to LHSI HTX 40 Cooling MOV KAA42AA005	0.008	1.1
MSS	30LBA41AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA41AA191	0.007	14.6
MSS	30LBA42AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA42AA191	0.007	14.6
SCWS	30QKA30AP107	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107	0.006	1.5
SCWS	30QKA20AP107	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107	0.006	1.4
ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	0.006	2.5
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	0.005	2.5

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Internal Basic Events ID	Description	Nom.val.	FV	RAW
QKA40GH001_FS	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Start on Demand	4.85E-03	8.59E-02	1.87E+01
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	8.51E-02	1.85E+01
XKA80____DFR	ELEC, SBO Diesel Generator XKA80, Fails to Run	5.44E-02	4.69E-02	1.82E+00
XKA50____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run	5.44E-02	4.67E-02	1.81E+00
XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	2.75E-02	4.23E-02	2.49E+00
XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	2.75E-02	4.17E-02	2.47E+00
LAS11AP001EFR	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Run	1.19E-02	2.82E-02	3.35E+00
LAS41AP001EFR	EFWS, Train 4 Motor Driven Pump LAS41AP001, Fails to Run	1.19E-02	2.75E-02	3.29E+00
XKA40____DFR	ELEC, Emergency Diesel Generator XKA40, Fails to Run	2.75E-02	2.72E-02	1.96E+00
XKA10____DFR	ELEC, Emergency Diesel Generator XKA10, Fails to Run	2.75E-02	2.52E-02	1.89E+00
LBA40AA002PFC	MSS, Train 4 Main Steam Isolation Valve LBA40AA002, Fails to Close on Demand	1.10E-03	1.52E-02	1.48E+01
34BTD01_BATST	ELEC, 250V 1E 2-hr Battery 34BTD01, Fails on Demand	6.50E-04	1.43E-02	2.30E+01
31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	1.35E-02	2.17E+01
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	1.24E-02	1.87E+01
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	1.19E-02	1.80E+01
LBA43AA101EFC	MSS, Train 4 MSRCV LBA43AA101, Fails to Close on Demand	3.42E-03	1.18E-02	4.44E+00
JEB10AA010EFC	RCP, RCP1 Leakoff Isolation MOV JEB10AA010, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB10AA020EFC	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB20AA010EFC	RCP, RCP2 Leakoff Isolation MOV JEB20AA010, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB20AA020EFC	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB30AA010EFC	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB30AA020EFC	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB40AA010EFC	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB40AA020EFC	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	7.90E-03	2.61E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	7.77E-03	2.58E+00
LAS31AP001EFR	EFWS, Train 3 Motor Driven Pump LAS31AP001, Fails to Run	1.19E-02	7.15E-03	1.60E+00
LAS21AP001EFR	EFWS, Train 2 Motor Driven Pump LAS21AP001, Fails to Run	1.19E-02	6.78E-03	1.56E+00
QKA40AP107EFS	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, Fails to Start on Demand	3.85E-04	6.34E-03	1.75E+01
QKA10AP107EFS	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Start on Demand	3.85E-04	6.29E-03	1.73E+01
SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	3.49E-04	5.93E-03	1.80E+01
SAC34AN001EFR	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Run	3.49E-04	5.93E-03	1.80E+01
SAC01AN001EFR	SAC, Normal Air Supply Fan SAC01AN001, Fails to Run	3.49E-04	5.74E-03	1.75E+01
SAC31AN001EFR	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Run	3.49E-04	5.74E-03	1.75E+01
QKA40GH001PANS	SCWS, Train 4 Chiller Unit QKA40GH001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	5.51E-03	1.74E+01
QKA10GH001PANS	SCWS, Train 1 Chiller Unit QKA10GH001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	5.46E-03	1.73E+01
PEB30AA005EFO	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005, Fails to Open on Demand	3.50E-03	5.31E-03	2.51E+00
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	5.21E-03	2.48E+00

All Basic Events with FV >= 5E-03

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System	Component ID	Description	RAW	FV
EFWS	30LAR40BB001	EFWS, Train 4 EFW Storage Tank LAR40BB001	33.8	0.000
EFWS	30LAR20BB001	EFWS, Train 2 EFW Storage Tank LAR20BB001	33.8	0.000
EFWS	30LAR10BB001	EFWS, Train 1 EFW Storage Tank LAR10BB001	33.8	0.000
EFWS	30LAR30BB001	EFWS, Train 3 EFW Storage Tank LAR30BB001	33.8	0.000
ELEC	34BUC	ELEC, 250V DC Bus 34BUC	33.3	0.001
ELEC	34BTD01_BAT	ELEC, 250V 1E 2-hr Battery 34BTD01	23.0	0.050
ELEC	34BDA	ELEC, 6.9kV SWGR 34BDA	22.7	0.001
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	21.7	0.049
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	18.7	0.168
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	18.5	0.167
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	18.0	0.020
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	18.0	0.020
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	17.8	0.020
CCWS	30KAB20AA193	CCWS, FPCS Train 2 Cooling Header Safety Valve KAB20AA193	17.7	0.001
CCWS	30KAB20AA192	CCWS, CCWS CH2 Return Safety Valve KAB20AA192	17.7	0.001
CCWS	30KAB70AA191	CCWS, CVCS HP Cooler 2 Return Safety Valve KAB60AA191	17.7	0.001
CCWS	30KAB30AA192	CCWS, CCWS CH2 RCP3/4 TB Return Safety Valve KAB30AA192	17.7	0.001
ELEC	30BRW70BUW71	ELEC, 24V DC I&C Power Rack 34BRW70/34BUW71	17.7	0.000
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	17.5	0.019
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	17.5	0.019
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	17.3	0.020
ELEC	31BUC	ELEC, 250V DC Bus 31BUC	15.7	0.000
HVAC	30SAC04AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC04AA005	15.6	0.001
SCWS	30QKA40AA003	SCWS, Train 4 Safety Chiller Pump Discharge Check Valve QKA40AA003	15.6	0.001
SCWS	30QKA10AA003	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003	15.5	0.001
HVAC	30SAC01AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005	15.5	0.001

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System	Component ID	Description	RAW	FV
MSS	30LBA40AA002	MSS, Train 4 Main Steam Isolation Valve LBA40AA002	14.8	0.034
MSS	30LBA41AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA41AA191	14.6	0.007
MSS	30LBA42AA191	MSS, Train 4 Main Steam Safety Relief Valve LBA42AA191	14.6	0.007
HVAC	30SAC34AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC34AA002	13.0	0.000
HVAC	30SAC31AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002	13.0	0.000
HVAC	30SAC04AA003	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003	13.0	0.000
HVAC	30SAC01AA003	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003	13.0	0.000
SCWS	30QKA10AA101	SCWS, Train 1 Chiller By-pass MOV QKA10AA101	13.0	0.000
SCWS	30QKC40AA101	SCWS, Return from SAC Div 4 MOV QKC40AA101	13.0	0.000
SCWS	30QKC10AA101	SCWS, Return from SAC Div 1 MOV QKC10AA101	13.0	0.000
SCWS	30QKA40AA101	SCWS, Train 4 Chiller By-pass MOV QKA40AA101	13.0	0.000
HVAC	30SAC34AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC34AA003	12.4	0.000
HVAC	30SAC31AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003	12.4	0.000
ELEC	31BTD01	ELEC, 250V Battery 31BTD01 Circuit Breaker	12.4	0.000
ELEC	34BTD01	ELEC, 250V Battery 34BTD01 Circuit Breaker	12.4	0.000
ELEC	34BMT04	ELEC, 6.9kV-480V Transformer 34BMT04	9.9	0.000
ELEC	34BDD	ELEC, 6.9kV SWGR 34BDD	9.9	0.000
ELEC	34BMD	ELEC, 480V Load Center 34BMD	9.9	0.000
ELEC	31BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery 31BTB01	7.3	0.004
ELEC	32BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery 32BTB01	7.0	0.004
ELEC	34BDA_4BDD1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker	6.2	0.000
ELEC	34BDD4BMT04	ELEC, 6.9kV SWGR 34BDD to Transformer 34BMT04 Circuit Breaker	6.2	0.000
ELEC	34BMT044BMD	ELEC, Transformer 34BMT04 to 480V Load Center 34BMD Circuit Breaker	6.2	0.000
ELEC	34BDA_4BDD2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker	6.2	0.000
ELEC	31BUD	ELEC, Non 1E 250V DC Distribution Panel 31BUD	5.9	0.000
ELEC	32BUD	ELEC, Non 1E 250V DC Distribution Panel 32BUD	5.2	0.000

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System	Component ID	Description	RAW	FV
MSS	30LBA43AA101	MSS, Train 4 MSRCV LBA43AA101	4.4	0.012
RCS	30JEB20AA020	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020	4.2	0.011
RCS	30JEB20AA010	RCP, RCP2 Leakoff Isolation MOV JEB20AA010	4.2	0.011
RCS	30JEB10AA020	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020	4.2	0.011
RCS	30JEB10AA010	RCP, RCP1 Leakoff Isolation MOV JEB10AA010	4.2	0.011
RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	3.9	0.010
RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	3.9	0.010
RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	3.9	0.010
RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	3.9	0.010
OCWS	30QNA22AN001	OCWS, Train 2A Chiller Unit QNA22AN001	3.6	0.002
OCWS	30QNA23AN001	OCWS, Train 1B Chiller Unit QNA23AN001	3.6	0.002
RCS	30JEB20 SSSF	Stand Still Seal for RCP2	3.5	0.002
RCS	30JEB10 SSSF	Stand Still Seal for RCP1	3.5	0.002
RCS	30JEB30 SSSF	Stand Still Seal for RCP3	3.4	0.002
RCS	30JEB40 SSSF	Stand Still Seal for RCP4	3.4	0.002
EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	3.3	0.042
ELEC	31BRU03	ELEC, Inverter 31BRU03	3.3	0.000
ELEC	32BRU03	ELEC, Inverter 32BRU03	3.3	0.000
EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	3.3	0.041
OCWS	30QNA23AP043	OCWS, Train 1B Motor Driven Chiller Unit Pump QNA23AP043	3.3	0.001
OCWS	30QNA22AP033	OCWS, Train 2A Motor Driven Chiller Unit Pump QNA22AP033	3.3	0.001
ELEC	32BRC	ELEC, 480V MCC 32BRC	3.2	0.000
ELEC	34BRB	ELEC, 480V MCC 34BRB	3.2	0.000
ELEC	32BRU0301	ELEC, Inverter 32BRU03 Bypass Switch 32BRU0301	3.2	0.000
ELEC	31BRU0301	ELEC, Inverter 31BRU03 Bypass Switch 31BRU0301	3.2	0.000
ELEC	31BRC	ELEC, 480V MCC 31BRC	3.2	0.000

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System	Component ID	Description	RAW	FV
ELEC	31BRB	ELEC, 480V MCC 31BRB	3.2	0.000
RCS	30JEB10AA018	RCP Seal, RCP1 Nitrogen Supply Solenoid Valve JEB10AA018	3.1	0.001
RCS	30JEB20AA018	RCP Seal, RCP2 Nitrogen Supply Solenoid Valve JEB20AA018	3.1	0.001
RCS	30JEB30AA018	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018	3.0	0.001
RCS	30JEB40AA018	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018	3.0	0.001
EFWS	30LAR11AA103	EFWS, Train 1 SG Pressure Control MOV LAR11AA103	3.0	0.003
EFWS	30LAR11AA105	EFWS, Train 1 SG Level Control MOV LAR11AA005	3.0	0.003
ELEC	30BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	2.9	0.000
EFWS	30LAR41AA105	EFWS, Train 4 SG Level Control MOV LAR41AA005	2.9	0.003
EFWS	30LAR41AA103	EFWS, Train 4 SG Pressure Control MOV LAR41AA103	2.9	0.003
ELEC	36BBG	ELEC, 6.9kV SWGR 36BBG	2.8	0.000
ELEC	35BBG	ELEC, 6.9kV SWGR 35BBG	2.8	0.000
ELEC	35BBA	ELEC, 13.8kV SWGR 35BBA	2.8	0.000
ELEC	36BFT05	ELEC, 13.8kV-480V Transformer 36BFT05	2.8	0.000
ELEC	36BBT07	ELEC, 13.8kV-6.9kV Transformer 36BBT07	2.8	0.000
ELEC	36BFE	ELEC, 480V Bus 36BFE	2.8	0.000
ELEC	35BBT07	ELEC, 13.8kV-6.9kV Transformer 35BBT07	2.8	0.000
ELEC	36BBA	ELEC, 13.8kV SWGR 36BBA	2.8	0.000
ELEC	35BFE	ELEC, 480V Load Center 35BFE	2.8	0.000
ELEC	35BFT05	ELEC, 13.8kV-480V Transformer 35BFT05	2.8	0.000
ELEC	30BRW52BUW53	ELEC, 24V DC I&C Power Rack BRW52/BUW53	2.7	0.000
RCS	30JEB10AP001	ELEC, 13.8kV SWGR 31BBC Circuit Breaker for RCP JEB10AP001	2.6	0.001
RCS	30JEB20AP001	ELEC, 13.8kV SWGR 32BBC Circuit Breaker for RCP JEB20AP001	2.6	0.001
ESWS	30PEB40AP001	ESWS, Train 4 Motor Driven Pump PEB40AP001	2.6	0.003
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	2.6	0.010
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	2.6	0.010

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System	Component ID	Description	RAW	FV
ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	2.5	0.006
ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	2.5	0.187
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	2.5	0.005
ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	2.5	0.187
ELEC	30BRW32BUW33	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33	2.5	0.000
ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	2.4	0.000
ELEC	34BMB	ELEC, 480V Load Center 34BMB	2.4	0.000
ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	2.4	0.000
ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	2.4	0.000
EFWS	30LAR11AA001	EFWS, Train 1 Pump Suction Manual Valve LAR11AA001	2.3	0.000
EFWS	30LAR41AA001	EFWS, Train 4 Pump Suction Manual Valve LAR41AA001	2.3	0.000
CCWS	30KAA40AP001	CCWS, Train 40 Motor Driven Pump KAA40AP001	2.2	0.000
ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	2.1	0.000
ELEC	31BMB	ELEC, 480V Load Center 31BMB	2.1	0.000
ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	2.1	0.000
ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	2.1	0.000
ELEC	32BTB01	ELEC, 250V Battery 32BTB01 Circuit Breaker	2.1	0.000
ELEC	31BTB01	ELEC, 250V Battery 31BTB01 Circuit Breaker	2.1	0.000

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Internal Basic Events ID	Description	Nom.val.	FV	RAW
LAR10BB001TEL	EFWS, Train 1 EFW Storage Tank LAR10BB001, External Leakage	1.00E-06	3.28E-05	3.38E+01
LAR20BB001TEL	EFWS, Train 2 EFW Storage Tank LAR20BB001, External Leakage	1.00E-06	3.28E-05	3.38E+01
LAR30BB001TEL	EFWS, Train 3 EFW Storage Tank LAR30BB001, External Leakage	1.00E-06	3.28E-05	3.38E+01
LAR40BB001TEL	EFWS, Train 4 EFW Storage Tank LAR40BB001, External Leakage	1.00E-06	3.28E-05	3.38E+01
34BUC_____OFL	ELEC, 250V DC Distribution Panel 34BUC, Fails During Operation	2.40E-05	7.74E-04	3.33E+01
34BTD01_BATST	ELEC, 250V 1E 2-hr Battery 34BTD01, Fails on Demand	6.50E-04	1.43E-02	2.30E+01
34BDA_____OFL	ELEC, 6.9kV SWGR 34BDA, Fails During Operation	2.40E-05	5.20E-04	2.27E+01
31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	1.35E-02	2.17E+01
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	1.24E-02	1.87E+01
QKA40GH001_FS	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Start on Demand	4.85E-03	8.59E-02	1.87E+01
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	8.51E-02	1.85E+01
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	1.19E-02	1.80E+01
SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	3.49E-04	5.93E-03	1.80E+01
SAC34AN001EFR	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Run	3.49E-04	5.93E-03	1.80E+01
QKA40AP107EFR	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, Fails to Run	2.37E-04	3.98E-03	1.78E+01
KAB20AA192SPO	CCWS, CCWS CH2 Return Safety Valve KAB20AA192, Premature Opening	7.20E-05	1.20E-03	1.77E+01
KAB20AA193SPO	CCWS, FPCS Train 2 Cooling Header Safety Valve KAB20AA193, Premature Opening	7.20E-05	1.20E-03	1.77E+01
KAB30AA192SPO	CCWS, CCWS CH2 RCP3/4 TB Return Safety Valve KAB30AA192, Premature Opening	7.20E-05	1.20E-03	1.77E+01
KAB70AA191SPO	CCWS, CVCS HP Cooler 2 Return Safety Valve KAB60AA191, Premature Opening	7.20E-05	1.20E-03	1.77E+01
QKA40AP107EFS	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, Fails to Start on Demand	3.85E-04	6.34E-03	1.75E+01
SAC01AN001EFR	SAC, Normal Air Supply Fan SAC01AN001, Fails to Run	3.49E-04	5.74E-03	1.75E+01
SAC31AN001EFR	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Run	3.49E-04	5.74E-03	1.75E+01
QKA40GH001PANS	SCWS, Train 4 Chiller Unit QKA40GH001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	5.51E-03	1.74E+01
QKA10AP107EFS	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Start on Demand	3.85E-04	6.29E-03	1.73E+01
QKA10GH001PANS	SCWS, Train 1 Chiller Unit QKA10GH001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	5.46E-03	1.73E+01
QKA10AP107EFR	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Run	2.37E-04	3.86E-03	1.73E+01
SAC04AN001EFS	SAC, Normal Air Supply Fan SAC04AN001, Fails to Start on Demand	2.12E-04	3.39E-03	1.70E+01
SAC34AN001EFS	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Start on Demand	2.12E-04	3.39E-03	1.70E+01
SAC01AN001EFS	SAC, Normal Air Supply Fan SAC01AN001, Fails to Start on Demand	2.12E-04	3.36E-03	1.69E+01
SAC31AN001EFS	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Start on Demand	2.12E-04	3.36E-03	1.69E+01
34BNB01___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BNB01 Control Power, Fails to Run	1.53E-04	2.41E-03	1.67E+01
31BNB01___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB01 Control Power, Fails to Run	1.53E-04	2.39E-03	1.66E+01
QKA40AP107EEL	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, External Leakage	7.20E-05	1.11E-03	1.64E+01
QKA10AP107EEL	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, External Leakage	7.20E-05	1.07E-03	1.59E+01
31BUC_____OFL	ELEC, 250V DC Distribution Panel 31BUC, Fails During Operation	2.40E-05	3.53E-04	1.57E+01
QKA40AA003CFO	SCWS, Train 4 Safety Chiller Pump Discharge Check Valve QKA40AA003, Fails to Open	4.76E-05	6.95E-04	1.56E+01
SAC04AA005CFO	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC04AA005, Fails to Open on Demand	4.76E-05	6.95E-04	1.56E+01
QKA10AA003CFO	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Open	4.76E-05	6.92E-04	1.55E+01

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Internal Basic Events ID	Description	Nom.val.	FV	RAW
SAC01AA005CFO	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005, Fails to Open on Demand	4.76E-05	6.92E-04	1.55E+01
LBA40AA002PFC	MSS, Train 4 Main Steam Isolation Valve LBA40AA002, Fails to Close on Demand	1.10E-03	1.52E-02	1.48E+01
LBA40AA002POP	MSS, Train 4 Main Steam Isolation Valve LBA40AA002, Fails to Remain Closed (SO)	7.92E-05	1.07E-03	1.46E+01
LBA41AA191SPO	MSS, Train 4 Main Steam Safety Relief Valve LBA41AA191, Premature Opening	7.20E-05	9.76E-04	1.46E+01
LBA42AA191SPO	MSS, Train 4 Main Steam Safety Relief Valve LBA42AA191, Premature Opening	7.20E-05	9.76E-04	1.46E+01
QKA10AA101ECF	SCWS, Train 1 Chiller By-pass MOV QKA10AA101, Fails to Control Flow	8.40E-06	1.00E-04	1.30E+01
QKA10GH001PASM	SCWS, Train 1 Chiller Unit QKA10GH001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	9.33E-05	1.30E+01
QKA40AA101ECF	SCWS, Train 4 Chiller By-pass MOV QKA40AA101, Fails to Control Flow	8.40E-06	1.00E-04	1.30E+01
QKA40GH001PASM	SCWS, Train 4 Chiller Unit QKA40GH001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	9.33E-05	1.30E+01
QKC10AA101ECL	SCWS, Return from SAC Div 1 MOV QKC10AA101, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
QKC40AA101ECL	SCWS, Return from SAC Div 4 MOV QKC40AA101, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
SAC01AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
SAC04AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
SAC31AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
SAC34AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC34AA002, Fails to Remain Open (SO)	8.40E-06	1.00E-04	1.30E+01
31BTD01___BOP	ELEC, 250V Battery 31BTD01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.18E-05	1.24E+01
34BTD01___BOP	ELEC, 250V Battery 34BTD01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.18E-05	1.24E+01
QKA10AA003CCL	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
QKA40AA003CCL	SCWS, Train 4 Safety Chiller Pump Discharge Check Valve QKA40AA003, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
SAC01AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
SAC04AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC04AA005, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
SAC31AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
SAC31AA003CFO	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003, Fails to Open on Demand	4.57E-06	5.19E-05	1.24E+01
SAC34AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC34AA003, Fails to Remain Open	4.80E-06	5.45E-05	1.24E+01
SAC34AA003CFO	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC34AA003, Fails to Open on Demand	4.57E-06	5.19E-05	1.24E+01
34BDD_____OFL	ELEC, 6.9kV SWGR 34BDD, Fails During Operation	2.40E-05	2.15E-04	9.95E+00
34BMD_____OFL	ELEC, 480V Load Center 34BMD, Fails During Operation	2.40E-05	2.15E-04	9.95E+00
34BMT04___TFL	ELEC, 6.9kV-480V Transformer 34BMT04, Fails During Operation	2.40E-05	2.15E-04	9.95E+00
31BTB01_BATST	ELEC, 250V Non 1E 12-hr Battery 31BTB01, Fails on Demand	6.53E-04	4.13E-03	7.33E+00
32BTB01_BATST	ELEC, 250V Non 1E 12-hr Battery 32BTB01, Fails on Demand	6.53E-04	3.92E-03	7.00E+00
34BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BRA Control Power, Fails to Run	1.53E-04	8.87E-04	6.79E+00
4BDA_4BDD1BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.75E-05	6.21E+00
4BDA_4BDD2BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.75E-05	6.21E+00
4BDD4BMT04BOP	ELEC, 6.9kV SWGR 34BDD to Transformer 34BMT04 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.75E-05	6.21E+00
4BMT044BMDBOP	ELEC, Transformer 34BMT04 to 480V Load Center 34BMD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.75E-05	6.21E+00
31BUD_____OFL	ELEC, Non 1E 250V DC Distribution Panel 31BUD, Fails During Operation	2.40E-05	1.18E-04	5.90E+00
31BRB_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRB Control Power, Fails to Run	1.53E-04	6.77E-04	5.41E+00
32BUD_____OFL	ELEC, Non 1E 250V DC Distribution Panel 32BUD, Fails During Operation	2.40E-05	1.02E-04	5.25E+00

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Internal Basic Events ID	Description	Nom.val.	FV	RAW
34BRB____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BRB Control Power, Fails to Run	1.53E-04	6.50E-04	5.24E+00
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.00E-02	1.30E-01	5.20E+00
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.00E-02	1.22E-01	4.95E+00
LBA43AA101EFC	MSS, Train 4 MSRCV LBA43AA101, Fails to Close on Demand	3.42E-03	1.18E-02	4.44E+00
JEB10AA010EFC	RCP, RCP1 Leakoff Isolation MOV JEB10AA010, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB10AA020EFC	RCP Seal, RCP1 Seal Nitrogen Venting Isolation MOV JEB10AA020, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB20AA010EFC	RCP, RCP2 Leakoff Isolation MOV JEB20AA010, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB20AA020EFC	RCP Seal, RCP2 Seal Nitrogen Venting Isolation MOV JEB20AA020, Fails to Close on Demand	3.48E-03	1.10E-02	4.16E+00
JEB30AA010EFC	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB30AA020EFC	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB40AA010EFC	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
JEB40AA020EFC	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Fails to Close on Demand	3.48E-03	1.02E-02	3.93E+00
QNA22AN001_FR	OCWS, Train 2A Chiller Unit QNA22AN001, Fails to Run	6.97E-04	1.80E-03	3.58E+00
QNA23AN001_FR	OCWS, Train 1B Chiller Unit QNA23AN001, Fails to Run	6.97E-04	1.80E-03	3.58E+00
JEB10 SSSF	Mechanical Failure of the Stand Still Seal for RCP1	9.68E-04	2.46E-03	3.54E+00
JEB20 SSSF	Mechanical Failure of the Stand Still Seal for RCP2	9.68E-04	2.46E-03	3.54E+00
JEB30 SSSF	Mechanical Failure of the Stand Still Seal for RCP3	9.68E-04	2.29E-03	3.37E+00
JEB40 SSSF	Mechanical Failure of the Stand Still Seal for RCP4	9.68E-04	2.29E-03	3.37E+00
LAS11AP001EFR	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Run	1.19E-02	2.82E-02	3.35E+00
31BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB02 Control Power, Fails to Run	1.53E-04	3.58E-04	3.34E+00
31BRU03___IFR	ELEC, Inverter 31BRU03, Fails to Run	2.98E-05	6.84E-05	3.30E+00
32BRU03___IFR	ELEC, Inverter 32BRU03, Fails to Run	2.98E-05	6.84E-05	3.30E+00
LAS41AP001EFR	EFWS, Train 4 Motor Driven Pump LAS41AP001, Fails to Run	1.19E-02	2.75E-02	3.29E+00
QNA22AP033EFR	OCWS, Train 2A Motor Driven Chiller Unit Pump QNA22AP033, Fails to Run	2.37E-04	5.43E-04	3.29E+00
QNA23AP043EFR	OCWS, Train 1B Motor Driven Chiller Unit Pump QNA23AP043, Fails to Run	2.37E-04	5.43E-04	3.29E+00
34BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BNB02 Control Power, Fails to Run	1.53E-04	3.43E-04	3.23E+00
31BRB_____OFL	ELEC, 480V MCC 31BRB, Fails During Operation	2.40E-05	5.30E-05	3.21E+00
31BRC_____OFL	ELEC, 480V MCC 31BRC, Fails During Operation	2.40E-05	5.30E-05	3.21E+00
31BRU0301_SOP	ELEC, Inverter 31BRU03 Bypass Switch 31BRU0301, Fails to Remain Closed (SO)	2.40E-05	5.30E-05	3.21E+00
32BRC_____OFL	ELEC, 480V MCC 32BRC, Fails During Operation	2.40E-05	5.30E-05	3.21E+00
32BRU0301_SOP	ELEC, Inverter 32BRU03 Bypass Switch 32BRU0301, Fails to Remain Closed (SO)	2.40E-05	5.30E-05	3.21E+00
34BRB_____OFL	ELEC, 480V MCC 34BRB, Fails During Operation	2.40E-05	5.30E-05	3.21E+00
JEB10AA018OFO	RCP Seal, RCP1 Nitrogen Supply Solenoid Valve JEB10AA018, Fails to Open on Demand	4.84E-04	1.04E-03	3.15E+00
JEB20AA018OFO	RCP Seal, RCP2 Nitrogen Supply Solenoid Valve JEB20AA018, Fails to Open on Demand	4.84E-04	1.04E-03	3.15E+00
33BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 33BRA Control Power, Fails to Run	1.53E-04	3.25E-04	3.12E+00
32BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	1.53E-04	3.17E-04	3.07E+00
JEB30AA018OFO	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018, Fails to Open on Demand	4.84E-04	9.76E-04	3.01E+00
JEB40AA018OFO	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018, Fails to Open on Demand	4.84E-04	9.76E-04	3.01E+00

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Internal Basic Events ID	Description	Nom.val.	FV	RAW
QNA22AP033EEL	OCWS, Train 2A Motor Driven Chiller Unit Pump QNA22AP033, External Leakage	7.20E-05	1.43E-04	2.98E+00
QNA23AP043EEL	OCWS, Train 1B Motor Driven Chiller Unit Pump QNA23AP043, External Leakage	7.20E-05	1.43E-04	2.98E+00
LAR11AA103ECF	EFWS, Train 1 SG Pressure Control MOV LAR11AA103, Fails to Control Flow	1.50E-03	2.94E-03	2.95E+00
LAR11AA105ECF	EFWS, Train 1 SG Level Control MOV LAR11AA005, Fails to Control Flow	1.50E-03	2.94E-03	2.95E+00
BRW12BUW13OFL	ELEC, 24V DC I&C Power Rack 31BRW12/31BUW13, Fails During Operation	2.40E-05	4.60E-05	2.92E+00
BRW72BUW73OFL	ELEC, 24V DC I&C Power Rack 34BRW72/34BUW73, Fails During Operation	2.40E-05	4.60E-05	2.92E+00
BRW10BUW11OFL	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11, Fails During Operation	2.40E-05	4.57E-05	2.90E+00
LAS11AP001EFS	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Start on Demand	1.24E-03	2.34E-03	2.89E+00
LAR41AA103ECF	EFWS, Train 4 SG Pressure Control MOV LAR41AA103, Fails to Control Flow	1.50E-03	2.84E-03	2.89E+00
LAR41AA105ECF	EFWS, Train 4 SG Level Control MOV LAR41AA005, Fails to Control Flow	1.50E-03	2.84E-03	2.89E+00
LAS41AP001EFS	EFWS, Train 4 Motor Driven Pump LAS41AP001, Fails to Start on Demand	1.24E-03	2.26E-03	2.83E+00
35BBA____OFL	ELEC, 13.8kV SWGR 35BBA, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
35BBG____OFL	ELEC, 6.9kV SWGR 35BBG, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
35BBT07___TFL	ELEC, 13.8kV-6.9kV Transformer 35BBT07, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
35BFE____OFL	ELEC, 480V Load Center 35BFE, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
35BFT05___TFL	ELEC, 13.8kV-480V Transformer 35BFT05, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
36BBA____OFL	ELEC, 13.8kV SWGR 36BBA, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
36BBG____OFL	ELEC, 6.9kV SWGR 36BBG, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
36BBT07___TFL	ELEC, 13.8kV-6.9kV Transformer 36BBT07, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
36BFE____OFL	ELEC, 480V Load Center 36BFE, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
36BFT05___TFL	ELEC, 13.8kV-480V Transformer 36BFT05, Fails During Operation	2.40E-05	4.26E-05	2.78E+00
BRW52BUW53OFL	ELEC, 24V DC I&C Power Rack BRW52/BUW53, Fails During Operation	2.40E-05	4.13E-05	2.72E+00
31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	1.53E-04	2.53E-04	2.65E+00
JEB10AP001BFO	ELEC, 13.8kV SWGR 31BBC Circuit Breaker for RCP JEB10AP001, Fails to Open on Demand	4.67E-04	7.62E-04	2.63E+00
JEB20AP001BFO	ELEC, 13.8kV SWGR 32BBC Circuit Breaker for RCP JEB20AP001, Fails to Open on Demand	4.67E-04	7.62E-04	2.63E+00
PEB40AP001EFR	ESWS, Train 4 Motor Driven Pump PEB40AP001, Fails to Run	1.08E-04	1.76E-04	2.63E+00
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	7.90E-03	2.61E+00
32BRB____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRB Control Power, Fails to Run	1.53E-04	2.44E-04	2.59E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	7.77E-03	2.58E+00
33BRB____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 33BRB Control Power, Fails to Run	1.53E-04	2.37E-04	2.54E+00
PEB30AA005EFO	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005, Fails to Open on Demand	3.50E-03	5.31E-03	2.51E+00
JEB10AP001PANS	RCP, Train 1 Pump JEB10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	5.04E-04	2.50E+00
JEB20AP001PANS	RCP, Train 2 Pump JEB20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	5.04E-04	2.50E+00
XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	2.75E-02	4.23E-02	2.49E+00
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	5.21E-03	2.48E+00
XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	2.75E-02	4.17E-02	2.47E+00
LAR11AA103PANS	EFWS, Train 1 Press. MOV LAR11AA103, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.94E-04	2.47E+00
LAR11AA105PANS	EFWS, Train 1 Level MOV LAR11AA105, , Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.94E-04	2.47E+00

t19.1-9b2

Internal Basic Events ID	Description	Nom.val.	FV	RAW
LAS11AP001PANS	EFWS, Train 1 Pump LAS11AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.94E-04	2.47E+00
BRW32BUW33OFL	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33, Fails During Operation	2.40E-05	3.48E-05	2.45E+00
34BDB____OFL	ELEC, 6.9kV SWGR 34BDB, Fails During Operation	2.40E-05	3.40E-05	2.42E+00
34BDC____OFL	ELEC, 6.9kV SWGR 34BDC, Fails During Operation	2.40E-05	3.40E-05	2.42E+00
34BMB____OFL	ELEC, 480V Load Center 34BMB, Fails During Operation	2.40E-05	3.40E-05	2.42E+00
34BMT02__TFL	ELEC, 6.9kV-480V Transformer 34BMT02, Fails During Operation	2.40E-05	3.40E-05	2.42E+00
LAR41AA103PBNS	EFWS, Train 4 Press. MOV LAR41AA103, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.71E-04	2.40E+00
LAR41AA105PBNS	EFWS, Train 4 Level MOV LAR41AA105, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.71E-04	2.40E+00
LAS41AP001PBNS	EFWS, Train 4 Pump LAS41AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.71E-04	2.40E+00
LAR11AA001MEC1	EFWS, Train 1 Pump Suction Manual Valve LAR11AA001, Left in Wrong Position	2.00E-04	2.68E-04	2.34E+00
LAR41AA001MEC1	EFWS, Train 4 Pump Suction Manual Valve LAR41AA001, Left in Wrong Position	2.00E-04	2.55E-04	2.28E+00
KAA40AP001EEL	CCWS, Train 40 Motor Driven Pump KAA40AP001, External Leakage	7.20E-05	8.40E-05	2.17E+00
31BDB____OFL	ELEC, 6.9kV SWGR 31BDB, Fails During Operation	2.40E-05	2.75E-05	2.15E+00
31BDC____OFL	ELEC, 6.9kV SWGR 31BDC, Fails During Operation	2.40E-05	2.75E-05	2.15E+00
31BMB____OFL	ELEC, 480V Load Center 31BMB, Fails During Operation	2.40E-05	2.75E-05	2.15E+00
31BMT02__TFL	ELEC, 6.9kV-480V Transformer 31BMT02, Fails During Operation	2.40E-05	2.75E-05	2.15E+00
KAA40AP001EFR	CCWS, Train 40 Motor Driven Pump KAA40AP001, Fails to Run	4.69E-05	5.28E-05	2.13E+00
LAS11AP001EEL	EFWS, Train 1 Motor Driven Pump LAS11AP001, External Leakage	7.20E-05	7.86E-05	2.09E+00
XKA20____DFS	ELEC, Emergency Diesel Generator XKA20, Fails to Start on Demand	4.42E-03	4.80E-03	2.08E+00
XKA30____DFS	ELEC, Emergency Diesel Generator XKA30, Fails to Start on Demand	4.42E-03	4.78E-03	2.08E+00
31BTB01__BOP	ELEC, 250V Battery 31BTB01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.59E-06	2.06E+00
32BTB01__BOP	ELEC, 250V Battery 32BTB01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.59E-06	2.06E+00
LAS41AP001EEL	EFWS, Train 4 Motor Driven Pump LAS41AP001, External Leakage	7.20E-05	7.51E-05	2.04E+00

All Basic Events with RAW >= 2E+00

t19.1-10b

Basic Event	Description	Nominal Value	FV	RAW
OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.430	33.6
OPE-FB-40M	Operator Fails to Initiate Feed & Bleed for SLOCA	1.3E-01	0.082	1.5
OPE-FCD-40M	Operator Fails to Initiate Fast Cooldown for SLOCA	1.3E-01	0.067	1.4
OPF-XTDIV-NSC	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Divison 3 During Non-SBO Conditions	5.0E-01	0.054	1.1
OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBO DGs to Div 1 or 4 During Non-SBO Conditions	1.0E-01	0.037	1.3
OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours	1.0E-03	0.027	27.2
OPE-FCD-40MSBO	Operator Fails to Initiate Fast Cooldown for RCP During SBO Conditions	5.0E-01	0.020	1.0
OPF-EBS-30M	Operator Fails to Manually Actuate EBS (SLB & ATWS)	2.2E-02	0.020	1.9
OPF-SGTR-1H	Operator Fails to Isolate SGTR and Initiate Cooldown	2.0E-03	0.012	7.1
OPD-RHR4H/SGTR1H	Dependency (MED) Between Operator Actions for Stabilizing SGTR and Initiating RHR	1.4E-01	0.012	1.1
OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	0.008	16.4

t19.1-11b

Basic Event	Description	Nominal Value	FV	RAW
OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.430	33.6
OPE-RHR-4H	Operator Fails to Initiate RHR Within 4 Hours	1.0E-03	0.027	27.2
OPE-FB-90M	Operator Fails to Initiate Feed & Bleed for Transient	5.0E-04	0.008	16.4
OPF-SGTR-1H	Operator Fails to Isolate SGTR and Initiate Cooldown	2.0E-03	0.012	7.1
OPF-XTLDSBO-2H	Operator Fails to Connect and Load SBO DGs to Div 1 and 4	6.0E-04	0.003	5.5
OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	2.0E-04	0.000	3.4

t19.1-12b

System	ID	Description	Nominal Value	RAW
ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	2.9E-07	72,580.0
IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-07	5,341.0
SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	4.5E-06	5,140.0
HVAC	SAC31AN001EFR_D-ALL	CCF to Run Normal Air Exhaust Fans	1.3E-06	4,967.0
HVAC	SAC01AN001EFR_D-ALL	CCF to Run Normal Air Supply Fans	1.3E-06	4,967.0
SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6.4E-07	4,911.0
ELEC	XKA10_____DFR_D-ALL	CCF of EDGs to Run	1.0E-04	909.3
ELEC	XKA10_____DFS_D-ALL	CCF of EDGs to Start	7.0E-06	830.7
SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run	3.8E-05	685.8
MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	3.7E-05	685.7
MSS	MSRIVSCPFO_P-ALL	CCF to Open Main Steam Relief Isolation Pneumatic Pilot Valves	1.3E-05	682.5
MSS	MSRIVSOOFO_P-ALL	CCF to Open Main Steam Relief Isolation Solenoid Pilot Valves	4.2E-06	680.2
SIS/RHRS	JND10AP001EFS_D-ALL	CCF of MHSI Pumps to Start	4.6E-06	673.1
ELEC	XKA10_1BDABFO_D-ALL	CCF to Close EDG Supply Breakers	1.4E-06	664.8
ELEC	BDT02_BDA-BFO_D-ALL	CCF to Open Backup Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	664.8
ELEC	BDT01_BDA_BFO_D-ALL	CCF to Open Normal Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	664.8
SIS/RHRS	JND10AA007CFO_D-ALL	CCF to Open MHSI Discharge CVs (CIVs)	7.3E-07	646.7
SIS/RHRS	JND10AA003CFO_D-ALL	CCF to Open MHSI Pump Discharge Motor Operated CHECK Valves	7.3E-07	646.7
MSS	LBA11AA191SFO_H-ALL	CCF to Open Main Steam Safety Relief Valves	1.1E-05	588.2
ESWS	PEB10AA004CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	4.5E-07	554.5
SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	2.2E-05	388.1
SCWS	QKA10GH001_FS_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Start	1.5E-04	362.8
MSS	LBA10AA002PFC_D-ALL	CCF to Close Main Steam Isolation Valves	1.2E-05	358.5
SCWS	QKA10AP107EFS_D-ALL	CCF of SCWS Pumps to Start	2.6E-06	357.2
HVAC	SAC31AN001EFS_D-ALL	CCF to Start Normal Air Exhaust Fans	8.1E-07	354.0
HVAC	SAC01AN001EFS_D-ALL	CCF to Start Normal Air Supply Fans	8.1E-07	354.0
HVAC	SAC01AA005CFO_D-ALL	CCF to Open Normal SAC Supply Fan Discharge Check Dampers	4.5E-07	349.8
SCWS	QKA10AA003CFO_D-ALL	CCF to Open SCWS Pump Discharge Check Valves	4.5E-07	349.8
ESWS	PED10AN001EFR_D-ALL	CCF to Run Normally Running Cooling Tower Fans	2.7E-06	338.9

t19.1-12b

System	ID	Description	Nominal Value	RAW
HVAC	SAC31AA003CFO_D-ALL	CCF to Open Normal Air Exhaust Fan Discharge Check Damper	4.3E-08	335.5
CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	328.5
ESWS	PED10AN002EFS_D-ALL	CCF to Start Standby Cooling Tower Fans	1.9E-05	327.4
ESWS	PED10AN002EFR_D-ALL	CCF to Run Standby Cooling Tower Fans	2.7E-06	315.7
EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	1.1E-05	302.3
EFWS	LAS11AP001EFR_D-ALL	CCF of EFWS Pumps to Run	9.6E-06	301.7
SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start	1.8E-06	284.1
SIS/RHRS	JNG10AP001EFR_D-ALL	CCF of LHSI Pumps to Run	5.6E-07	264.8
SIS/RHRS	JNG10AA009CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	256.0
SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	256.0
SIS/RHRS	JNG10AA011CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	256.0
CCWS	KAA12AA012CFO_D-ALL	CCF to Open CCWS from LHSI HTX Discharge Check Valve	4.5E-07	256.0
CCWS	KAA10AA004CFO_D-ALL	CCF to Open CCWS HTX Discharge Check Valves	4.5E-07	26.3
SIS/RHRS	JNA10AA003EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	22.4
SIS/RHRS	JNA10AA002EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS Angled MOVs	1.1E-05	22.4
SIS/RHRS	JNA10AA001EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	22.4
SIS/RHRS	JNG10AA004EFC_D-ALL	CCF to Close LHSI to Tangential Miniflow MOTOR Operated Check Valves	1.1E-05	22.4
ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	9.9E-05	20.5

t19.1-13b

ID	Description	Nominal Value	RAW
CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	1.0E-07	35,340.0
CL-PS-B-SWCCF	SW CCF of Protection System diversity group B	5.0E-06	5,128.0
ALU-B CCF NS-ALL	CCF of ALU-B Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	4,998.0
ALU-B CCF SM-ALL	CCF of ALU-B Protection System Computer Processors (Self-Monitored)	9.0E-08	4,971.0
APU4 CCF NS-ALL	CCF of APU-4 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	3,756.0
APU4 CCF SM-ALL	CCF of APU-4 Protection System Computer Processors (Self-Monitored)	9.0E-08	3,729.0
SG4 PRES CCF-ALL	CCF of SG4 pressure sensors	6.7E-07	3,715.0
SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	1,231.0
PZR PRES CCF-ALL	CCF of pressurizer (RCS) pressure sensors	6.7E-07	661.6
APU3 CCF SM-ALL	CCF of APU-3 Protection System Computer Processors (Self-Monitored)	9.0E-08	622.7
APU3 CCF NS-ALL	CCF of APU-3 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	622.7
CL-PS-A-SWCCF	SW CCF of Protection System diversity group A	5.0E-06	291.4
ALU-A CCF NS-ALL	CCF of ALU-A Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	207.6
APU2 CCF NS-ALL	CCF of APU-2 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	207.6
APU2 CCF SM-ALL	CCF of APU-2 Protection System Computer Processors (Self-Monitored)	9.0E-08	122.2
ALU-A CCF SM-ALL	CCF of ALU-A Protection System Computer Processors (Self-Monitored)	9.0E-08	122.2

t19.1-14b

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
CVCS VCT	CVCS Switchover to IRWST May Not Be Required	1.0E-01	0.111	2.0
PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.240	2.0
STUCK ROD	Stuck Control Rods	4.1E-08	0.019	428,800.0
Preventive Maintenance				
SBODG8 PM4	SBO-DG Train 4 Unavailable due to Preventive Maintenance	4.0E-02	0.013	1.3
SBODG5 PM1	SBO-DG Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.013	1.3
SAHR PM4	SAHR Train Unavailable due to Preventive Maintenance	4.0E-02	0.016	1.4
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.0E-02	0.130	5.2
SAC03/QKA30 PM3	Normal SAC03/QKA30 Train Unavailable due to Preventive Maintenance	3.0E-02	0.005	1.2
SAC02/QKA20 PM2	Normal SAC02/QKA20 Train Unavailable due to Preventive Maintenance	3.0E-02	0.005	1.2
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.0E-02	0.122	5.0
MHSI PM4	MHSI Train 4 Unavailable due to Preventive Maintenance	4.0E-02	0.006	1.1
MHSI PM1	MHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.005	1.1
EFWS PM4	EFWS Train 4 Unavailable due to Preventive Maintenance	4.0E-02	0.027	1.7
EFWS PM3	EFWS Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.006	1.1
EFWS PM2	EFWS Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.006	1.1
EFWS PM1	EFWS Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.028	1.7
EDG PM4	EDG Train 4 Unavailable due to Preventive Maintenance	4.0E-02	0.007	1.2
EDG PM3	EDG Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.013	1.3
EDG PM2	EDG Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.013	1.3
EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.007	1.2
CVCS32 PM4	CVCS Train 2 Unavailable due to Preventive Maintenance	6.0E-02	0.005	1.1
CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.026	1.4
CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.024	1.4
Offsite Power Related Events				

t19.1-14b

ID	Description	Nominal Value	FV	RAW
LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.004	85.0
LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.113	63.6
LOOPCONL+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for LOCA IEs	5.3E-03	0.034	7.3
LOOPCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to a Controlled Shutdown	1.8E-04	0.009	51.2
REC OSP 1HR	Failure to Recover Offsite Power Within 1 Hour	5.3E-01	0.076	1.1
REC OSP 2HR	Failure to Recover Offsite Power Within 2 Hours	3.2E-01	0.397	1.9

t19.1-42b

System	Component ID	Description	FV	RAW
SIS/RHRS	30JND10AP001	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001	0.102	4.8
SIS/RHRS	30JND20AP001	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001	0.076	3.1
SIS/RHRS	30JND30AP001	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001	0.075	3.0
RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	0.063	18.9
RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	0.063	18.9
RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	0.063	18.9
RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	0.063	18.9
ESWS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	0.044	5.1
ESWS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	0.034	3.5
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	0.031	4.9
SIS/RHRS	30JND10AA003	MHSI, MHSI Pump 10 Discharge Manual CHECK Valve JND10AA003	0.031	4.7
ESWS	30PED30AN002	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002	0.030	2.7
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	0.029	5.4
SIS/RHRS	30JND40AP001	MHSI, MHSI Train 4 Motor Driven Pump JND40AP001	0.026	1.0
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	0.025	4.6
CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	0.025	3.4
CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	0.022	2.6
SIS/RHRS	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	0.020	3.4
SIS/RHRS	30JND20AA003	MHSI, MHSI Pump 20 Discharge Manual CHECK Valve JND20AA003	0.017	3.0
SIS/RHRS	30JND30AA003	MHSI, MHSI Pump 30 Discharge Manual CHECK Valve JND30AA003	0.017	3.0
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	0.016	5.3
RCS	30JEB30 SSSF	Stand Still Seal for RCP3	0.016	17.0
RCS	30JEB40 SSSF	Stand Still Seal for RCP4	0.016	17.0
SIS/RHRS	30JNG30AA006	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006	0.015	2.8
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	0.014	5.1
ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.014	1.3
SIS/RHRS	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	0.013	2.6
ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.013	1.2
ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	0.013	4.5

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System	Component ID	Description	FV	RAW
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	0.013	6.7
ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.012	1.2
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	0.012	3.8
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	0.012	3.8
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	0.012	3.6
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	0.012	3.7
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	0.011	2.0
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	0.011	2.0
ESWS	30PED40AN002	UHS, Cooling Tower Train 4 Cooling Fan PED40AN002	0.011	1.0
CCWS	30KAA42AA005	CCWS, Train 4 to LHSI HTX 40 Cooling MOV KAA42AA005	0.011	1.0
HVAC	30SAC32AN001	SAC, Normal Air Exhaust Fan SAC32AN001	0.011	1.4
HVAC	30SAC02AN001	SAC, Normal Air Supply Fan SAC02AN001	0.011	1.4
HVAC	30SAC33AN001	SAC, Normal Air Exhaust Fan SAC33AN001	0.011	1.1
HVAC	30SAC03AN001	SAC, Normal Air Supply Fan SAC03AN001	0.011	1.1
EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.011	1.2
EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	0.010	1.1
CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	0.010	4.6
EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	0.010	1.1
EFWS	30LAS31AP001	EFWS, Train 3 Motor Driven Pump LAS31AP001	0.010	1.1
CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	0.009	3.9
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	0.008	5.6
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	0.008	2.2
RCS	30JEB40AA018	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018	0.007	15.5
RCS	30JEB30AA018	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018	0.007	15.5
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	0.007	1.9
SCWS	30QKA20AP107	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107	0.006	1.3
SCWS	30QKA30AP107	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107	0.006	1.1
ESWS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	0.005	3.8
SIS/RHRS	30JNG10AA104	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104	0.005	4.3

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Flood Basic Events ID	Description	Nom.val.	FV	RAW
JEB30AA010EFC	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB30AA020EFC	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB40AA010EFC	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB40AA020EFC	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JND10AP001EFR	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001, Fails to Run	1.19E-02	4.57E-02	4.81E+00
JND10AA003MEC3	MHSI, MHSI Pump 10 Discharge MANUAL Check Valve JND10AA003, Left in Wrong Position	8.00E-03	3.01E-02	4.73E+00
JND20AP001EFR	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001, Fails to Run	1.19E-02	2.48E-02	3.07E+00
JND30AP001EFR	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001, Fails to Run	1.19E-02	2.46E-02	3.05E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	2.16E-02	5.41E+00
PED10AN002EFS	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Start on Demand	4.84E-03	2.01E-02	5.13E+00
JNG10AA006MEC3	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006, Left in Wrong Position	8.00E-03	1.92E-02	3.38E+00
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	1.79E-02	4.64E+00
JND20AA003MEC3	MHSI, MHSI Pump 20 Discharge MANUAL Check Valve JND20AA003, Left in Wrong Position	8.00E-03	1.63E-02	3.02E+00
JND30AA003MEC3	MHSI, MHSI Pump 30 Discharge MANUAL Check Valve JND30AA003, Left in Wrong Position	8.00E-03	1.61E-02	3.00E+00
JEB30 SSSF	Mechanical Failure of the Stand Still Seal for RCP3	9.68E-04	1.55E-02	1.70E+01
JEB40 SSSF	Mechanical Failure of the Stand Still Seal for RCP4	9.68E-04	1.55E-02	1.70E+01
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	1.51E-02	5.29E+00
JNG30AA006MEC3	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006, Left in Wrong Position	8.00E-03	1.47E-02	2.82E+00
KAA12AA005EFO	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005, Fails to Open on Demand	3.40E-03	1.35E-02	4.94E+00
JNG20AA006MEC3	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006, Left in Wrong Position	8.00E-03	1.28E-02	2.59E+00
PEB30AA005EFO	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005, Fails to Open on Demand	3.50E-03	1.24E-02	4.53E+00
PED20AN002EFS	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Start on Demand	4.84E-03	1.21E-02	3.49E+00
PED30AN002EFS	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002, Fails to Start on Demand	4.84E-03	8.32E-03	2.71E+00
KAA22AA005EFO	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005, Fails to Open on Demand	3.40E-03	8.08E-03	3.37E+00
XKA10____DFR	ELEC, Emergency Diesel Generator XKA10, Fails to Run	2.75E-02	7.42E-03	1.26E+00
JEB30AA018OFO	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018, Fails to Open on Demand	4.84E-04	7.04E-03	1.55E+01
JEB40AA018OFO	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018, Fails to Open on Demand	4.84E-04	7.04E-03	1.55E+01
XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	2.75E-02	6.80E-03	1.24E+00
XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	2.75E-02	6.01E-03	1.21E+00
KAA32AA005EFO	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005, Fails to Open on Demand	3.40E-03	5.46E-03	2.60E+00
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	5.13E-03	2.05E+00
JNG10AA104ECF	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104, Fails to Control Flow	1.50E-03	5.02E-03	4.34E+00

All Basic Events with FV >= 5E-03

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System	Component ID	Description	RAW	FV
RCS	30JEB40AA020	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020	18.9	0.063
RCS	30JEB30AA010	RCP, RCP3 Leakoff Isolation MOV JEB30AA010	18.9	0.063
RCS	30JEB30AA020	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020	18.9	0.063
RCS	30JEB40AA010	RCP, RCP4 Leakoff Isolation MOV JEB40AA010	18.9	0.063
RCS	30JEB30 SSSF	Stand Still Seal for RCP3	17.0	0.016
RCS	30JEB40 SSSF	Stand Still Seal for RCP4	17.0	0.016
RCS	30JEB30AA018	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018	15.5	0.007
RCS	30JEB40AA018	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018	15.5	0.007
EFWS	30LAR10BB001	EFWS, Train 1 EFW Storage Tank LAR10BB001	11.8	0.000
EFWS	30LAR30BB001	EFWS, Train 3 EFW Storage Tank LAR30BB001	11.8	0.000
EFWS	30LAR40BB001	EFWS, Train 4 EFW Storage Tank LAR40BB001	11.8	0.000
EFWS	30LAR20BB001	EFWS, Train 2 EFW Storage Tank LAR20BB001	11.8	0.000
RCS	30JEB30AA019	RCP Seal, RCP3 Nitrogen Supply Check Valve JEB30AA019	9.4	0.000
RCS	30JEB40AA019	RCP Seal, RCP4 Nitrogen Supply Check Valve JEB40AA019	9.4	0.000
ELEC	32BRU03	ELEC, Inverter 32BRU03	8.2	0.000
ELEC	32BUD	ELEC, Non 1E 250V DC Distribution Panel 32BUD	7.7	0.000
ELEC	32BRC	ELEC, 480V MCC 32BRC	7.3	0.000
ELEC	34BRB	ELEC, 480V MCC 34BRB	7.3	0.000
ELEC	32BRU0301	ELEC, Inverter 32BRU03 Bypass Switch 32BRU0301	7.3	0.000
ELEC	33BRB	ELEC, 480V MCC 33BRB	6.8	0.000
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	6.7	0.013
RCS	30JEB40AP001	ELEC, 13.8kV Bus BBH Circuit Breaker for RCP JEB40AP001	6.5	0.004
RCS	30JEB30AP001	ELEC, 13.8kV SWGR 33BBC Circuit Breaker for RCP JEB30AP001	6.5	0.004
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	5.6	0.008
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	5.4	0.029
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	5.3	0.016

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System	Component ID	Description	RAW	FV
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	5.1	0.014
ESWS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	5.1	0.044
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	4.9	0.031
SIS/RHRS	30JND10AP001	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001	4.8	0.102
ESWS	30PEB10AP001	ESWS, Train 1 Motor Driven Pump PEB10AP001	4.8	0.001
SIS/RHRS	30JND10AA003	MHSI, MHSI Pump 10 Discharge Manual CHECK Valve JND10AA003	4.7	0.031
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	4.6	0.025
CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	4.6	0.010
ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	4.5	0.013
SIS/RHRS	30JNG10AA104	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104	4.3	0.005
CCWS	30KAB30AA191	CCWS, CCWS CH1 RCP1/2 TB Return Safety Valve KAB30AA191	3.9	0.000
CCWS	30KAB10AA192	CCWS, CCWS CH1 Return Safety Valve KAB10AA192	3.9	0.000
CCWS	30KAB60AA191	CCWS, CVCS HP Cooler 1 Return Safety Valve KAB60AA191	3.9	0.000
CCWS	30KAB10AA193	CCWS, FPCS Train 1 Cooling Header Safety Valve KAB10AA193	3.9	0.000
CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	3.9	0.009
ESWS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	3.8	0.005
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	3.8	0.012
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	3.8	0.012
CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	3.8	0.000
ELEC	32BRC_3BRB2	ELEC, 480V MCC 32BRC to 480V MCC 33BRB Circuit Breaker	3.7	0.000
ELEC	32BRC_3BRB1	ELEC, 480V MCC 32BRC to 480V MCC 33BRB Circuit Breaker	3.7	0.000
ELEC	32BRC_4BRB1	ELEC, 480V MCC 32BRC to 480V MCC 34BRB Circuit Breaker	3.7	0.000
ELEC	32BRC_4BRB2	ELEC, 480V MCC 32BRC to 480V MCC 34BRB Circuit Breaker	3.7	0.000
ELEC	32BRU032BRC	ELEC, Inverter 32BRU03 to 480V MCC 32BRC Circuit Breaker	3.7	0.000
ELEC	32BUD2BRU03	ELEC, 250V Bus 32BUD to Inverter 32BRU03 Circuit Breaker	3.7	0.000
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	3.7	0.012

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System	Component ID	Description	RAW	FV
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	3.6	0.012
ESWS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	3.5	0.034
SIS/RHRS	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	3.4	0.020
CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	3.4	0.025
SIS/RHRS	30JNG10AP001	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001	3.4	0.004
HVAC	30SAC31AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002	3.1	0.000
SCWS	30QKA10AA101	SCWS, Train 1 Chiller By-pass MOV QKA10AA101	3.1	0.000
SCWS	30QKC10AA101	SCWS, Return from SAC Div 1 MOV QKC10AA101	3.1	0.000
HVAC	30SAC01AA003	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003	3.1	0.000
CCWS	30KAA20AA007	CCWS, Pump 20 Cooling Manual Valve KAA20AA007	3.1	0.000
CCWS	30KAA20AA005	CCWS, Discharge from CCW HTX 20 Manual Valve KAA20AA005	3.1	0.000
CCWS	30KAA20AA018	CCWS, Pump 20 Discharge Manual Valve KAA20AA018	3.1	0.000
CCWS	30KAA20AA015	CCWS, Pump 20 Suction Manual Valve KAA20AA015	3.1	0.000
CCWS	30KAA20AA011	CCWS, Pump 20 Suction from CCST Manual Valve KAA20AA011	3.1	0.000
CCWS	30KAA20AA140	CCWS, Pump 20 Cooling Manual Valve KAA20AA140	3.1	0.000
ESWS	30PEB20AA007	ESWS, Train 2 Manual Valve PEB20AA007	3.1	0.000
CCWS	30KAA20AA008	CCWS, Pump 20 Cooling Manual Valve KAA20AA008	3.1	0.000
ESWS	30PEB20AA009	ESWS, Train 2 Manual Valve PEB20AA009	3.1	0.000
ESWS	30PEB20AA010	ESWS, Train 2 Manual Valve PEB20AA010	3.1	0.000
SIS/RHRS	30JND20AP001	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001	3.1	0.076
SIS/RHRS	30JND30AP001	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001	3.0	0.075
SIS/RHRS	30JND20AA003	MHSI, MHSI Pump 20 Discharge Manual CHECK Valve JND20AA003	3.0	0.017
SIS/RHRS	30JNG20AA104	LHSI, LHSI Pump 20 Throttle Control MOV JNG20AA104	3.0	0.003
SIS/RHRS	30JND30AA003	MHSI, MHSI Pump 30 Discharge Manual CHECK Valve JND30AA003	3.0	0.017
HVAC	30SAC01AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005	2.9	0.000
HVAC	30SAC31AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003	2.9	0.000

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System	Component ID	Description	RAW	FV
SCWS	30QKA10AA003	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003	2.9	0.000
SIS/RHRS	30JND10AA001	MHSI, MHSI Pump 10 Suction Manual Valve JND10AA001	2.9	0.000
CCWS	30KAA12AA006	CCWS, MHSI Pump 10 Cooling Manual Valve KAA12AA006	2.9	0.000
CCWS	30KAA12AA009	CCWS, MHSI Pump 10 Cooling Manual Valve KAA12AA009	2.9	0.000
CCWS	30KAA12AA115	CCWS, MHSI Pump 10 Cooling Manual Control Valve KAA12AA115	2.9	0.000
SIS/RHRS	30JNG30AA006	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006	2.8	0.015
SCWS	30QKC10AA026	SCWS, LHSI Pump 10 Motor Cooling Manual Valve QKC10AA026	2.7	0.000
SCWS	30QKC10AA027	SCWS, LHSI Pump 10 Sealing Fluid Cooling Manual Valve QKC10AA027	2.7	0.000
CCWS	30KAA12AA011	CCWS, LHSI HTX 10 Cooling Manual Valve KAA12AA011	2.7	0.000
ESWS	30PED30AN002	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002	2.7	0.030
ESWS	30PED20AN001	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001	2.7	0.004
ELEC	32BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery 32BTB01	2.6	0.001
CCWS	30KAA30AA015	CCWS, Pump 30 Suction Manual Valve KAA30AA015	2.6	0.000
CCWS	30KAA30AA007	CCWS, Pump 30 Cooling Manual Valve KAA30AA007	2.6	0.000
CCWS	30KAA30AA011	CCWS, Pump 30 Suction from CCST Manual Valve KAA30AA011	2.6	0.000
ESWS	30PEB30AA010	ESWS, Train 3 Manual Valve PEB30AA010	2.6	0.000
CCWS	30KAA30AA018	CCWS, Pump 30 Discharge Manual Valve KAA30AA018	2.6	0.000
CCWS	30KAA30AA140	CCWS, Pump 30 Cooling Manual Valve KAA30AA140	2.6	0.000
ESWS	30PEB30AA007	ESWS, Train 3 Manual Valve PEB30AA007	2.6	0.000
CCWS	30KAA30AA008	CCWS, Pump 30 Cooling Manual Valve KAA30AA008	2.6	0.000
ESWS	30PEB30AA009	ESWS, Train 3 Manual Valve PEB30AA009	2.6	0.000
CCWS	30KAA30AA005	CCWS, Discharge from CCW HTX 30 Manual Valve KAA30AA005	2.6	0.000
CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	2.6	0.022
SIS/RHRS	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	2.6	0.013
SIS/RHRS	30JNG20AP001	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001	2.4	0.003
SIS/RHRS	30JNG30AA104	LHSI, LHSI Pump 30 Throttle Control MOV JNG30AA104	2.3	0.002

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System	Component ID	Description	RAW	FV
ELEC	31BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery 31BTB01	2.3	0.001
ELEC	31BMB	ELEC, 480V Load Center 31BMB	2.3	0.000
ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	2.3	0.000
ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	2.3	0.000
ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	2.3	0.000
RCS	30PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.2	0.302
ELEC	32BMB	ELEC, 480V Load Center 32BMB	2.2	0.000
ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	2.2	0.000
ELEC	33BMB	ELEC, 480V Load Center 33BMB	2.2	0.000
ELEC	33BMT02	ELEC, 6.9kV-480V Transformer 33BMT02	2.2	0.000
ELEC	33BDB	ELEC, 6.9kV SWGR 33BDB	2.2	0.000
ELEC	30BRW52BUW53	ELEC, 24V DC I&C Power Rack BRW52/BUW53	2.2	0.000
ELEC	32BMT02	ELEC, 6.9kV-480V Transformer 32BMT02	2.2	0.000
ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	2.2	0.000
ELEC	30BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	2.2	0.000
ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	2.2	0.000
ELEC	34BMB	ELEC, 480V Load Center 34BMB	2.2	0.000
ELEC	30BRW70BUW71	ELEC, 24V DC I&C Power Rack 34BRW70/34BUW71	2.2	0.000
ELEC	30BRW32BUW33	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33	2.2	0.000
ELEC	32BDB	ELEC, 6.9kV SWGR 32BDB	2.2	0.000
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	2.2	0.002
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	2.2	0.008
CCWS	30KAA22AA115	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA115	2.1	0.000
CCWS	30KAA32AA009	CCWS, MHSI Pump 30 Cooling Manual Valve KAA32AA009	2.1	0.000
CCWS	30KAA32AA006	CCWS, MHSI Pump 30 Cooling Manual Valve KAA32AA006	2.1	0.000
SIS/RHRS	30JND20AA001	MHSI, MHSI Pump 20 Suction Manual Valve JND20AA001	2.1	0.000

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System	Component ID	Description	RAW	FV
CCWS	30KAA22AA009	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA009	2.1	0.000
SIS/RHRS	30JND30AA001	MHSI, MHSI Pump 30 Suction Manual Valve JND30AA001	2.1	0.000
CCWS	30KAA22AA006	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA006	2.1	0.000
CCWS	30KAA32AA115	CCWS, MHSI Pump 30 Cooling Manual Control Valve KAA32AA115	2.1	0.000
MFWS	30LAB31AA001	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA001	2.0	0.000
MFWS	30LAB31AA002	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA002	2.0	0.000
MFWS	30LAB32AA001	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA001	2.0	0.000
MFWS	30LAB32AA002	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA002	2.0	0.000
CLCWS	30PGB19AA191	CLCWS, Safety Valve PGB19AA191	2.0	0.000
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	2.0	0.011
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	2.0	0.011
ESWS	30PED30AN001	UHS, Cooling Tower Train 3 Cooling Fan PED30AN001	2.0	0.004
CCWS	30KAA22AA010	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA010	2.0	0.000
CCWS	30KAA22AA011	CCWS, LHSI HTX 20 Cooling Manual Valve KAA22AA011	2.0	0.000
CCWS	30KAA22AA116	CCWS, LHSI Pump 20 Motor Cooling Manual Valve KAA22AA116	2.0	0.000
CCWS	30KAA22AA127	CCWS, LHSI Pump 20 Sealing Fluid Cooling Manual Valve KAA22AA127	2.0	0.000
CCWS	30KAA22AA007	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA007	2.0	0.000

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Flood Basic Events ID	Description	Nom.val.	FV	RAW
JEB30AA010EFC	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB30AA020EFC	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB40AA010EFC	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB40AA020EFC	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Fails to Close on Demand	3.48E-03	6.25E-02	1.89E+01
JEB30 SSSF	Mechanical Failure of the Stand Still Seal for RCP3	9.68E-04	1.55E-02	1.70E+01
JEB40 SSSF	Mechanical Failure of the Stand Still Seal for RCP4	9.68E-04	1.55E-02	1.70E+01
JEB30AA018OFO	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018, Fails to Open on Demand	4.84E-04	7.04E-03	1.55E+01
JEB40AA018OFO	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018, Fails to Open on Demand	4.84E-04	7.04E-03	1.55E+01
34BRB____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BRB Control Power, Fails to Run	1.53E-04	1.99E-03	1.40E+01
33BRB____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 33BRB Control Power, Fails to Run	1.53E-04	1.84E-03	1.30E+01
LAR10BB001TEL	EFWS, Train 1 EFW Storage Tank LAR10BB001, External Leakage	1.00E-06	1.08E-05	1.18E+01
LAR20BB001TEL	EFWS, Train 2 EFW Storage Tank LAR20BB001, External Leakage	1.00E-06	1.08E-05	1.18E+01
LAR30BB001TEL	EFWS, Train 3 EFW Storage Tank LAR30BB001, External Leakage	1.00E-06	1.08E-05	1.18E+01
LAR40BB001TEL	EFWS, Train 4 EFW Storage Tank LAR40BB001, External Leakage	1.00E-06	1.08E-05	1.18E+01
JEB30AA019CFO	RCP Seal, RCP3 Nitrogen Supply Check Valve JEB30AA019, Fails to Open on Demand	4.76E-05	4.00E-04	9.41E+00
JEB40AA019CFO	RCP Seal, RCP4 Nitrogen Supply Check Valve JEB40AA019, Fails to Open on Demand	4.76E-05	4.00E-04	9.41E+00
32BRU03___IFR	ELEC, Inverter 32BRU03, Fails to Run	2.98E-05	2.14E-04	8.18E+00
32BUD____OFL	ELEC, Non 1E 250V DC Distribution Panel 32BUD, Fails During Operation	2.40E-05	1.61E-04	7.70E+00
32BRC____OFL	ELEC, 480V MCC 32BRC, Fails During Operation	2.40E-05	1.50E-04	7.25E+00
32BRU0301_SOP	ELEC, Inverter 32BRU03 Bypass Switch 32BRU0301, Fails to Remain Closed (SO)	2.40E-05	1.50E-04	7.25E+00
34BRB____OFL	ELEC, 480V MCC 34BRB, Fails During Operation	2.40E-05	1.50E-04	7.25E+00
33BRB____OFL	ELEC, 480V MCC 33BRB, Fails During Operation	2.40E-05	1.40E-04	6.84E+00
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	4.01E-03	6.75E+00
JEB30AP001BFO	ELEC, 13.8kV SWGR 33BBC Circuit Breaker for RCP JEB30AP001, Fails to Open on Demand	4.67E-04	2.57E-03	6.50E+00
JEB40AP001BFO	ELEC, 13.8kV SWGR 34BBC Circuit Breaker for RCP JEB40AP001, Fails to Open on Demand	4.67E-04	2.57E-03	6.50E+00
JEB30AP001PANS	RCP, Train 3 Pump JEB10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	1.67E-03	5.97E+00
JEB40AP001PANS	RCP, Train 4 Pump JEB40AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	1.67E-03	5.97E+00
QKA10AP107EFR	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Run	2.37E-04	1.09E-03	5.57E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	2.16E-02	5.41E+00
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	1.51E-02	5.29E+00
JNG13AA005CFO	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005, Fails to Open on Demand	8.96E-04	3.70E-03	5.13E+00
PED10AN002EFS	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Start on Demand	4.84E-03	2.01E-02	5.13E+00
KAA12AA005EFO	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005, Fails to Open on Demand	3.40E-03	1.35E-02	4.94E+00
JND10AP001EFR	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001, Fails to Run	1.19E-02	4.57E-02	4.81E+00
PEB10AP001EFR	ESWS, Train 1 Motor Driven Pump PEB10AP001, Fails to Run	1.08E-04	4.09E-04	4.78E+00
JND10AA003MEC3	MHSI, MHSI Pump 10 Discharge MANUAL Check Valve JND10AA003, Left in Wrong Position	8.00E-03	3.01E-02	4.73E+00
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	1.79E-02	4.64E+00
KAA20AP001EFS	CCWS, Train 2 Motor Driven Pump KAA20AP001, Fails to Start on Demand	1.32E-03	4.76E-03	4.59E+00
JEB30AA018OCL	RCP Seal, RCP3 Nitrogen Supply Solenoid Valve JEB30AA018, Fails to Remain Open (SO)	1.20E-05	4.25E-05	4.54E+00
JEB40AA018OCL	RCP Seal, RCP4 Nitrogen Supply Solenoid Valve JEB40AA018, Fails to Remain Open (SO)	1.20E-05	4.25E-05	4.54E+00

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PEB30AA005EFO	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005, Fails to Open on Demand	3.50E-03	1.24E-02	4.53E+00
JNG10AA104ECF	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104, Fails to Control Flow	1.50E-03	5.02E-03	4.34E+00
JEB30AA010EOP	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Fails to Remain Closed (SO)	8.40E-06	2.70E-05	4.22E+00
JEB30AA020EOP	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Fails to Remain Closed (SO)	8.40E-06	2.70E-05	4.22E+00
JEB40AA010EOP	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Fails to Remain Closed (SO)	8.40E-06	2.70E-05	4.22E+00
JEB40AA020EOP	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Fails to Remain Closed (SO)	8.40E-06	2.70E-05	4.22E+00
QKA10AP107EEL	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, External Leakage	7.20E-05	2.23E-04	4.10E+00
JND10AP001EFS	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001, Fails to Start on Demand	1.24E-03	3.75E-03	4.02E+00
KAB10AA192SPO	CCWS, CCWS CH1 Return Safety Valve KAB10AA192, Premature Opening	7.20E-05	2.09E-04	3.90E+00
KAB10AA193SPO	CCWS, FPCS Train 1 Cooling Header Safety Valve KAB10AA193, Premature Opening	7.20E-05	2.09E-04	3.90E+00
KAB30AA191SPO	CCWS, CCWS CH1 RCP1/2 TB Return Safety Valve KAB30AA191, Premature Opening	7.20E-05	2.09E-04	3.90E+00
KAB60AA191SPO	CCWS, CVCS HP Cooler 1 Return Safety Valve KAB60AA191, Premature Opening	7.20E-05	2.09E-04	3.90E+00
KAA30AP001EFS	CCWS, Train 3 Motor Driven Pump KAA30AP001, Fails to Start on Demand	1.32E-03	3.83E-03	3.90E+00
PED10AN001EFR	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001, Fails to Run	6.97E-04	1.97E-03	3.82E+00
PED10AN002EFR	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Run	6.97E-04	1.97E-03	3.82E+00
SAC01AN001EFR	SAC, Normal Air Supply Fan SAC01AN001, Fails to Run	3.49E-04	9.73E-04	3.79E+00
SAC31AN001EFR	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Run	3.49E-04	9.73E-04	3.79E+00
KAA10AP001EEL	CCWS, Train 1 Motor Driven Pump KAA10AP001, External Leakage	7.20E-05	1.99E-04	3.76E+00
2BRC_3BRB1BOP	ELEC, 480V MCC 32BRC to 480V MCC 33BRB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
2BRC_3BRB2BOP	ELEC, 480V MCC 32BRC to 480V MCC 33BRB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
2BRC_4BRB1BOP	ELEC, 480V MCC 32BRC to 480V MCC 34BRB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
2BRC_4BRB2BOP	ELEC, 480V MCC 32BRC to 480V MCC 34BRB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
2BRU032BRCBOP	ELEC, Inverter 32BRU03 to 480V MCC 32BRC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
2BUD2BRU03BOP	ELEC, 250V Pnl 32BUD to Inverter 32BRU03 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.94E-05	3.69E+00
JNG33AA005CFO	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005, Fails to Open on Demand	8.96E-04	2.41E-03	3.69E+00
JNG23AA005CFO	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005, Fails to Open on Demand	8.96E-04	2.35E-03	3.62E+00
PEB20AA005PBNS	ESWS, Pump 2 Isolation MOV PEB20AA005, PAC B Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	8.44E-04	3.52E+00
PEB20AP001PBNS	ESWS, Train 2 Pump PEB20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	8.44E-04	3.52E+00
KAA20AP001PBNS	CCWS, Train 2 Pump KAA20AP001,Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	8.42E-04	3.51E+00
PED20AN002EFS	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Start on Demand	4.84E-03	1.21E-02	3.49E+00
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.00E-02	7.52E-02	3.43E+00
JNG10AA006MEC3	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006, Left in Wrong Position	8.00E-03	1.92E-02	3.38E+00
KAA22AA005EFO	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005, Fails to Open on Demand	3.40E-03	8.08E-03	3.37E+00
JNG10AP001EFS	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Start on Demand	3.94E-04	9.30E-04	3.36E+00
JND10AP001PANS	MHSI, Train 1 Pump JND10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	7.76E-04	3.31E+00
JEB30AA019CCL	RCP Seal, RCP3 Nitrogen Supply Check Valve JEB30AA019, Fails to Remain Open	4.80E-06	1.08E-05	3.25E+00
JEB40AA019CCL	RCP Seal, RCP4 Nitrogen Supply Check Valve JEB40AA019, Fails to Remain Open	4.80E-06	1.08E-05	3.25E+00
JNG10AP001PANS	LHSI, Train 1 Pump JNG10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	7.32E-04	3.18E+00
KAA12AA005PANS	CCWS, CCWS1 to LHSI HTX 10 KAA12AA005, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	7.32E-04	3.18E+00
QKA10AA101ECF	SCWS, Train 1 Chiller By-pass MOV QKA10AA101, Fails to Control Flow	8.40E-06	1.78E-05	3.12E+00

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Flood Basic Events ID	Description	Nom.val.	FV	RAW
QKC10AA101ECL	SCWS, Return from SAC Div 1 MOV QKC10AA101, Fails to Remain Open (SO)	8.40E-06	1.78E-05	3.12E+00
SAC01AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003, Fails to Remain Open (SO)	8.40E-06	1.78E-05	3.12E+00
SAC31AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002, Fails to Remain Open (SO)	8.40E-06	1.78E-05	3.12E+00
KAA20AA005MEC1	CCWS, Discharge from CCW HTX 20 Manual Valve KAA20AA005, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA007MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA007, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA008MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA008, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA011MEC1	CCWS, Pump 20 Suction from CCST Manual Valve KAA20AA011, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA015MEC1	CCWS, Pump 20 Suction Manual Valve KAA20AA015, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA018MEC1	CCWS, Pump 20 Discharge Manual Valve KAA20AA018, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
KAA20AA140MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA140, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
PEB20AA007MEC1	ESWS, Train 2 Manual Valve PEB20AA007, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
PEB20AA009MEC1	ESWS, Train 2 Manual Valve PEB20AA009, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
PEB20AA010MEC1	ESWS, Train 2 Manual Valve PEB20AA010, Left in Wrong Position	2.00E-04	4.15E-04	3.07E+00
JND20AP001EFR	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001, Fails to Run	1.19E-02	2.48E-02	3.07E+00
JND30AP001EFR	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001, Fails to Run	1.19E-02	2.46E-02	3.05E+00
JND20AA003MEC3	MHSI, MHSI Pump 20 Discharge MANUAL Check Valve JND20AA003, Left in Wrong Position	8.00E-03	1.63E-02	3.02E+00
JNG20AA104ECF	LHSI, LHSI Pump 20 Throttle Control MOV JNG20AA104, Fails to Control Flow	1.50E-03	3.01E-03	3.00E+00
JND30AA003MEC3	MHSI, MHSI Pump 30 Discharge MANUAL Check Valve JND30AA003, Left in Wrong Position	8.00E-03	1.61E-02	3.00E+00
KAA10AP001EFR	CCWS, Train 1 Motor Driven Pump KAA10AP001, Fails to Run	4.69E-05	9.22E-05	2.96E+00
PEB30AA005PANS	ESWS, Pump 3 Isolation MOV PEB30AA005, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	6.58E-04	2.96E+00
PEB30AP001PANS	ESWS, Train 3 Pump PEB30AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	6.58E-04	2.96E+00
KAA30AP001PANS	CCWS, Train 3 Pump KAA30AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	6.56E-04	2.96E+00
QKA10AA003CCL	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Remain Open	4.80E-06	9.14E-06	2.90E+00
SAC01AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005, Fails to Remain Open	4.80E-06	9.14E-06	2.90E+00
SAC31AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003, Fails to Remain Open	4.80E-06	9.14E-06	2.90E+00
JND10AA001MEC1	MHSI, MHSI Pump 10 Suction Manual Valve JND10AA001, Left in Wrong Position	2.00E-04	3.81E-04	2.90E+00
KAA12AA006MEC1	CCWS, MHSI Pump 10 Cooling Manual Valve KAA12AA006, Left in Wrong Position	2.00E-04	3.81E-04	2.90E+00
KAA12AA009MEC1	CCWS, MHSI Pump 10 Cooling Manual Valve KAA12AA009, Left in Wrong Position	2.00E-04	3.81E-04	2.90E+00
KAA12AA115MEC1	CCWS, MHSI Pump 10 Cooling Manual Control Valve KAA12AA115, Left in Wrong Position	2.00E-04	3.81E-04	2.90E+00
JNG10AP001EFR	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Run	2.40E-04	4.54E-04	2.89E+00
32BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BNB02 Control Power, Fails to Run	1.53E-04	2.85E-04	2.86E+00
JNG30AA006MEC3	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006, Left in Wrong Position	8.00E-03	1.47E-02	2.82E+00
KAA12AA011MEC1	CCWS, LHSI HTX 10 Cooling Manual Valve KAA12AA011, Left in Wrong Position	2.00E-04	3.45E-04	2.73E+00
QKC10AA026MEC1	SCWS, LHSI Pump 10 Motor Cooling Manual Valve QKC10AA026, Left in Wrong Position	2.00E-04	3.45E-04	2.73E+00
QKC10AA027MEC1	SCWS, LHSI Pump 10 Sealing Fluid Cooling Manual Valve QKC10AA027, Left in Wrong Position	2.00E-04	3.45E-04	2.73E+00
PED30AN002EFS	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002, Fails to Start on Demand	4.84E-03	8.32E-03	2.71E+00
PED20AN001EFR	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001, Fails to Run	6.97E-04	1.17E-03	2.67E+00
PED20AN002EFR	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Run	6.97E-04	1.17E-03	2.67E+00
JND20AP001EFS	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001, Fails to Start on Demand	1.24E-03	2.05E-03	2.65E+00
31BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB02 Control Power, Fails to Run	1.53E-04	2.52E-04	2.65E+00

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Flood Basic Events ID	Description	Nom.val.	FV	RAW
JND30AP001EFS	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001, Fails to Start on Demand	1.24E-03	2.04E-03	2.64E+00
32BTB01_BATST	ELEC, 250V Non 1E 12-hr Battery 32BTB01, Fails on Demand	6.53E-04	1.06E-03	2.62E+00
KAA30AA005MEC1	CCWS, Discharge from CCW HTX 30 Manual Valve KAA30AA005, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA007MEC1	CCWS, Pump 30 Cooling Manual Valve KAA30AA007, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA008MEC1	CCWS, Pump 30 Cooling Manual Valve KAA30AA008, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA011MEC1	CCWS, Pump 30 Suction from CCST Manual Valve KAA30AA011, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA015MEC1	CCWS, Pump 30 Suction Manual Valve KAA30AA015, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA018MEC1	CCWS, Pump 30 Discharge Manual Valve KAA30AA018, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA30AA140MEC1	CCWS, Pump 30 Cooling Manual Valve KAA30AA140, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
PEB30AA007MEC1	ESWS, Train 3 Manual Valve PEB30AA007, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
PEB30AA009MEC1	ESWS, Train 3 Manual Valve PEB30AA009, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
PEB30AA010MEC1	ESWS, Train 3 Manual Valve PEB30AA010, Left in Wrong Position	2.00E-04	3.21E-04	2.61E+00
KAA32AA005EFO	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005, Fails to Open on Demand	3.40E-03	5.46E-03	2.60E+00
JNG20AA006MEC3	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006, Left in Wrong Position	8.00E-03	1.28E-02	2.59E+00
PEB20AP001EFR	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Run	1.08E-04	1.64E-04	2.51E+00
JEB30AA010EIR	RCP, RCP3 Leakoff Isolation MOV JEB30AA010, Internal Rupture	2.40E-06	3.55E-06	2.48E+00
JEB30AA020EIR	RCP Seal, RCP3 Seal Nitrogen Venting Isolation MOV JEB30AA020, Internal Rupture	2.40E-06	3.55E-06	2.48E+00
JEB40AA010EIR	RCP, RCP4 Leakoff Isolation MOV JEB40AA010, Internal Rupture	2.40E-06	3.55E-06	2.48E+00
JEB40AA020EIR	RCP Seal, RCP4 Seal Nitrogen Venting Isolation MOV JEB40AA020, Internal Rupture	2.40E-06	3.55E-06	2.48E+00
33BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 33BNB02 Control Power, Fails to Run	1.53E-04	2.20E-04	2.44E+00
JNG20AP001EFS	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001, Fails to Start on Demand	3.94E-04	5.37E-04	2.36E+00
JNG30AA104ECF	LHSI, LHSI Pump 30 Throttle Control MOV JNG30AA104, Fails to Control Flow	1.50E-03	1.93E-03	2.29E+00
JND20AP001PBNS	MHSI, Train 2 Pump JND20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.31E-04	2.29E+00
JND30AP001PANS	MHSI, Train 3 Pump JND30AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.31E-04	2.29E+00
31BTB01_BATST	ELEC, 250V Non 1E 12-hr Battery 31BTB01, Fails on Demand	6.53E-04	8.31E-04	2.27E+00
31BDB____OFL	ELEC, 6.9kV SWGR 31BDB, Fails During Operation	2.40E-05	3.03E-05	2.26E+00
31BDC____OFL	ELEC, 6.9kV SWGR 31BDC, Fails During Operation	2.40E-05	3.03E-05	2.26E+00
31BMB____OFL	ELEC, 480V Load Center 31BMB, Fails During Operation	2.40E-05	3.03E-05	2.26E+00
31BMT02___TFL	ELEC, 6.9kV-480V Transformer 31BMT02, Fails During Operation	2.40E-05	3.03E-05	2.26E+00
JNG20AP001PBNS	LHSI, Train 2 Pump JNG20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.17E-04	2.24E+00
KAA22AA005PBNS	CCWS, CCWS2 to LHSI HTX 20 KAA22AA005, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.17E-04	2.24E+00
32BDB____OFL	ELEC, 6.9kV SWGR 32BDB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
32BMB____OFL	ELEC, 480V Load Center 32BMB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
32BMT02___TFL	ELEC, 6.9kV-480V Transformer 32BMT02, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
33BDB____OFL	ELEC, 6.9kV SWGR 33BDB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
33BMB____OFL	ELEC, 480V Load Center 33BMB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
33BMT02___TFL	ELEC, 6.9kV-480V Transformer 33BMT02, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
34BDB____OFL	ELEC, 6.9kV SWGR 34BDB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
34BDC____OFL	ELEC, 6.9kV SWGR 34BDC, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
34BMB____OFL	ELEC, 480V Load Center 34BMB, Fails During Operation	2.40E-05	2.85E-05	2.19E+00

t19.1-43b2

Flood Basic Events ID	Description	Nom.val.	FV	RAW
34BMT02___TFL	ELEC, 6.9kV-480V Transformer 34BMT02, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
BRW10BUW11OFL	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
BRW32BUW33OFL	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
BRW52BUW53OFL	ELEC, 24V DC I&C Power Rack BRW52/BUW53, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
BRW70BUW71OFL	ELEC, 24V DC I&C Power Rack 34BRW70/34BUW71, Fails During Operation	2.40E-05	2.85E-05	2.19E+00
31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	7.67E-04	2.18E+00
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	8.11E-04	2.16E+00
JNG20AP001EFR	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001, Fails to Run	2.40E-04	2.67E-04	2.11E+00
KAA20AP001EEL	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	7.20E-05	7.94E-05	2.10E+00
PEB30AP001EFR	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Run	1.08E-04	1.18E-04	2.09E+00
JND20AA001MEC1	MHSI, MHSI Pump 20 Suction Manual Valve JND20AA001, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
JND30AA001MEC1	MHSI, MHSI Pump 30 Suction Manual Valve JND30AA001, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA22AA006MEC1	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA006, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA22AA009MEC1	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA009, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA22AA115MEC1	CCWS, MHSI Pump 20 Cooling Manual Valve KAA22AA115, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA32AA006MEC1	CCWS, MHSI Pump 30 Cooling Manual Valve KAA32AA006, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA32AA009MEC1	CCWS, MHSI Pump 30 Cooling Manual Valve KAA32AA009, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
KAA32AA115MEC1	CCWS, MHSI Pump 30 Cooling Manual Control Valve KAA32AA115, Left in Wrong Position	2.00E-04	2.14E-04	2.07E+00
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	5.13E-03	2.05E+00
LAB31AA001PCL	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA001, Fails to Remain Open (SO)	7.92E-05	8.24E-05	2.04E+00
LAB31AA002PCL	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA002, Fails to Remain Open (SO)	7.92E-05	8.24E-05	2.04E+00
LAB32AA001PCL	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA001, Fails to Remain Open (SO)	7.92E-05	8.24E-05	2.04E+00
LAB32AA002PCL	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA002, Fails to Remain Open (SO)	7.92E-05	8.24E-05	2.04E+00
PGB19AA191SPO	CLCWS, Safety Valve PGB19AA191, Premature Opening	7.20E-05	7.50E-05	2.04E+00
SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	3.49E-04	3.61E-04	2.03E+00
SAC34AN001EFR	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Run	3.49E-04	3.61E-04	2.03E+00
PED30AN001EFR	UHS, Cooling Tower Train 3 Cooling Fan PED30AN001, Fails to Run	6.97E-04	7.07E-04	2.01E+00
PED30AN002EFR	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002, Fails to Run	6.97E-04	7.07E-04	2.01E+00
KAA22AA007MEC1	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA007, Left in Wrong Position	2.00E-04	2.01E-04	2.00E+00
KAA22AA010MEC1	CCWS, LHSI Pump 20 Cooling Manual Valve KAA22AA010, Left in Wrong Position	2.00E-04	2.01E-04	2.00E+00
KAA22AA011MEC1	CCWS, LHSI HTX 20 Cooling Manual Valve KAA22AA011, Left in Wrong Position	2.00E-04	2.01E-04	2.00E+00
KAA22AA116MEC1	CCWS, LHSI Pump 20 Motor Cooling Manual Valve KAA22AA116, Left in Wrong Position	2.00E-04	2.01E-04	2.00E+00
KAA22AA127MEC1	CCWS, LHSI Pump 20 Sealing Fluid Cooling Manual Valve KAA22AA127, Left in Wrong Position	2.00E-04	2.01E-04	2.00E+00

All Basic Events with RAW >= 2E+00

t19.1-44b

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

t19.1-45b

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

t19.1-46b

System	ID	Description	Nominal Value	RAW
HVAC	SAC31AN001EFR_D-ALL	CCF to Run Normal Air Exhaust Fans	1.3E-06	6,995.0
HVAC	SAC01AN001EFR_D-ALL	CCF to Run Normal Air Supply Fans	1.3E-06	6,995.0
SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6.4E-07	6,993.0
ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	2.9E-07	1,018.0
SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run	3.8E-05	470.1
SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	4.5E-06	460.9
SIS/RHRS	JND10AP001EFS_D-ALL	CCF of MHSI Pumps to Start	4.6E-06	460.9
CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	450.3
ESWS	PED10AN002EFS_D-ALL	CCF to Start Standby Cooling Tower Fans	1.9E-05	448.9
ESWS	PED10AN001EFR_D-ALL	CCF to Run Normally Running Cooling Tower Fans	2.7E-06	439.6
ESWS	PED10AN002EFR_D-ALL	CCF to Run Standby Cooling Tower Fans	2.7E-06	439.6
SIS/RHRS	JND10AA007CFO_D-ALL	CCF to Open MHSI Discharge CVs (CIVs)	7.3E-07	438.2
SIS/RHRS	JND10AA003CFO_D-ALL	CCF to Open MHSI Pump Discharge Motor Operated CHECK Valves	7.3E-07	438.2
SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start	1.8E-06	436.4
IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-07	430.0
SIS/RHRS	JNG10AP001EFR_D-ALL	CCF of LHSI Pumps to Run	5.6E-07	416.0
CCWS	KAA12AA012CFO_D-ALL	CCF to Open CCWS from LHSI HTX Discharge Check Valve	4.5E-07	404.9
SIS/RHRS	JNG10AA009CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	382.5
SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	382.5
SIS/RHRS	JNG10AA011CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	382.5
EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	1.1E-05	312.4
EFWS	LAS11AP001EFR_D-ALL	CCF of EFWS Pumps to Run	9.6E-06	312.3
ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	9.9E-05	67.9
SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	2.2E-05	67.5
CCWS	KAA20AP001EFS_B-ALL	CCF of CCWS Pumps 2 and 3 to Start (Standby)	6.7E-05	66.5
MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	3.7E-05	63.6
MSS	MSRIVSCPFO_P-ALL	CCF to Open Main Steam Relief Isolation Pneumatic Pilot Valves	1.3E-05	62.6
MSS	MSRIVSOOFO_P-ALL	CCF to Open Main Steam Relief Isolation Solenoid Pilot Valves	4.2E-06	60.2
ESWS	PEB20AP001EFR_B-ALL	CCF of ESWS Pumps 2 and 3 to Run (Standby)	2.2E-06	41.1

t19.1-46b

System	ID	Description	Nominal Value	RAW
MSS	LBA11AA191SFO_H-ALL	CCF to Open Main Steam Safety Relief Valves	1.1E-05	37.7
ELEC	XKA10_____DFR_D-ALL	CCF of EDGs to Run	1.0E-04	30.4
CCWS	KAA20AP001EFR_B-ALL	CCF of CCWS Pumps 2 and 3 to Run (Standby)	1.1E-06	29.9
ELEC	XKA10_____DFS_D-ALL	CCF of EDGs to Start	7.0E-06	25.9
CCWS	KAA22AA014CFO_B-ALL	CCF to Open CCWS Discharge of LHSI Pump Seal Cooler Check Valves	2.5E-06	24.5

t19.1-47b

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

t19.1-48b

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
PROB ANNULUS	Probability that the Annulus connection boxes will withstand a contained Flood	5.0E-01	0.522	1.5
PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.302	2.2
Preventive Maintenance				
CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.041	1.6
CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.048	1.7
LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.018	1.4
LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.009	1.2
LHSI PM3	LHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.015	1.3
MHSI PM1	MHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.027	1.6
MHSI PM2	MHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.017	1.4
MHSI PM3	MHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.017	1.4
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.0E-02	0.075	3.4
SAC02/QKA20 PM2	Normal SAC02/QKA20 Train Unavailable due to Preventive Maintenance	3.0E-02	0.009	1.3
SAC03/QKA30 PM3	Normal SAC03/QKA30 Train Unavailable due to Preventive Maintenance	3.0E-02	0.011	1.4
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.0E-02	0.008	1.3
Offsite Power Related Events				
LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.009	187.0
LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.016	10.2
LOOPCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to a Controlled Shutdown	1.8E-04	0.037	208.4

t19.1-67b

System	Component ID	Description	FV	RAW
ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.030	1.6
ESWS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	0.030	3.5
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	0.026	23.1
ESWS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	0.024	2.5
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	0.022	3.4
ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.022	1.4
ESWS	30PED30AN002	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002	0.021	2.1
CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	0.018	2.5
MSS	30LBA33AA001	MSS, Train 3 MSRIV LBA33AA001	0.017	1.0
MSS	30LBA13AA001	MSS, Train 1 MSRIV LBA13AA001	0.017	1.0
MSS	30LBA23AA001	MSS, Train 2 MSRIV LBA23AA001	0.017	1.0
CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	0.017	2.0
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	0.017	16.1
EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.017	1.5
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	0.015	3.3
ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.015	1.2
EFWS	30LAS21AP001	EFWS, Train 2 Motor Driven Pump LAS21AP001	0.014	1.3
EFWS	30LAS31AP001	EFWS, Train 3 Motor Driven Pump LAS31AP001	0.014	1.3
MSS	30LBA43AA001	MSS, Train 4 MSRIV LBA43AA001	0.013	1.0
SIS/RHRS	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	0.012	2.4
EFWS	30LAS41AP001	EFWS, Train 4 Motor Driven Pump LAS41AP001	0.011	1.2
ESWS	30PED40AN002	UHS, Cooling Tower Train 4 Cooling Fan PED40AN002	0.011	1.0
MSS	30LBA20AA002	MSS, Train 2 Main Steam Isolation Valve LBA20AA002	0.010	6.2
MSS	30LBA10AA002	MSS, Train 1 Main Steam Isolation Valve LBA10AA002	0.010	6.2
CCWS	30KAA42AA005	CCWS, Train 4 to LHSI HTX 40 Cooling MOV KAA42AA005	0.010	1.0
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	0.010	20.9

t19.1-67b

System	Component ID	Description	FV	RAW
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	0.010	20.9
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	0.010	2.4
ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	0.009	1.1
SIS/RHRS	30JNG30AA006	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006	0.009	2.1
SIS/RHRS	30JND10AP001	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001	0.009	1.3
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	0.009	3.3
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	0.008	22.5
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	0.008	16.0
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	0.008	16.0
SIS/RHRS	30JNG20AA006	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006	0.008	1.9
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	0.008	2.4
SCWS	30QKA20GH001	SCWS, Train 2 Chiller Unit QKA20GH001	0.007	9.9
ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	0.007	1.1
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	0.007	1.9
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	0.007	2.0
MSS	30LBA30AA002	MSS, Train 3 Main Steam Isolation Valve LBA30AA002	0.006	2.7
ELEC	31BDA	ELEC, 6.9kV SWGR 31BDA	0.006	261.3
SCWS	30QKA30GH001	SCWS, Train 3 Chiller Unit QKA30GH001	0.006	8.5
SIS/RHRS	30JND20AP001	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001	0.006	1.2
SIS/RHRS	30JND30AP001	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001	0.006	1.1
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	0.006	16.0
ELEC	32BMT02	ELEC, 6.9kV-480V Transformer 32BMT02	0.006	242.6
ELEC	32BMB	ELEC, 480V Load Center 32BMB	0.006	242.6
ELEC	32BDB	ELEC, 6.9kV SWGR 32BDB	0.006	242.6
ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	0.006	242.3
ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	0.006	242.3

t19.1-67b

System	Component ID	Description	FV	RAW
ELEC	31BMB	ELEC, 480V Load Center 31BMB	0.006	242.3
ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	0.006	241.9
ELEC	30BRW32BUW33	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33	0.006	240.4
ELEC	30BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	0.006	240.2
ELEC	31BRA	ELEC, 480V MCC 31BRA	0.006	233.0
ELEC	32BRA	ELEC, 480V MCC 32BRA	0.006	232.2
HVAC	30SAC02AN001	SAC, Normal Air Supply Fan SAC02AN001	0.005	9.9
HVAC	30SAC32AN001	SAC, Normal Air Exhaust Fan SAC32AN001	0.005	9.9

t19.1-67b2

Fire Basic Events ID	Description	Nom.val.	FV	RAW
31BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	1.53E-04	3.57E-02	2.34E+02
32BRA____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	1.53E-04	3.57E-02	2.34E+02
XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	2.75E-02	1.83E-02	1.65E+00
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	1.55E-02	2.31E+01
PED10AN002EFS	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Start on Demand	4.84E-03	1.20E-02	3.46E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	1.15E-02	3.33E+00
JNG10AA006MEC3	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006, Left in Wrong Position	8.00E-03	1.14E-02	2.41E+00
XKA10____DFR	ELEC, Emergency Diesel Generator XKA10, Fails to Run	2.75E-02	1.08E-02	1.38E+00
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	1.06E-02	1.61E+01
JNG30AA006MEC3	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006, Left in Wrong Position	8.00E-03	8.83E-03	2.09E+00
KAA12AA005EFO	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005, Fails to Open on Demand	3.40E-03	8.25E-03	3.42E+00
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	8.01E-03	3.28E+00
JNG20AA006MEC3	LHSI, LHSI CL2 Discharge Manual CHECK Valve JNG20AA006, Left in Wrong Position	8.00E-03	7.48E-03	1.93E+00
PED20AN002EFS	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Start on Demand	4.84E-03	7.20E-03	2.48E+00
SAC01AN001EFR	SAC, Normal Air Supply Fan SAC01AN001, Fails to Run	3.49E-04	6.93E-03	2.09E+01
SAC31AN001EFR	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Run	3.49E-04	6.93E-03	2.09E+01
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	6.74E-03	2.37E+00
XKA50____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run	5.44E-02	6.57E-03	1.11E+00
31BDA____OFL	ELEC, 6.9kV Switchgear 31BDA, Fails During Operation	2.40E-05	6.25E-03	2.61E+02
QKA20GH001_FR	SCWS, Train 2 Chiller Unit QKA20GH001, Fails to Run	6.98E-04	6.22E-03	9.92E+00
32BDB____OFL	ELEC, 6.9kV SWGR 32BDB, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
32BMB____OFL	ELEC, 480V Load Center 32BMB, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
32BMT02__TFL	ELEC, 6.9kV-480V Transformer 32BMT02, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
31BDB____OFL	ELEC, 6.9kV SWGR 31BDB, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BMB____OFL	ELEC, 480V Load Center 31BMB, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BMT02__TFL	ELEC, 6.9kV-480V Transformer 31BMT02, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BDC____OFL	ELEC, 6.9kV SWGR 31BDC, Fails During Operation	2.40E-05	5.78E-03	2.42E+02
LAS11AP001EFR	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Run	1.19E-02	5.71E-03	1.48E+00
LBA10AA002PFC	MSS, Train 1 Main Steam Isolation Valve LBA10AA002, Fails to Close on Demand	1.10E-03	5.70E-03	6.17E+00
LBA20AA002PFC	MSS, Train 2 Main Steam Isolation Valve LBA20AA002, Fails to Close on Demand	1.10E-03	5.70E-03	6.17E+00
31BRA____OFL	ELEC, 480V MCC 31BRA, Fails During Operation	2.40E-05	5.57E-03	2.33E+02
32BRA____OFL	ELEC, 480V MCC 32BRA, Fails During Operation	2.40E-05	5.55E-03	2.32E+02
QKA30GH001_FR	SCWS, Train 3 Chiller Unit QKA30GH001, Fails to Run	6.98E-04	5.24E-03	8.50E+00
SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	3.49E-04	5.23E-03	1.60E+01
SAC34AN001EFR	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Run	3.49E-04	5.23E-03	1.60E+01
PED30AN002EFS	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002, Fails to Start on Demand	4.84E-03	5.16E-03	2.06E+00
XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	2.75E-02	5.16E-03	1.18E+00
QKA10AP107EFR	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Run	2.37E-04	5.11E-03	2.25E+01

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System	Component ID	Description	RAW	FV
ELEC	31BDA	ELEC, 6.9kV SWGR 31BDA	261.3	0.006
ELEC	32BMT02	ELEC, 6.9kV-480V Transformer 32BMT02	242.6	0.006
ELEC	32BMB	ELEC, 480V Load Center 32BMB	242.6	0.006
ELEC	32BDB	ELEC, 6.9kV SWGR 32BDB	242.6	0.006
ELEC	31BMB	ELEC, 480V Load Center 31BMB	242.3	0.006
ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	242.3	0.006
ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	242.3	0.006
ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	241.9	0.006
ELEC	30BRW32BUW33	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33	240.4	0.006
ELEC	30BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	240.2	0.006
ELEC	32BDB2BMT02	ELEC, 6.9kV SWGR 32BDB to Transformer 32BMT02 Circuit Breaker	238.2	0.002
ELEC	31BMT021BMB	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker	238.2	0.002
ELEC	32BMT022BMB	ELEC, Transformer 32BMT02 to 480V Load Center 32BMB Circuit Breaker	238.2	0.002
ELEC	31BDC_1BDB1	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	238.2	0.002
ELEC	31BDB1BMT02	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker	238.2	0.002
ELEC	31BDC_1BDB2	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	238.2	0.002
ELEC	31BRA	ELEC, 480V MCC 31BRA	233.0	0.006
ELEC	32BRA	ELEC, 480V MCC 32BRA	232.2	0.006
ELEC	31BRU011BRA	ELEC, Inverter 31BRU01 to 480V MCC 31BRA Circuit Breaker	229.9	0.002
ELEC	32BRU012BRA	ELEC, Inverter 32BRU01 to 480V MCC 32BRA Circuit Breaker	229.9	0.002
ELEC	32BDA	ELEC, 6.9kV SWGR 32BDA	121.2	0.003
ELEC	32BDA_2BDB1	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	118.9	0.001
ELEC	32BDA_2BDB2	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker	118.9	0.001
ELEC	31BDA_1BDC2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	31.1	0.000
ELEC	31BDA_1BDC1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	31.1	0.000
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	23.1	0.026

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System	Component ID	Description	RAW	FV
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	22.5	0.008
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	20.9	0.010
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	20.9	0.010
HVAC	30SAC01AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005	18.8	0.000
HVAC	30SAC31AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002	18.8	0.000
SCWS	30QKC10AA101	SCWS, Return from SAC Div 1 MOV QKC10AA101	18.8	0.000
SCWS	30QKA10AA101	SCWS, Train 1 Chiller By-pass MOV QKA10AA101	18.8	0.000
HVAC	30SAC01AA003	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003	18.8	0.000
SCWS	30QKA10AA003	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003	18.8	0.000
HVAC	30SAC31AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003	18.8	0.000
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	16.1	0.017
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	16.0	0.008
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	16.0	0.008
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	16.0	0.006
CCWS	30KAB10AA193	CCWS, FPCS Train 1 Cooling Header Safety Valve KAB10AA193	15.5	0.001
CCWS	30KAB30AA191	CCWS, CCWS CH1 RCP1/2 TB Return Safety Valve KAB30AA191	15.5	0.001
CCWS	30KAB10AA192	CCWS, CCWS CH1 Return Safety Valve KAB10AA192	15.5	0.001
CCWS	30KAB60AA191	CCWS, CVCS HP Cooler 1 Return Safety Valve KAB60AA191	15.5	0.001
SCWS	30QKC40AA101	SCWS, Return from SAC Div 4 MOV QKC40AA101	14.7	0.000
HVAC	30SAC34AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC34AA002	14.7	0.000
HVAC	30SAC34AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC34AA003	14.7	0.000
SCWS	30QKA40AA101	SCWS, Train 4 Chiller By-pass MOV QKA40AA101	14.7	0.000
HVAC	30SAC04AA003	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003	14.7	0.000
SCWS	30QKA40AA003	SCWS, Train 4 Safety Chiller Pump Discharge Check Valve QKA40AA003	14.7	0.000
HVAC	30SAC04AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC04AA005	14.7	0.000
SCWS	30QKA20GH001	SCWS, Train 2 Chiller Unit QKA20GH001	9.9	0.007

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System	Component ID	Description	RAW	FV
HVAC	30SAC02AN001	SAC, Normal Air Supply Fan SAC02AN001	9.9	0.005
HVAC	30SAC32AN001	SAC, Normal Air Exhaust Fan SAC32AN001	9.9	0.005
SCWS	30QKA20AP107	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107	9.8	0.004
ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	9.7	0.000
ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	9.7	0.000
ELEC	34BMB	ELEC, 480V Load Center 34BMB	9.7	0.000
ELEC	33BMT02	ELEC, 6.9kV-480V Transformer 33BMT02	9.7	0.000
ELEC	33BMB	ELEC, 480V Load Center 33BMB	9.7	0.000
ELEC	33BDB	ELEC, 6.9kV SWGR 33BDB	9.7	0.000
ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	9.6	0.000
ELEC	34BDA	ELEC, 6.9kV SWGR 34BDA	9.6	0.000
ESWS	30PEB10AP001	ESWS, Train 1 Motor Driven Pump PEB10AP001	9.5	0.003
HVAC	30SAC32AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC32AA002	8.7	0.000
HVAC	30SAC32AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC32AA003	8.7	0.000
SCWS	30QKC20AA101	SCWS, Return from SAC Div 2 MOV QKC20AA101	8.7	0.000
CCWS	30KAA22AA101	CCWS, Common Header 1 QKA20 Chiller Return 3-Way MOV KAA22AA101	8.7	0.000
HVAC	30SAC02AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC02AA005	8.7	0.000
SCWS	30QKA20AA101	SCWS, Train 2 Chiller By-pass MOV QKA20AA101	8.7	0.000
SCWS	30QKA20AA003	SCWS, Train 2 Safety Chiller Pump Discharge Check Valve QKA20AA003	8.7	0.000
HVAC	30SAC02AA003	SAC, Normal Air Inlet Motor Operated Damper SAC02AA003	8.7	0.000
CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	8.6	0.001
SCWS	30QKA30GH001	SCWS, Train 3 Chiller Unit QKA30GH001	8.5	0.006
HVAC	30SAC03AN001	SAC, Normal Air Supply Fan SAC03AN001	8.5	0.005
HVAC	30SAC33AN001	SAC, Normal Air Exhaust Fan SAC33AN001	8.5	0.005
SCWS	30QKA30AP107	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107	8.5	0.003
CCWS	30KAB70AA191	CCWS, CVCS HP Cooler 2 Return Safety Valve KAB60AA191	8.4	0.001

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System	Component ID	Description	RAW	FV
CCWS	30KAB20AA192	CCWS, CCWS CH2 Return Safety Valve KAB20AA192	8.4	0.001
CCWS	30KAB30AA192	CCWS, CCWS CH2 RCP3/4 TB Return Safety Valve KAB30AA192	8.4	0.001
CCWS	30KAB20AA193	CCWS, FPCS Train 2 Cooling Header Safety Valve KAB20AA193	8.4	0.001
ELEC	34BDC_4BDB2	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	8.4	0.000
ELEC	34BMT024BMB	ELEC, Transformer 34BMT02 to 480V Load Center 34BMB Circuit Breaker	8.4	0.000
ELEC	34BDB4BMT02	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT02 Circuit Breaker	8.4	0.000
ELEC	34BDC_4BDB1	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	8.4	0.000
ELEC	34BDA_4BDC1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	8.4	0.000
ELEC	33BMT023BMB	ELEC, Transformer 33BMT02 to 480V Load Center 33BMB Circuit Breaker	8.4	0.000
ELEC	33BDB3BMT02	ELEC, 6.9kV SWGR 33BDB to Transformer 33BMT02 Circuit Breaker	8.4	0.000
ELEC	34BDA_4BDC2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	8.4	0.000
ELEC	30BRW52BUW53	ELEC, 24V DC I&C Power Rack BRW52/BUW53	8.2	0.000
ELEC	30BRW70BUW71	ELEC, 24V DC I&C Power Rack 34BRW70/34BUW71	8.2	0.000
HVAC	30SAC03AA003	SAC, Normal Air Inlet Motor Operated Damper SAC03AA003	7.9	0.000
SCWS	30QKA30AA101	SCWS, Train 3 Chiller By-pass MOV QKA30AA101	7.9	0.000
HVAC	30SAC03AA005	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC03AA005	7.9	0.000
SCWS	30QKA30AA003	SCWS, Train 3 Safety Chiller Pump Discharge Check Valve QKA30AA003	7.9	0.000
CCWS	30KAA32AA101	CCWS, Common Header 2 QKA30 Chiller Return 3-Way MOV KAA32AA101	7.9	0.000
HVAC	30SAC33AA003	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC33AA003	7.9	0.000
SCWS	30QKC30AA101	SCWS, Return from SAC Div 3 MOV QKC30AA101	7.9	0.000
HVAC	30SAC33AA002	SAC, Normal Air Exhaust Motor Operated Damper SAC33AA002	7.9	0.000
MSS	30LBA10AA002	MSS, Train 1 Main Steam Isolation Valve LBA10AA002	6.2	0.010
MSS	30LBA20AA002	MSS, Train 2 Main Steam Isolation Valve LBA20AA002	6.2	0.010
SIS/RHRS	30JNG10AC001	LHSI, LHSI Train 1 HTX JNG10AC001	5.9	0.000
ELEC	31BMD	ELEC, 480V Load Center 31BMD	5.8	0.000
ELEC	31BMT04	ELEC, 6.9kV-480V Transformer 31BMT04	5.8	0.000

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System	Component ID	Description	RAW	FV
ELEC	31BDD	ELEC, 6.9kV SWGR 31BDD	5.8	0.000
EFWS	30LAR30BB001	EFWS, Train 3 EFW Storage Tank LAR30BB001	5.1	0.000
EFWS	30LAR20BB001	EFWS, Train 2 EFW Storage Tank LAR20BB001	5.1	0.000
EFWS	30LAR10BB001	EFWS, Train 1 EFW Storage Tank LAR10BB001	5.1	0.000
EFWS	30LAR40BB001	EFWS, Train 4 EFW Storage Tank LAR40BB001	5.1	0.000
ELEC	33BDA	ELEC, 6.9kV SWGR 33BDA	5.0	0.000
CCWS	30KAA10BB001	CCWS, Train 1 Surge Tank KAA10BB001	4.8	0.000
ELEC	33BDA_3BDB1	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker	4.7	0.000
ELEC	33BDA_3BDB2	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker	4.7	0.000
CCWS	30KAA10AA112	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112	4.2	0.000
ESWS	30PEB10AA005	ESWS, Train 1 Pump Discharge Isolation MOV, PEB10AA005	4.2	0.000
CCWS	30KAA10AC001	CCWS, Train 1 HTX 10 KAA10AC001	3.9	0.000
ELEC	31BMT041BMD	ELEC, Transformer 31BMT04 to 480V Load Center 31BMD Circuit Breaker	3.9	0.000
ELEC	31BDD1BMT04	ELEC, 6.9kV SWGR 31BDD to Transformer 31BMT04 Circuit Breaker	3.9	0.000
ELEC	31BDA_1BDD2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	3.9	0.000
ELEC	31BDA_1BDD1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	3.9	0.000
ESWS	30PED10AN002	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002	3.5	0.030
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	3.4	0.022
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	3.4	0.002
CVCS	30KBA31AP001	CVCS, HP Motor Driven Charging Pump KBA31AP001	3.3	0.001
ESWS	30PEB20AP001	ESWS, Train 2 Motor Driven Pump PEB20AP001	3.3	0.015
SIS/RHRS	30JNG10AA104	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104	3.3	0.003
ESWS	30PEB20AA005	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005	3.3	0.009
CVCS	30KBA31AA191	CVCS, Train 1 Charging Pump 31 Safety Valve KBA31AA191	3.1	0.000
ESWS	30PED10AN001	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001	3.0	0.004
SIS/RHRS	30JNG10AP001	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001	2.9	0.003

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System	Component ID	Description	RAW	FV
ELEC	31BUC	ELEC, 250V DC Bus 31BUC	2.8	0.000
MSS	30LBA30AA002	MSS, Train 3 Main Steam Isolation Valve LBA30AA002	2.7	0.006
SCWS	30QKC10AA027	SCWS, LHSI Pump 10 Sealing Fluid Cooling Manual Valve QKC10AA027	2.7	0.000
SCWS	30QKC10AA026	SCWS, LHSI Pump 10 Motor Cooling Manual Valve QKC10AA026	2.7	0.000
CCWS	30KAA12AA011	CCWS, LHSI HTX 10 Cooling Manual Valve KAA12AA011	2.7	0.000
RCS	30JEB30AP001	ELEC, 13.8kV SWGR 33BBC Circuit Breaker for RCP JEB30AP001	2.6	0.001
RCS	30JEB40AP001	ELEC, 13.8kV Bus BBH Circuit Breaker for RCP JEB40AP001	2.6	0.001
CCWS	30KAA10AA004	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004	2.6	0.000
ESWS	30PEB10AA004	ESWS, Train 1 Pump Discharge Check Valve PEB10AA004	2.6	0.000
ELEC	30BDT01	ELEC, Aux Transformer 30BDT01	2.6	0.000
CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	2.6	0.004
ESWS	30PEB20AA007	ESWS, Train 2 Manual Valve PEB20AA007	2.5	0.000
ESWS	30PEB20AA010	ESWS, Train 2 Manual Valve PEB20AA010	2.5	0.000
ESWS	30PEB20AA009	ESWS, Train 2 Manual Valve PEB20AA009	2.5	0.000
ESWS	30PED20AN002	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002	2.5	0.024
ELEC	30BDT01_1BDA	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 31BDA Circuit Breaker	2.5	0.000
CCWS	30KAA22AA005	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005	2.5	0.018
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	2.4	0.008
MFWS	30LAB32AA002	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA002	2.4	0.000
CLCWS	30PGB19AA191	CLCWS, Safety Valve PGB19AA191	2.4	0.000
MFWS	30LAB32AA001	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA001	2.4	0.000
MFWS	30LAB31AA002	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA002	2.4	0.000
MFWS	30LAB31AA001	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA001	2.4	0.000
SIS/RHRS	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	2.4	0.012
SIS/RHRS	30JNG20AA104	LHSI, LHSI Pump 20 Throttle Control MOV JNG20AA104	2.4	0.002
ESWS	30PEB30AP001	ESWS, Train 3 Motor Driven Pump PEB30AP001	2.4	0.010

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System	Component ID	Description	RAW	FV
ELEC	31BTD01	ELEC, 250V Battery 31BTD01 Circuit Breaker	2.3	0.000
ESWS	30PEB30AA005	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005	2.3	0.005
ESWS	30PED20AN001	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001	2.2	0.003
SIS/RHRS	30JNG20AP001	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001	2.1	0.003
CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	2.1	0.004
SIS/RHRS	30JNG10AA009	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009	2.1	0.000
SCWS	30QKC10AA028	SCWS, Train 1 Discharge of LHSI Pump Seal Cooler Check Valve QKC10AA028	2.1	0.000
CCWS	30KAA12AA012	CCWS, Train 1 LHSI HTX Discharge Check Valve KAA12AA012	2.1	0.000
SIS/RHRS	30JNG10AA011	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA011	2.1	0.000
SIS/RHRS	30JNG30AA006	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006	2.1	0.009
HVAC	30SAC05AN001	SAC, Maintenance Division Air Supply Fan SAC05AN01	2.1	0.000
HVAC	30SAC35AN001	SAC, Maintenance Division Air Exhaust Fan SAC35AN01	2.1	0.000
CCWS	30KAA20AA008	CCWS, Pump 20 Cooling Manual Valve KAA20AA008	2.1	0.000
CCWS	30KAA20AA007	CCWS, Pump 20 Cooling Manual Valve KAA20AA007	2.1	0.000
CCWS	30KAA20AA018	CCWS, Pump 20 Discharge Manual Valve KAA20AA018	2.1	0.000
CCWS	30KAA20AA140	CCWS, Pump 20 Cooling Manual Valve KAA20AA140	2.1	0.000
CCWS	30KAA20AA005	CCWS, Discharge from CCW HTX 20 Manual Valve KAA20AA005	2.1	0.000
CCWS	30KAA20AA011	CCWS, Pump 20 Suction from CCST Manual Valve KAA20AA011	2.1	0.000
CCWS	30KAA20AA015	CCWS, Pump 20 Suction Manual Valve KAA20AA015	2.1	0.000
ESWS	30PEB20AA004	ESWS, Train 2 Pump Discharge Check Valve PEB20AA004	2.1	0.000
ESWS	30PED30AN002	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002	2.1	0.021
CCWS	30KAA32AA005	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005	2.0	0.017

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
31BDA_____OFL	ELEC, 6.9kV Switchgear 31BDA, Fails During Operation	2.40E-05	6.25E-03	2.61E+02
32BDB_____OFL	ELEC, 6.9kV SWGR 32BDB, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
32BMB_____OFL	ELEC, 480V Load Center 32BMB, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
32BMT02___TFL	ELEC, 6.9kV-480V Transformer 32BMT02, Fails During Operation	2.40E-05	5.80E-03	2.43E+02
31BDB_____OFL	ELEC, 6.9kV SWGR 31BDB, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BMB_____OFL	ELEC, 480V Load Center 31BMB, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BMT02___TFL	ELEC, 6.9kV-480V Transformer 31BMT02, Fails During Operation	2.40E-05	5.79E-03	2.42E+02
31BDC_____OFL	ELEC, 6.9kV SWGR 31BDC, Fails During Operation	2.40E-05	5.78E-03	2.42E+02
BRW32BUW33OFL	ELEC, 24V DC I&C Power Rack 32BRW32/32BUW33, Fails During Operation	2.40E-05	5.75E-03	2.40E+02
BRW10BUW11OFL	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11, Fails During Operation	2.40E-05	5.74E-03	2.40E+02
1BDB1BMT02BOP	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
1BDC_1BDB1BOP	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
1BDC_1BDB2BOP	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
1BMT021BMBBOP	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
2BDB2BMT02BOP	ELEC, 6.9kV SWGR 32BDB to Transformer 32BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
2BMT022BMBBOP	ELEC, Transformer 32BMT02 to 480V Load Center 32BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.71E-03	2.38E+02
31BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BRA Control Power, Fails to Run	1.53E-04	3.57E-02	2.34E+02
32BRA_____RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BRA Control Power, Fails to Run	1.53E-04	3.57E-02	2.34E+02
31BRA_____OFL	ELEC, 480V MCC 31BRA, Fails During Operation	2.40E-05	5.57E-03	2.33E+02
32BRA_____OFL	ELEC, 480V MCC 32BRA, Fails During Operation	2.40E-05	5.55E-03	2.32E+02
1BRU011BRABOP	ELEC, Inverter 31BRU01 to 480V MCC 31BRA Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.65E-03	2.30E+02
2BRU012BRABOP	ELEC, Inverter 32BRU01 to 480V MCC 32BRA Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.65E-03	2.30E+02
32BDA_____OFL	ELEC, 6.9kV SWGR 32BDA, Fails During Operation	2.40E-05	2.89E-03	1.21E+02
2BDA_2BDB1BOP	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.49E-04	1.19E+02
2BDA_2BDB2BOP	ELEC, 6.9kV SWGR 32BDA to 6.9kV SWGR 32BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.49E-04	1.19E+02
1BDA_1BDC1BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.17E-04	3.11E+01
1BDA_1BDC2BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.17E-04	3.11E+01
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	1.55E-02	2.31E+01
QKA10AP107EFR	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Run	2.37E-04	5.11E-03	2.25E+01
QKA10AP107EEL	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, External Leakage	7.20E-05	1.50E-03	2.18E+01
SAC01AN001EFR	SAC, Normal Air Supply Fan SAC01AN001, Fails to Run	3.49E-04	6.93E-03	2.09E+01
SAC31AN001EFR	SAC, Normal Air Exhaust Fan SAC31AN001, Fails to Run	3.49E-04	6.93E-03	2.09E+01
QKA10AA003CCL	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Remain Open	4.80E-06	8.54E-05	1.88E+01
QKA10AA101ECF	SCWS, Train 1 Chiller By-pass MOV QKA10AA101, Fails to Control Flow	8.40E-06	1.49E-04	1.88E+01
QKC10AA101ECL	SCWS, Return from SAC Div 1 MOV QKC10AA101, Fails to Remain Open (SO)	8.40E-06	1.49E-04	1.88E+01
SAC01AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC01AA003, Fails to Remain Open (SO)	8.40E-06	1.49E-04	1.88E+01
SAC01AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC01AA005, Fails to Remain Open	4.80E-06	8.54E-05	1.88E+01
SAC31AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC31AA002, Fails to Remain Open (SO)	8.40E-06	1.49E-04	1.88E+01
SAC31AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC31AA003, Fails to Remain Open	4.80E-06	8.54E-05	1.88E+01

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	1.06E-02	1.61E+01
SAC04AN001EFR	SAC, Normal Air Supply Fan SAC04AN001, Fails to Run	3.49E-04	5.23E-03	1.60E+01
SAC34AN001EFR	SAC, Normal Air Exhaust Fan SAC34AN001, Fails to Run	3.49E-04	5.23E-03	1.60E+01
QKA40AP107EFR	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, Fails to Run	2.37E-04	3.55E-03	1.60E+01
QKA40AP107EEL	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, External Leakage	7.20E-05	1.06E-03	1.58E+01
KAB10AA192SPO	CCWS, CCWS CH1 Return Safety Valve KAB10AA192, Premature Opening	7.20E-05	1.05E-03	1.55E+01
KAB10AA193SPO	CCWS, FPCS Train 1 Cooling Header Safety Valve KAB10AA193, Premature Opening	7.20E-05	1.05E-03	1.55E+01
KAB30AA191SPO	CCWS, CCWS CH1 RCP1/2 TB Return Safety Valve KAB30AA191, Premature Opening	7.20E-05	1.05E-03	1.55E+01
KAB60AA191SPO	CCWS, CVCS HP Cooler 1 Return Safety Valve KAB60AA191, Premature Opening	7.20E-05	1.05E-03	1.55E+01
QKA40AA003CCL	SCWS, Train 4 Safety Chiller Pump Discharge Check Valve QKA40AA003, Fails to Remain Open	4.80E-06	6.58E-05	1.47E+01
QKA40AA101ECF	SCWS, Train 4 Chiller By-pass MOV QKA40AA101, Fails to Control Flow	8.40E-06	1.15E-04	1.47E+01
QKC40AA101ECL	SCWS, Return from SAC Div 4 MOV QKC40AA101, Fails to Remain Open (SO)	8.40E-06	1.15E-04	1.47E+01
SAC04AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC04AA003, Fails to Remain Open (SO)	8.40E-06	1.15E-04	1.47E+01
SAC04AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC04AA005, Fails to Remain Open	4.80E-06	6.58E-05	1.47E+01
SAC34AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC34AA002, Fails to Remain Open (SO)	8.40E-06	1.15E-04	1.47E+01
SAC34AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC34AA003, Fails to Remain Open	4.80E-06	6.58E-05	1.47E+01
QKA20GH001_FR	SCWS, Train 2 Chiller Unit QKA20GH001, Fails to Run	6.98E-04	6.22E-03	9.92E+00
SAC02AN001EFR	SAC, Normal Air Supply Fan SAC02AN001, Fails to Run	3.49E-04	3.09E-03	9.86E+00
SAC32AN001EFR	SAC, Normal Air Exhaust Fan SAC32AN001, Fails to Run	3.49E-04	3.09E-03	9.86E+00
QKA20AP107EFR	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107, Fails to Run	2.37E-04	2.09E-03	9.82E+00
33BDB____OFL	ELEC, 6.9kV SWGR 33BDB, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
33BMB____OFL	ELEC, 480V Load Center 33BMB, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
33BMT02___TFL	ELEC, 6.9kV-480V Transformer 33BMT02, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
34BDB____OFL	ELEC, 6.9kV SWGR 34BDB, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
34BMB____OFL	ELEC, 480V Load Center 34BMB, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
34BMT02___TFL	ELEC, 6.9kV-480V Transformer 34BMT02, Fails During Operation	2.40E-05	2.09E-04	9.69E+00
QKA20AP107EEL	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107, External Leakage	7.20E-05	6.20E-04	9.62E+00
34BDA____OFL	ELEC, 6.9kV SWGR 34BDA, Fails During Operation	2.40E-05	2.07E-04	9.61E+00
34BDC____OFL	ELEC, 6.9kV SWGR 34BDC, Fails During Operation	2.40E-05	2.07E-04	9.61E+00
PEB10AP001EFR	ESWS, Train 1 Motor Driven Pump PEB10AP001, Fails to Run	1.08E-04	9.17E-04	9.47E+00
KAA22AA101ECL	CCWS, Common Header 1 QKA20 Chiller Return 3-Way MOV KAA22AA101, Fails to Remain Open (SO)	8.40E-06	6.51E-05	8.74E+00
QKA20AA003CCL	SCWS, Train 2 Safety Chiller Pump Discharge Check Valve QKA20AA003, Fails to Remain Open	4.80E-06	3.72E-05	8.74E+00
QKA20AA101ECF	SCWS, Train 2 Chiller By-pass MOV QKA20AA101, Fails to Control Flow	8.40E-06	6.51E-05	8.74E+00
QKC20AA101ECL	SCWS, Return from SAC Div 2 MOV QKC20AA101, Fails to Remain Open (SO)	8.40E-06	6.51E-05	8.74E+00
SAC02AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC02AA003, Fails to Remain Open (SO)	8.40E-06	6.51E-05	8.74E+00
SAC02AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC02AA005, Fails to Remain Open	4.80E-06	3.72E-05	8.74E+00
SAC32AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC32AA002, Fails to Remain Open (SO)	8.40E-06	6.51E-05	8.74E+00
SAC32AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC32AA003, Fails to Remain Open	4.80E-06	3.72E-05	8.74E+00
KAA10AP001EEL	CCWS, Train 1 Motor Driven Pump KAA10AP001, External Leakage	7.20E-05	5.50E-04	8.64E+00

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
QKA30GH001_FR	SCWS, Train 3 Chiller Unit QKA30GH001, Fails to Run	6.98E-04	5.24E-03	8.50E+00
SAC03AN001EFR	SAC, Normal Air Supply Fan SAC03AN001, Fails to Run	3.49E-04	2.61E-03	8.49E+00
SAC33AN001EFR	SAC, Normal Air Exhaust Fan SAC33AN001, Fails to Run	3.49E-04	2.61E-03	8.49E+00
QKA30AP107EFR	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107, Fails to Run	2.37E-04	1.77E-03	8.47E+00
KAB20AA192SPO	CCWS, CCWS CH2 Return Safety Valve KAB20AA192, Premature Opening	7.20E-05	5.35E-04	8.43E+00
KAB20AA193SPO	CCWS, FPCS Train 2 Cooling Header Safety Valve KAB20AA193, Premature Opening	7.20E-05	5.35E-04	8.43E+00
KAB30AA192SPO	CCWS, CCWS CH2 RCP3/4 TB Return Safety Valve KAB30AA192, Premature Opening	7.20E-05	5.35E-04	8.43E+00
KAB70AA191SPO	CCWS, CVCS HP Cooler 2 Return Safety Valve KAB60AA191, Premature Opening	7.20E-05	5.35E-04	8.43E+00
3BDB3BMT02BOP	ELEC, 6.9kV SWGR 33BDB to Transformer 33BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
3BMT023BMBBOP	ELEC, Transformer 33BMT02 to 480V Load Center 33BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BDA_4BDC1BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BDA_4BDC2BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BDB4BMT02BOP	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BDC_4BDB1BOP	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BDC_4BDB2BOP	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
4BMT024BMBBOP	ELEC, Transformer 34BMT02 to 480V Load Center 34BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.33E-05	8.41E+00
QKA30AP107EEL	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107, External Leakage	7.20E-05	5.32E-04	8.39E+00
BRW52BUW53OFL	ELEC, 24V DC I&C Power Rack BRW52/BUW53, Fails During Operation	2.40E-05	1.72E-04	8.18E+00
BRW70BUW71OFL	ELEC, 24V DC I&C Power Rack 34BRW70/34BUW71, Fails During Operation	2.40E-05	1.72E-04	8.18E+00
KAA10AP001EFR	CCWS, Train 1 Motor Driven Pump KAA10AP001, Fails to Run	4.69E-05	3.22E-04	7.87E+00
KAA32AA101ECL	CCWS, Common Header 2 QKA30 Chiller Return 3-Way MOV KAA32AA101, Fails to Remain Open (SO)	8.40E-06	5.76E-05	7.86E+00
QKA30AA003CCL	SCWS, Train 3 Safety Chiller Pump Discharge Check Valve QKA30AA003, Fails to Remain Open	4.80E-06	3.29E-05	7.86E+00
QKA30AA101ECF	SCWS, Train 3 Chiller By-pass MOV QKA30AA101, Fails to Control Flow	8.40E-06	5.76E-05	7.86E+00
QKC30AA101ECL	SCWS, Return from SAC Div 3 MOV QKC30AA101, Fails to Remain Open (SO)	8.40E-06	5.76E-05	7.86E+00
SAC03AA003ECL	SAC, Normal Air Inlet Motor Operated Damper SAC03AA003, Fails to Remain Open (SO)	8.40E-06	5.76E-05	7.86E+00
SAC03AA005CCL	SAC, Normal Air Inlet Supply Fan Discharge Check Damper SAC03AA005, Fails to Remain Open	4.80E-06	3.29E-05	7.86E+00
SAC33AA002ECL	SAC, Normal Air Exhaust Motor Operated Damper SAC33AA002, Fails to Remain Open (SO)	8.40E-06	5.76E-05	7.86E+00
SAC33AA003CCL	SAC, Normal Air Exhaust Supply Fan Discharge Check Damper SAC33AA003, Fails to Remain Open	4.80E-06	3.29E-05	7.86E+00
LBA10AA002PFC	MSS, Train 1 Main Steam Isolation Valve LBA10AA002, Fails to Close on Demand	1.10E-03	5.70E-03	6.17E+00
LBA20AA002PFC	MSS, Train 2 Main Steam Isolation Valve LBA20AA002, Fails to Close on Demand	1.10E-03	5.70E-03	6.17E+00
LBA10AA002POP	MSS, Train 1 Main Steam Isolation Valve LBA10AA002, Fails to Remain Closed (SO)	7.92E-05	3.97E-04	6.02E+00
LBA20AA002POP	MSS, Train 2 Main Steam Isolation Valve LBA20AA002, Fails to Remain Closed (SO)	7.92E-05	3.97E-04	6.02E+00
JNG10AC001TLK	LHSI, LHSI Train 1 HTX JNG10AC001, Tube Leakage	2.40E-05	1.17E-04	5.86E+00
31BDD____OFL	ELEC, 6.9kV SWGR 31BDD, Fails During Operation	2.40E-05	1.14E-04	5.77E+00
31BMD____OFL	ELEC, 480V Load Center 31BMD, Fails During Operation	2.40E-05	1.14E-04	5.77E+00
31BMT04___TFL	ELEC, 6.9kV-480V Transformer 31BMT04, Fails During Operation	2.40E-05	1.14E-04	5.77E+00
LAR10BB001TEL	EFWS, Train 1 EFW Storage Tank LAR10BB001, External Leakage	1.00E-06	4.09E-06	5.09E+00
LAR20BB001TEL	EFWS, Train 2 EFW Storage Tank LAR20BB001, External Leakage	1.00E-06	4.09E-06	5.09E+00
LAR30BB001TEL	EFWS, Train 3 EFW Storage Tank LAR30BB001, External Leakage	1.00E-06	4.09E-06	5.09E+00

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
LAR40BB001TEL	EFWS, Train 4 EFW Storage Tank LAR40BB001, External Leakage	1.00E-06	4.09E-06	5.09E+00
33BDA_____OFL	ELEC, 6.9kV SWGR 33BDA, Fails During Operation	2.40E-05	9.52E-05	4.97E+00
KAA10BB001TEL	CCWS, Train 1 Surge Tank KAA10BB001, External Leakage	1.20E-05	4.54E-05	4.78E+00
3BDA_3BDB1BOP	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.67E-05	4.70E+00
3BDA_3BDB2BOP	ELEC, 6.9kV SWGR 33BDA to 6.9kV SWGR 33BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.67E-05	4.70E+00
KAA10AA112EOP	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112, Fails to Remain Closed (SO)	8.40E-06	2.66E-05	4.17E+00
PEB10AA005ECL	ESWS, Train 1 Pump Discharge Isolation MOV, PEB10AA005, Fails to Remain Open (SO)	8.40E-06	2.66E-05	4.17E+00
PEB10AA010ECL	UHS, Cooling Tower Train 1 Spray MOV PEB10AA010, Fails to Remain Open (SO)	8.40E-06	2.66E-05	4.17E+00
PEB10AA011EOP	UHS, Cooling Tower Train 1 Bypass Line MOV PEB10AA011, Fails to Remain Closed (SO)	8.40E-06	2.66E-05	4.17E+00
1BDA_1BDD1BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.11E-05	3.93E+00
1BDA_1BDD2BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.11E-05	3.93E+00
1BDD1BMT04BOP	ELEC, 6.9kV SWGR 31BDD to Transformer 31BMT04 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.11E-05	3.93E+00
1BMT041BMDBOP	ELEC, Transformer 31BMT04 to 480V Load Center 31BMD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.11E-05	3.93E+00
KAA10AC001SEL	CCWS, Train 1 HTX 10 KAA10AC001, Shell - External Leakage	7.20E-06	2.11E-05	3.93E+00
PED10AN002EFS	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Start on Demand	4.84E-03	1.20E-02	3.46E+00
KAA12AA005EFO	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005, Fails to Open on Demand	3.40E-03	8.25E-03	3.42E+00
31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	1.56E-03	3.39E+00
KBA31AP001EFR	CVCS, HP Motor Driven Charging Pump KBA31AP001, Fails to Run	3.05E-04	7.15E-04	3.35E+00
PEB20AP001EFS	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Start on Demand	4.89E-03	1.15E-02	3.33E+00
JNG10AA104ECF	LHSI, LHSI Pump 10 Throttle Control MOV JNG10AA104, Fails to Control Flow	1.50E-03	3.49E-03	3.33E+00
PEB20AA005EFO	ESWS, Train 2 Pump Discharge Isolation MOV PEB20AA005, Fails to Open on Demand	3.50E-03	8.01E-03	3.28E+00
KBA31AA191SPO	CVCS, Train 1 Charging Pump 31 Safety Valve KBA31AA191, Premature Opening	7.20E-05	1.49E-04	3.07E+00
PED10AN001EFR	UHS, Cooling Tower Train 1 Cooling Fan PED10AN001, Fails to Run	6.97E-04	1.43E-03	3.04E+00
PED10AN002EFR	UHS, Cooling Tower Train 1 Cooling Fan PED10AN002, Fails to Run	6.97E-04	1.42E-03	3.04E+00
JNG10AP001EFS	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Start on Demand	3.94E-04	7.45E-04	2.89E+00
JNG10AP001PANS	LHSI, Train 1 Pump JNG10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	6.22E-04	2.86E+00
KAA12AA005PANS	CCWS, CCWS1 to LHSI HTX 10 KAA12AA005, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	6.22E-04	2.86E+00
31BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB02 Control Power, Fails to Run	1.53E-04	2.83E-04	2.85E+00
JNG10AP001EFR	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Run	2.40E-04	4.29E-04	2.79E+00
31BUC_____OFL	ELEC, 250V DC Distribution Panel 31BUC, Fails During Operation	2.40E-05	4.22E-05	2.76E+00
PEB20AA005PBNS	ESWS, Pump 2 Isolation MOV PEB20AA005, PAC B Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	5.83E-04	2.74E+00
PEB20AP001PBNS	ESWS, Train 2 Pump PEB20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	5.83E-04	2.74E+00
LBA30AA002PFC	MSS, Train 3 Main Steam Isolation Valve LBA30AA002, Fails to Close on Demand	1.10E-03	1.89E-03	2.71E+00
KAA12AA011MEC1	CCWS, LHSI HTX 10 Cooling Manual Valve KAA12AA011, Left in Wrong Position	2.00E-04	3.36E-04	2.68E+00
QKC10AA026MEC1	SCWS, LHSI Pump 10 Motor Cooling Manual Valve QKC10AA026, Left in Wrong Position	2.00E-04	3.36E-04	2.68E+00
QKC10AA027MEC1	SCWS, LHSI Pump 10 Sealing Fluid Cooling Manual Valve QKC10AA027, Left in Wrong Position	2.00E-04	3.36E-04	2.68E+00
JEB30AP001BFO	ELEC, 13.8kV SWGR 33BBC Circuit Breaker for RCP JEB30AP001, Fails to Open on Demand	4.67E-04	7.70E-04	2.65E+00
JEB40AP001BFO	ELEC, 13.8kV SWGR 34BBC Circuit Breaker for RCP JEB40AP001, Fails to Open on Demand	4.67E-04	7.70E-04	2.65E+00
LBA30AA002POP	MSS, Train 3 Main Steam Isolation Valve LBA30AA002, Fails to Remain Closed (SO)	7.92E-05	1.28E-04	2.62E+00

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
KAA10AA004CCL	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004, Fails to Remain Open	4.80E-06	7.61E-06	2.59E+00
PEB10AA004CCL	ESWS, Train 1 Pump Discharge Check Valve PEB10AA004, Fails to Remain Open	4.80E-06	7.61E-06	2.59E+00
30BDT01___TFL	ELEC, Aux Transformer 30BDT01, Fails During Operation	2.40E-05	3.80E-05	2.58E+00
KAA20AP001EFS	CCWS, Train 2 Motor Driven Pump KAA20AP001, Fails to Start on Demand	1.32E-03	2.09E-03	2.58E+00
32BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 32BNB02 Control Power, Fails to Run	1.53E-04	2.38E-04	2.56E+00
PEB20AA007MEC1	ESWS, Train 2 Manual Valve PEB20AA007, Left in Wrong Position	2.00E-04	3.08E-04	2.54E+00
PEB20AA009MEC1	ESWS, Train 2 Manual Valve PEB20AA009, Left in Wrong Position	2.00E-04	3.08E-04	2.54E+00
PEB20AA010MEC1	ESWS, Train 2 Manual Valve PEB20AA010, Left in Wrong Position	2.00E-04	3.08E-04	2.54E+00
PED20AN002EFS	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Start on Demand	4.84E-03	7.20E-03	2.48E+00
BDT01_1BDABOP	ELEC, Aux Transformer 30BDT01 to 6.9kV SWGR 31BDA Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.06E-05	2.48E+00
KAA22AA005EFO	CCWS, Train 2 to LHSI HTX 20 Cooling MOV KAA22AA005, Fails to Open on Demand	3.40E-03	4.95E-03	2.45E+00
JNG13AA005CFO	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005, Fails to Open on Demand	8.96E-04	1.27E-03	2.42E+00
LAB31AA001PCL	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA001, Fails to Remain Open (SO)	7.92E-05	1.12E-04	2.41E+00
LAB31AA002PCL	FWS, HP Heater Train 1 Bypass Pneumatic Valve LAB31AA002, Fails to Remain Open (SO)	7.92E-05	1.12E-04	2.41E+00
LAB32AA001PCL	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA001, Fails to Remain Open (SO)	7.92E-05	1.12E-04	2.41E+00
LAB32AA002PCL	FWS, HP Heater Train 2 Bypass Pneumatic Valve LAB32AA002, Fails to Remain Open (SO)	7.92E-05	1.12E-04	2.41E+00
PGB19AA191SPO	CLCWS, Safety Valve PGB19AA191, Premature Opening	7.20E-05	1.02E-04	2.41E+00
JNG10AA006MEC3	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006, Left in Wrong Position	8.00E-03	1.14E-02	2.41E+00
JNG20AA104ECF	LHSI, LHSI Pump 20 Throttle Control MOV JNG20AA104, Fails to Control Flow	1.50E-03	2.09E-03	2.39E+00
PEB20AP001EFR	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Run	1.08E-04	1.49E-04	2.37E+00
PEB30AP001EFS	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Start on Demand	4.89E-03	6.74E-03	2.37E+00
31BTD01___BOP	ELEC, 250V Battery 31BTD01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	9.71E-06	2.35E+00
PEB30AA005EFO	ESWS, Train 3 Pump Discharge Isolation MOV PEB30AA005, Fails to Open on Demand	3.50E-03	4.65E-03	2.32E+00
JEB30AP001PANS	RCP, Train 3 Pump JEB10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.43E-04	2.32E+00
JEB40AP001PANS	RCP, Train 4 Pump JEB40AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.43E-04	2.32E+00
KAA20AP001PBNS	CCWS, Train 2 Pump KAA20AP001,Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	4.26E-04	2.27E+00
PED20AN001EFR	UHS, Cooling Tower Train 2 Cooling Fan PED20AN001, Fails to Run	6.97E-04	8.60E-04	2.23E+00
PED20AN002EFR	UHS, Cooling Tower Train 2 Cooling Fan PED20AN002, Fails to Run	6.97E-04	8.60E-04	2.23E+00
JNG20AP001EFS	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001, Fails to Start on Demand	3.94E-04	4.51E-04	2.14E+00
JNG20AP001PBNS	LHSI, Train 2 Pump JNG20AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	3.78E-04	2.13E+00
KAA22AA005PBNS	CCWS, CCWS2 to LHSI HTX 20 KAA22AA005, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	3.78E-04	2.13E+00
KAA30AP001EFS	CCWS, Train 3 Motor Driven Pump KAA30AP001, Fails to Start on Demand	1.32E-03	1.47E-03	2.11E+00
JNG10AA009CFO	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009, Fails to Open on Demand	4.65E-05	5.12E-05	2.10E+00
JNG10AA011CFO	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA011, Fails to Open on Demand	4.65E-05	5.12E-05	2.10E+00
KAA12AA012CFO	CCWS, Train 1 LHSI HTX Discharge Check Valve KAA12AA012, Fails to Open on Demand	4.76E-05	5.24E-05	2.10E+00
QKC10AA028CFO	SCWS, Train 1 Discharge of LHSI Pump Seal Cooler Check Valve QKC10AA028, Fails to Open on Demand	4.75E-05	5.23E-05	2.10E+00
JNG30AA006MEC3	LHSI, LHSI CL3 Discharge Manual CHECK Valve JNG30AA006, Left in Wrong Position	8.00E-03	8.83E-03	2.09E+00
SAC05AN001EFR	SAC, Maintenance Division Air Supply Fan SAC05AN01, Fails to Run	3.49E-04	3.81E-04	2.09E+00
SAC35AN001EFR	SAC, Maintenance Division Air Exhaust Fan SAC35AN01, Fails to Run	3.49E-04	3.81E-04	2.09E+00

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Fire Basic Events ID	Description	Nom.val.	FV	RAW
KAA20AA005MEC1	CCWS, Discharge from CCW HTX 20 Manual Valve KAA20AA005, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA007MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA007, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA008MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA008, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA011MEC1	CCWS, Pump 20 Suction from CCST Manual Valve KAA20AA011, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA015MEC1	CCWS, Pump 20 Suction Manual Valve KAA20AA015, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA018MEC1	CCWS, Pump 20 Discharge Manual Valve KAA20AA018, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
KAA20AA140MEC1	CCWS, Pump 20 Cooling Manual Valve KAA20AA140, Left in Wrong Position	2.00E-04	2.15E-04	2.07E+00
PEB20AA004CFO	ESWS, Train 2 Pump Discharge Check Valve, PEB20AA004, Fails to Open on Demand	4.76E-05	5.10E-05	2.07E+00
PED30AN002EFS	UHS, Cooling Tower Train 3 Cooling Fan PED30AN002, Fails to Start on Demand	4.84E-03	5.16E-03	2.06E+00
JNG20AP001EFR	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001, Fails to Run	2.40E-04	2.54E-04	2.06E+00
KAA32AA005EFO	CCWS, Train 3 to LHSI HTX 30 Cooling MOV KAA32AA005, Fails to Open on Demand	3.40E-03	3.54E-03	2.04E+00

All Basic Events with RAW >= 2E+00

t19.1-69b

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

t19.1-70b

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

t19.1-71b

System	ID	Description	Nominal Value	RAW
HVAC	SAC31AN001EFR_D-ALL	CCF to Run Normal Air Exhaust Fans	1.3E-06	691.3
HVAC	SAC01AN001EFR_D-ALL	CCF to Run Normal Air Supply Fans	1.3E-06	691.3
SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6.4E-07	688.3
SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves	4.5E-06	502.5
CCWS	KAA12AA005EFO_D-ALL	CCF to Open CCWS to LHSI HTX Cooling MOV	2.2E-05	403.0
ESWS	PED10AN002EFS_D-ALL	CCF to Start Standby Cooling Tower Fans	1.9E-05	402.9
ESWS	PED10AN002EFR_D-ALL	CCF to Run Standby Cooling Tower Fans	2.7E-06	397.2
ESWS	PED10AN001EFR_D-ALL	CCF to Run Normally Running Cooling Tower Fans	2.7E-06	397.2
SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start	1.8E-06	396.4
SIS/RHRS	JNG10AP001EFR_D-ALL	CCF of LHSI Pumps to Run	5.6E-07	384.3
CCWS	KAA12AA012CFO_D-ALL	CCF to Open CCWS from LHSI HTX Discharge Check Valve	4.5E-07	384.3
SIS/RHRS	JNG10AA011CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	375.4
SIS/RHRS	JNG10AA009CFO_D-ALL	CCF to Open LHSI Discharge Check Valves	2.3E-07	375.4
SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	375.4
IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-07	371.8
MSS	LBA13AA001PFO_D-ALL	CCF to Open Main Steam Relief Isolation Valves	3.7E-05	343.4
MSS	MSRIVSCPFO_P-ALL	CCF to Open Main Steam Relief Isolation Pneumatic Pilot Valves	1.3E-05	342.7
MSS	MSRIVSOOFO_P-ALL	CCF to Open Main Steam Relief Isolation Solenoid Pilot Valves	4.2E-06	339.3
EFWS	LAS11AP001EFS_D-ALL	CCF of EFWS Pumps to Start	1.1E-05	240.7
EFWS	LAS11AP001EFR_D-ALL	CCF of EFWS Pumps to Run	9.6E-06	240.7
SCWS	QKA10GH001_FR_B-ALL	CCF of the Air Cooled SCWS Chiller Units to Run	2.2E-05	236.4
ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	2.9E-07	168.9
SIS/RHRS	JNA10AA001EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	153.7
SIS/RHRS	JNA10AA002EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS Angled MOVs	1.1E-05	153.7
SIS/RHRS	JNA10AA003EFO_D-ALL	CCF to Open LHSI Pump Suction from RCS MOVs	1.1E-05	153.7
SIS/RHRS	JNG10AA004EFC_D-ALL	CCF to Close LHSI to Tangential Miniflow MOTOR Operated Check Valves	1.1E-05	153.7
MSS	LBA10AA002PFC_D-ALL	CCF to Close Main Steam Isolation Valves	1.2E-05	72.8
SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run	3.8E-05	48.7
ESWS	PEB10AA004CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	4.5E-07	48.5

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System	ID	Description	Nominal Value	RAW
ELEC	XKA10_____DFR_D-ALL	CCF of EDGs to Run	1.0E-04	47.8
SIS/RHRS	JND10AP001EFS_D-ALL	CCF of MHSI Pumps to Start	4.6E-06	45.1
SIS/RHRS	JND10AA003CFO_D-ALL	CCF to Open MHSI Pump Discharge Motor Operated CHECK Valves	7.3E-07	44.5
SIS/RHRS	JND10AA007CFO_D-ALL	CCF to Open MHSI Discharge CVs (CIVs)	7.3E-07	44.5
ESWS	PEB10AP001EFR_B-ALL	CCF of ESWS Pumps 1 and 4 to Run (Normally Running)	2.2E-06	43.2
SCWS	QKA20GH001_FR_B-ALL	CCF of the CCWS Cooled SCWS Chiller Units to Run	2.2E-05	43.1
ELEC	XKA10_____DFS_D-ALL	CCF of EDGs to Start	7.0E-06	42.1
CCWS	KAA10AP001EFR_B-ALL	CCF of CCWS Pumps 1 and 4 to Run (Normally Running)	1.1E-06	40.7
ELEC	XKA10_1BDABFO_D-ALL	CCF to Close EDG Supply Breakers	1.4E-06	38.2
ELEC	BDT02_BDA-BFO_D-ALL	CCF to Open Backup Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	38.2
ELEC	BDT01_BDA_BFO_D-ALL	CCF to Open Normal Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	38.2
ESWS	PEB20AP001EFS_B-ALL	CCF of ESWS Pumps 2 and 3 to Start (Standby)	9.9E-05	29.2
HVAC	SAC61AH001EFS_D-ALL	CCF to Start EFW Pump Room Ventilation Fans	3.3E-07	28.4
CCWS	KAA20AP001EFS_B-ALL	CCF of CCWS Pumps 2 and 3 to Start (Standby)	6.7E-05	26.9
ESWS	PEB20AP001EFR_B-ALL	CCF of ESWS Pumps 2 and 3 to Run (Standby)	2.2E-06	21.0
CCWS	KAA22AA014CFO_B-ALL	CCF to Open CCWS Discharge of LHSI Pump Seal Cooler Check Valves	2.5E-06	20.6

t19.1-72b

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

t19.1-73b

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
MSIV TR3 ISO-FIRE	MSIV 3 Fails to Isolate Due to Fire in MS/FW Valve Room	1.0E-01	0.177	2.6
MSIV TR4 ISO-FIRE	MSIV 4 Fails to Isolate Due to Fire in MS/FW Valve Room	5.0E-01	0.185	1.2
CVCS VCT	CVCS Switchover to IRWST May Not Be Required	1.0E-01	0.328	4.0
PROB SEAL LOCA	Probability of Seal LOCA Occurring Given a Loss of Seal Cooling	2.0E-01	0.434	2.7
Preventive Maintenance				
CCWS/ESWS PM2	CCWS/ESWS Train 2 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.041	1.6
CCWS/ESWS PM3	CCWS/ESWS Train 3 Pump Unavailable due to Preventive Maintenance	6.0E-02	0.019	1.3
EDG PM1	EDG Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.008	1.2
EDG PM2	EDG Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.020	1.5
LHSI PM1	LHSI Train 1 Unavailable due to Preventive Maintenance	4.0E-02	0.012	1.3
LHSI PM2	LHSI Train 2 Unavailable due to Preventive Maintenance	4.0E-02	0.006	1.1
LHSI PM3	LHSI Train 3 Unavailable due to Preventive Maintenance	4.0E-02	0.009	1.2
SAC01/QKA10 PM1	Normal SAC01/QKA10 Train Unavailable due to Preventive Maintenance	3.0E-02	0.113	4.7
SAC02/QKA20 PM2	Normal SAC02/QKA20 Train Unavailable due to Preventive Maintenance	3.0E-02	0.021	1.7
SAC03/QKA30 PM3	Normal SAC03/QKA30 Train Unavailable due to Preventive Maintenance	3.0E-02	0.020	1.6
SAC04/QKA40 PM4	Normal SAC04/QKA40 Train Unavailable due to Preventive Maintenance	3.0E-02	0.033	2.1
Offsite Power Related Events				
LOOP24+REC	Loss Of Offsite Power During Mission Time and Failure of Recovery Within 1 Hour	4.8E-05	0.014	297.5
LOOPCON+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for IEs Leading to Auto Scram	1.8E-03	0.013	8.2
LOOPFCSD+REC	Consequential LOOP and Failure of Recovery Within 1 Hour for Fire IEs Leading to a Controlled Shutdn	3.6E-04	0.113	314.8

t19.1-93b

System	Component ID	Description	FV	RAW
ELEC	30XKA20	ELEC, Emergency Diesel Generator XKA20	0.291	1.8
ELEC	30XKA30	ELEC, Emergency Diesel Generator XKA30	0.289	1.8
ELEC	30XKA40	ELEC, Emergency Diesel Generator XKA40	0.288	1.8
ELEC	30XKA10	ELEC, Emergency Diesel Generator XKA10	0.264	1.5
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	0.244	3.2
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	0.243	2.7
SIS/RHRS	30JNG43AA005	LHSI, CL4 First SIS Isolation Check Valve JNG43AA005	0.243	1.8
CVCS	30KBA14AA004	CVCS, Low Pressure Reducing Station Isolation MOV KBA14AA004	0.239	
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	0.236	4.6
ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	0.226	4.6
CVCS	30KBA14AA106	CVCS, CVCS Low Power Reducing Station MOV KBA14AA106	0.170	
SIS/RHRS	30JNA20AA191	RHR, LHSI Train 2 Safety Valve JNA20AA191	0.042	
SIS/RHRS	30JNA10AA191	RHR, LHSI Train 1 Safety Valve JNA10AA191	0.042	
SIS/RHRS	30JNG10AA192	LHSI, LHSI/RHR Train 10 Overpressure Protection Safety Valve JNG10AA192	0.042	
SIS/RHRS	30JNG20AA192	LHSI, LHSI/RHR Train 20 Overpressure Protection Safety Valve JNG20AA192	0.042	
SIS/RHRS	30JND10AP001	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001	0.041	1.6
ELEC	30XKA80	ELEC, SBO Diesel Generator XKA80	0.034	1.4
SIS/RHRS	30JND20AP001	MHSI, MHSI Train 2 Motor Driven Pump JND20AP001	0.034	1.1
SIS/RHRS	30JND30AP001	MHSI, MHSI Train 3 Motor Driven Pump JND30AP001	0.034	1.0
SIS/RHRS	30JND40AP001	MHSI, MHSI Train 4 Motor Driven Pump JND40AP001	0.033	1.0
IRWST	30JNK11AT001	IRWST, SIS Sump Strainer to MHSI/LHSI Train 4 Pumps JNK11AT001	0.029	1.2
IRWST	30JNK11AT002	IRWST, SIS Sump Strainer to MHSI/LHSI Train 3 Pumps JNK11AT002	0.029	1.1
IRWST	30JNK10AT002	IRWST, SIS Sump Strainer to MHSI/LHSI Train 2 Pumps JNK10AT002	0.029	1.1
IRWST	30JNK10AT001	IRWST, SIS Sump Strainer to MHSI/LHSI Train 1 Pumps JNK10AT001	0.028	1.3
IRWST	30JNK11AT003	IRWST, SAHR Sump Strainer JNK11AT003	0.028	2.3
SIS/RHRS	30JNG30AA192	LHSI, LHSI/RHR Train 30 Overpressure Protection Safety Valve JNG30AA192	0.020	
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	0.019	4.4
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	0.018	10.2

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System	Component ID	Description	FV	RAW
SIS/RHRS	30JNA30AA191	RHR, LHSI Train 3 Safety Valve JNA30AA191	0.017	
CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	0.012	3.7
ELEC	34BTD01_BAT	ELEC, 250V 1E 2-hr Battery 34BTD01	0.012	2.5
ELEC	33BTD01_BAT	ELEC, 250V 1E 2-hr Battery 33BTD01	0.012	1.7
ELEC	32BTD01_BAT	ELEC, 250V 1E 2-hr Battery 32BTD01	0.011	1.5
SIS/RHRS	30JNG10AA001	LHSI, LHSI Pump 10 Suction from IRWST MOV JNG10AA001	0.011	
SAHRS	30JMQ40AA001	SAHR, Suction Line Containment Isolation MOV JMQ40AA001	0.011	3.8
SAHRS	30JMQ42AA001	SAHR, Train Recirculation Line MOV JMQ42AA001	0.011	3.8
IRWST	30JNK11AA009	IRWST, SAHR Sump Containment Isolation MOV JNK11AA009	0.011	3.8
EFWS	30LAS11AP001	EFWS, Train 1 Motor Driven Pump LAS11AP001	0.011	1.7
SIS/RHRS	30JNG20AA001	LHSI, LHSI Pump 20 Suction from IRWST MOV JNG20AA001	0.010	
HVAC	30SAC01AN001	SAC, Normal Air Supply Fan SAC01AN001	0.010	1.6
HVAC	30SAC31AN001	SAC, Normal Air Exhaust Fan SAC31AN001	0.010	1.6
CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	0.010	2.5
HVAC	30SAC03AN001	SAC, Normal Air Supply Fan SAC03AN001	0.010	1.1
HVAC	30SAC33AN001	SAC, Normal Air Exhaust Fan SAC33AN001	0.010	1.1
HVAC	30SAC02AN001	SAC, Normal Air Supply Fan SAC02AN001	0.010	1.0
HVAC	30SAC32AN001	SAC, Normal Air Exhaust Fan SAC32AN001	0.010	1.0
CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	0.009	2.2
SIS/RHRS	30JND10AA003	MHSI, MHSI Pump 10 Discharge Manual CHECK Valve JND10AA003	0.009	
CCWS	30KAA40AP001	CCWS, Train 40 Motor Driven Pump KAA40AP001	0.009	1.9
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	0.009	4.2
SIS/RHRS	30JND20AA003	MHSI, MHSI Pump 20 Discharge Manual CHECK Valve JND20AA003	0.008	
SIS/RHRS	30JNG10AP001	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001	0.008	3.7
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	0.007	2.3
HVAC	30SAC04AN001	SAC, Normal Air Supply Fan SAC04AN001	0.007	1.3
HVAC	30SAC34AN001	SAC, Normal Air Exhaust Fan SAC34AN001	0.007	1.3
SIS/RHRS	30JNG30AP001	LHSI, LHSI Train 3 Motor Driven Pump JNG30AP001	0.007	2.3

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System	Component ID	Description	FV	RAW
SIS/RHRS	30JNG20AA003	LHSI, LHSI Train 2 to Radial Miniflow MOTOR OPERATED Check Valve JNG20AA003	0.007	
SIS/RHRS	30JNG10AA004	LHSI, LHSI Train 1 to Tangential Miniflow MOTOR OPERATED CV JNG10AA004	0.007	
SIS/RHRS	30JNG40AP001	LHSI, LHSI Train 4 Motor Driven Pump JNG40AP001	0.007	2.0
SIS/RHRS	30JNG20AP001	LHSI, LHSI Train 2 Motor Driven Pump JNG20AP001	0.007	1.8
SCWS	30QKA30AP107	SCWS, Train 3 Motor Driven Safety Chiller Pump QKA30AP107	0.007	1.1
SCWS	30QKA20AP107	SCWS, Train 2 Motor Driven Safety Chiller Pump QKA20AP107	0.007	1.0
SIS/RHRS	30JNG20AA004	LHSI, LHSI Train 2 to Tangential Miniflow MOTOR OPERATED CV JNG20AA004	0.006	
SIS/RHRS	30JNG10AA003	LHSI, LHSI Train 1 to Radial Miniflow MOTOR OPERATED Check Valve JNG10AA003	0.006	
SIS/RHRS	30JNG30AA001	LHSI, LHSI Pump 30 Suction from IRWST MOV JNG30AA001	0.005	
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	0.005	2.2

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Shutdown Basic Events ID	Description	Nom.val.	FV	RAW
XKA50____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run	5.44E-02	2.02E-01	4.51E+00
KBA14AA004EFC	CVCS, Low Pressure Reducing Station Isolation MOV KBA14AA004, Fails to Close on Demand	3.44E-03	9.96E-02	2.99E+01
JNA20AA191SPO	RHR, LHSI Train 2 Safety Valve JNA20AA191, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNA10AA191SPO	RHR, LHSI Train 1 Safety Valve JNA10AA191, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNG10AA192SPO	LHSI, LHSI/RHR Train 10 Overpressure Protection Safety Valve JNG10AA192, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNG20AA192SPO	LHSI, LHSI/RHR Train 20 Overpressure Protection Safety Valve JNG20AA192, Premature Opening	7.20E-05	4.25E-02	5.91E+02
KBA14AA106EFC	CVCS, CVCS Low Power Reducing Station MOV KBA14AA106, Fails to Close on Demand	3.44E-03	3.67E-02	1.16E+01
XKA80____DFR	ELEC, SBO Diesel Generator XKA80, Fails to Run	5.44E-02	2.44E-02	1.42E+00
XKA20____DFR	ELEC, Emergency Diesel Generator XKA20, Fails to Run	2.75E-02	2.36E-02	1.83E+00
XKA40____DFR	ELEC, Emergency Diesel Generator XKA40, Fails to Run	2.75E-02	2.34E-02	1.83E+00
XKA30____DFR	ELEC, Emergency Diesel Generator XKA30, Fails to Run	2.75E-02	2.27E-02	1.80E+00
JNG30AA192SPO	LHSI, LHSI/RHR Train 30 Overpressure Protection Safety Valve JNG30AA192, Premature Opening	7.20E-05	2.00E-02	2.78E+02
JNA30AA191SPO	RHR, LHSI Train 3 Safety Valve JNA30AA191, Premature Opening	7.20E-05	1.66E-02	2.31E+02
XKA50____DFS	ELEC, SBO Diesel Generator XKA50, Fails to Start on Demand	4.43E-03	1.61E-02	4.62E+00
XKA10____DFR	ELEC, Emergency Diesel Generator XKA10, Fails to Run	2.75E-02	1.48E-02	1.52E+00
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	1.47E-02	4.01E+00
JMQ40AA001EFO	SAHR, Suction Line Containment Isolation MOV JMQ40AA001, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
JMQ42AA001EFO	SAHR, Active Cooling Line MOV JMQ42AA001, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
JNK11AA009EFO	IRWST, SAHR Sump Containment Isolation MOV JNK11AA009, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
KBA14AA004PANS	CVCS, LP Reducing Iso MOV KBA14AA004, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	9.69E-03	2.99E+01
LAS11AP001EFR	EFWS, Train 1 Motor Driven Pump LAS11AP001, Fails to Run	1.19E-02	8.85E-03	1.74E+00
JNG10AA001EOP	LHSI, LHSI Pump 10 Suction from IRWST MOV JNG10AA001, Fails to Remain Closed (SO)	8.40E-06	7.92E-03	9.44E+02
JNG20AA001EOP	LHSI, LHSI Pump 20 Suction from IRWST MOV JNG20AA001, Fails to Remain Closed (SO)	8.40E-06	7.92E-03	9.44E+02
JND20AA003CIR	MHSI, MHSI Pump 20 Discharge Manual CHECK Valve JND20AA003, Internal Rupture	1.20E-05	7.92E-03	6.61E+02
JND10AA003CIR	MHSI, MHSI Pump 10 Discharge Manual CHECK Valve JND10AA003, Internal Rupture	1.20E-05	6.93E-03	5.79E+02
JND10AP001EFR	MHSI, MHSI Train 1 Motor Driven Pump JND10AP001, Fails to Run	1.19E-02	6.87E-03	1.57E+00
31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	5.96E-03	1.02E+01
JNG20AA003EOP	LHSI, LHSI Trn 2 to Radial Miniflow Motor Operated Check Vlv JNG20AA003, Fails to Remain Closed (SO)	8.40E-06	5.53E-03	6.60E+02
QKA40GH001_FS	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Start on Demand	4.85E-03	5.12E-03	2.05E+00

All Basic Events with FV >= 5E-03

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System	Component ID	Description	RAW	FV
ELEC	34BMB	ELEC, 480V Load Center 34BMB	50.6	0.001
ELEC	34BDB	ELEC, 6.9kV SWGR 34BDB	50.6	0.001
ELEC	34BDC	ELEC, 6.9kV SWGR 34BDC	50.6	0.001
ELEC	34BMT02	ELEC, 6.9kV-480V Transformer 34BMT02	50.6	0.001
ELEC	34BDB4BMT02	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT02 Circuit Breaker	47.4	0.000
ELEC	34BDC_4BDB1	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	47.4	0.000
ELEC	34BDC_4BDB2	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker	47.4	0.000
ELEC	34BMT024BMB	ELEC, Transformer 34BMT02 to 480V Load Center 34BMB Circuit Breaker	47.4	0.000
ELEC	34BNB02	ELEC, 480V MCC 34BNB02	42.8	0.001
ELEC	34BNT01	ELEC, Constant Voltage Transformer 34BNT01	42.8	0.001
ELEC	34BMB4BNT01	ELEC, 480V Load Center 34BMB to Transformer 34BNT01 Circuit Breaker	41.6	0.000
ELEC	34BNT014BNB02	ELEC, Transformer 34BNT01 to 480V MCC 34BNB02 Circuit Breaker	41.6	0.000
ELEC	34BDA	ELEC, 6.9kV SWGR 34BDA	14.8	0.000
ELEC	31BDB	ELEC, 6.9kV SWGR 31BDB	13.7	0.000
ELEC	31BDC	ELEC, 6.9kV SWGR 31BDC	13.7	0.000
ELEC	31BMB	ELEC, 480V Load Center 31BMB	13.7	0.000
ELEC	31BMT02	ELEC, 6.9kV-480V Transformer 31BMT02	13.7	0.000
ELEC	34BDD	ELEC, 6.9kV SWGR 34BDD	11.6	0.000
ELEC	34BMD	ELEC, 480V Load Center 34BMD	11.6	0.000
ELEC	34BMT04	ELEC, 6.9kV-480V Transformer 34BMT04	11.6	0.000
ELEC	31BDB1BMT02	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker	11.2	0.000
ELEC	31BDC_1BDB1	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	11.2	0.000
ELEC	31BDC_1BDB2	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker	11.2	0.000
ELEC	31BMT021BMB	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker	11.2	0.000
ELEC	31BTD01_BAT	ELEC, 250V 1E 2-hr Battery 31BTD01	10.2	0.018

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System	Component ID	Description	RAW	FV
ELEC	34BUC	ELEC, 250V DC Bus 34BUC	10.0	0.000
ELEC	31BUC	ELEC, 250V DC Bus 31BUC	9.0	0.000
ELEC	34BDA_4BDD1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker	8.8	0.000
ELEC	34BDA_4BDD2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker	8.8	0.000
ELEC	34BDD4BMT04	ELEC, 6.9kV SWGR 34BDD to Transformer 34BMT04 Circuit Breaker	8.8	0.000
ELEC	34BMT044BMD	ELEC, Transformer 34BMT04 to 480V Load Center 34BMD Circuit Breaker	8.8	0.000
ELEC	31BNB02	ELEC, 480V MCC 31BNB02	7.7	0.000
ELEC	31BNT01	ELEC, Constant Voltage Transformer 31BNT01	7.7	0.000
ELEC	31BTD01	ELEC, 250V Battery 31BTD01 Circuit Breaker	7.6	0.000
ELEC	31BMB1BNT01	ELEC, 480V Load Center 31BMB to Transformer 31BNT01 Circuit Breaker	6.6	0.000
ELEC	31BNT011BNB02	ELEC, Transformer 31BNT01 to 480V MCC 31BNB02 Circuit Breaker	6.6	0.000
ELEC	31BUD	ELEC, Non 1E 250V DC Distribution Panel 31BUD	5.7	0.000
ELEC	34BDA_4BDC1	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	5.0	0.000
ELEC	34BDA_4BDC2	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker	5.0	0.000
SIS/RHRS	30JNG13AA005	LHSI, CL1 First SIS Isolation Check Valve JNG13AA005	4.6	0.236
ELEC	30XKA50	ELEC, SBO Diesel Generator XKA50	4.6	0.226
ELEC	31BTB01_BAT	ELEC, 250V Non 1E 12-hr Battery 31BTB01	4.6	0.002
ELEC	30XKA50_1BBH	ELEC, SBO DG XKA50 to 6.9kV SWGR 31BBH Circuit Breaker	4.5	0.002
ELEC	31BBH_1BDC1	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker	4.5	0.002
ELEC	31BBH_1BDC2	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker	4.5	0.002
ELEC	31BBT081BBH	ELEC, Transformer 31BBT08 to 6.9kV SWGR 31BBH Circuit Breaker	4.5	0.002
ELEC	31BDA_1BDC2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker	4.5	0.002
SCWS	30QKA10GH001	SCWS, Train 1 Chiller Unit QKA10GH001	4.4	0.019
SCWS	30QKA10AP107	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107	4.2	0.009
ELEC	31BBH	ELEC, 6.9kV SWGR 31BBH	4.2	0.000

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System	Component ID	Description	RAW	FV
ELEC	31BRV31BUV	ELEC, 24V DC I&C Power Rack 31BRV/31BUV	4.2	0.000
ELEC	31BTB01	ELEC, 250V Battery 31BTB01 Circuit Breaker	3.9	0.000
SAHRS	30JMQ40AA001	SAHR, Suction Line Containment Isolation MOV JMQ40AA001	3.8	0.011
SAHRS	30JMQ42AA001	SAHR, Train Recirculation Line MOV JMQ42AA001	3.8	0.011
IRWST	30JNK11AA009	IRWST, SAHR Sump Containment Isolation MOV JNK11AA009	3.8	0.011
SIS/RHRS	30JNG10AC001	LHSI, LHSI Train 1 HTX JNG10AC001	3.7	0.000
ELEC	34BNB03	ELEC, 480V MCC 34BNB03	3.7	0.000
CCWS	30KAA10AP001	CCWS, Train 1 Motor Driven Pump KAA10AP001	3.7	0.012
SIS/RHRS	30JNG10AP001	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001	3.7	0.008
ELEC	31BNB01	ELEC, 480V MCC 31BNB01	3.6	0.000
CCWS	30KAA80AP001	CCWS, SA-CCW Motor Driven Pump KAA80AP001	3.6	0.002
SAHRS	30JMQ40AP001	SAHR, Motor Driven Pump JMQ40AP001	3.6	0.002
ELEC	31BDD	ELEC, 6.9kV SWGR 31BDD	3.4	0.000
ELEC	31BMD	ELEC, 480V Load Center 31BMD	3.4	0.000
ELEC	31BMT04	ELEC, 6.9kV-480V Transformer 31BMT04	3.4	0.000
SAHRS	30JMQ40AA002	SAHR, Suction Manual Valve JMQ40AA002	3.3	0.000
SAHRS	30JMQ40AA003	SAHR, Discharge Manual Valve JMQ40AA003	3.3	0.000
SAHRS	30JMQ40AA004	SAHR, HTX Discharge Manual Valve JMQ40AA004	3.3	0.000
CCWS	30KAA80AA001	CCWS, SA-CCW Pump Suction Manual Valve KAA80AA001	3.3	0.000
CCWS	30KAA80AA002	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA002	3.3	0.000
CCWS	30KAA80AA003	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA003	3.3	0.000
CCWS	30KAA80AA004	CCWS, SA-CCW Pump Discharge Manual Valve KAA80AA004	3.3	0.000
CCWS	30KAA80AA005	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA005	3.3	0.000
CCWS	30KAA82AA001	CCWS, SA-CCW to SAHR Pump Coolers Manual Valve KAA82AA001	3.3	0.000
CCWS	30KAA82AA002	CCWS, SA-CCW from SAHR Pump Seal Water Cooler Manual Valve KAA82AA002	3.3	0.000

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System	Component ID	Description	RAW	FV
CCWS	30KAA82AA003	CCWS, SA-CCW from SAHR Pump Motor Air Cooler Manual Valve KAA82AA003	3.3	0.000
CCWS	30KAA82AA004	CCWS, SA-CCW to SAGR Pump Bearing Cooler Manual Valve KAA82AA004	3.3	0.000
SCWS	30QKA10AA003	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003	3.3	0.000
ESWS	30PEB80AP001	ESWS, SA-ESWS Motor Driven Pump PEB80AP001	3.3	0.002
SIS/RHRS	30JNG10AA006	LHSI, LHSI CL1 Discharge Manual CHECK Valve JNG10AA006	3.3	0.000
SIS/RHRS	30JNG10AA009	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009	3.3	0.000
ELEC	31BNB03	ELEC, 480V MCC 31BNB03	3.3	0.000
SIS/RHRS	30JNG33AA005	LHSI, CL3 First SIS Isolation Check Valve JNG33AA005	3.2	0.244
CCWS	30KAA10AA004	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004	3.1	0.000
CCWS	30KAA12AA012	CCWS, Train 1 LHSI HTX Discharge Check Valve KAA12AA012	3.1	0.000
ELEC	30BRW10BUW11	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11	3.1	0.000
ESWS	30PEB80AA002	ESWS, SA-ESWS Pump Discharge Manual CHECK Valve PEB80AA002	3.1	0.001
ESWS	30PEB80AA003	ESWS, SA-CCWS HTX Suction Manual Valve PEB80AA003	3.1	0.000
ESWS	30PEB80AA004	ESWS, SA-CCWS HTX Discharge Manual Valve PEB80AA004	3.1	0.000
ESWS	30PEB80AA008	ESWS, SA-CCWS HTX Discharge Manual Valve PEB80AA008	3.1	0.000
CCWS	30KAA80AA191	CCWS, SA-CCW Surge Tank to Pump Suction Line Safety Valve KAA80AA191	3.1	0.000
SAHRS	30JMQ42AA002	SAHR, Recirculation Line Check Valve JMQ42AA002	3.0	0.000
CCWS	30KAA10BB001	CCWS, Train 1 Surge Tank KAA10BB001	3.0	0.000
ESWS	30PEB80AT001	ESWS, SA-ESWS Debris Filter PEB80AT001	3.0	0.000
SCWS	30QKA10AA101	SCWS, Train 1 Chiller By-pass MOV QKA10AA101	2.9	0.000
ELEC	32BUD	ELEC, Non 1E 250V DC Distribution Panel 32BUD	2.7	0.000
SIS/RHRS	30JNG23AA005	LHSI, CL2 First SIS Isolation Check Valve JNG23AA005	2.7	0.243
ELEC	30BRX10BUX11	ELEC, 24V DC I&C Power Rack 31BRX10/31BUX11	2.6	0.000
ELEC	30BRX70BUX71	ELEC, 24V DC I&C Power Rack 34BRX70/34BUX71	2.6	0.000
SAHRS	30JMQ40AC001	SAHR, HTX JMQ40AC001	2.6	0.000

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System	Component ID	Description	RAW	FV
CCWS	30KAA80AC001	CCWS, SA-CCW Heat Exchanger KAA80AC001	2.6	0.000
ELEC	34BMC	ELEC, 480V Load Center 34BMC	2.6	0.000
ELEC	34BMT03	ELEC, 6.9kV-480V Transformer 34BMT03	2.6	0.000
CCWS	30KAA10AA112	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112	2.6	0.000
SIS/RHRS	30JNA10AA101	RHR, LHSI Train 1 HTX Bypass MOV JNA10AA101	2.6	0.000
SIS/RHRS	30JNG10AA060	LHSI, LHSI Pump 10 Discharge MOV JNG10AA060	2.6	0.000
SIS/RHRS	30JNG10AA102	LHSI, LHSI Pump 10 Flow Control MOV JNG10AA102	2.6	0.000
ELEC	31BMB1BNB01	ELEC, 480V Load Center 31BMB to 480V MCC 31BNB01 Circuit Breaker	2.6	0.000
CCWS	30KAA30AP001	CCWS, Train 3 Motor Driven Pump KAA30AP001	2.5	0.010
CCWS	30KAA10AC001	CCWS, Train 1 HTX 10 KAA10AC001	2.5	0.000
ELEC	31BDA_1BDD1	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	2.5	0.000
ELEC	31BDA_1BDD2	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker	2.5	0.000
ELEC	31BDD1BMT04	ELEC, 6.9kV SWGR 31BDD to Transformer 31BMT04 Circuit Breaker	2.5	0.000
ELEC	31BMT041BMD	ELEC, Transformer 31BMT04 to 480V Load Center 31BMD Circuit Breaker	2.5	0.000
ELEC	34BTD01_BAT	ELEC, 250V 1E 2-hr Battery 34BTD01	2.5	0.012
CCWS	30KAA12AA005	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005	2.5	0.000
CCWS	30KAA80BB001	CCWS, SA-CCW Surge Tank to Pump Suction KAA80BB001	2.4	0.000
SIS/RHRS	30JNG30AP001	LHSI, LHSI Train 3 Motor Driven Pump JNG30AP001	2.3	0.007
SCWS	30QKA40GH001	SCWS, Train 4 Chiller Unit QKA40GH001	2.3	0.007
ESWS	30PEB40AA004	ESWS, Train 4 Pump Discharge Check Valve PEB40AA004	2.3	0.001
IRWST	30JNK11AT003	IRWST, SAHR Sump Strainer JNK11AT003	2.3	0.028
CCWS	30KAA80AA020	CCWS, SA-CCW Surge Tank to Pump Suction Line MOV KAA80AA020	2.3	0.000
CCWS	30KAA20AP001	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	2.2	0.009
SIS/RHRS	30JNG40AC001	LHSI, LHSI Train 4 HTX JNG40AC001	2.2	0.000
ELEC	34BNB024BNB031	ELEC, 480V MCC 34BNB02 to 480V MCC 34BNB03 Circuit Break	2.2	0.000

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System	Component ID	Description	RAW	FV
ELEC	34BNB024BNB032	ELEC, 480V MCC 34BNB02 to 480V MCC 34BNB03 Circuit Break	2.2	0.000
ELEC	31BNB021BNB031	ELEC, 480V MCC 31BNB02 to 480V MCC 31BNB03 Circuit Break	2.2	0.000
ELEC	31BNB021BNB032	ELEC, 480V MCC 31BNB02 to 480V MCC 31BNB03 Circuit Break	2.2	0.000
ELEC	34BDC4BMT03	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT03 Circuit Breaker	2.2	0.000
ELEC	34BMT034BMC	ELEC, Transformer 34BMT03 to 480V Load Center 34BMC Circuit Breaker	2.2	0.000
SCWS	30QKA40AP107	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107	2.2	0.005
SIS/RHRS	30JNG30AC001	LHSI, LHSI Train 3 HTX JNG30AC001	2.1	0.000
ELEC	33BDD	ELEC, 6.9kV SWGR 33BDD	2.1	0.000

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Shutdown Basic Events ID	Description	Nom.val.	FV	RAW
1BBH_1BDC1BFC	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Close on Demand	4.92E-04	1.72E-03	4.50E+00
1BBH_1BDC1BOP	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.10E-05	3.92E+00
1BBH_1BDC2BFC	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Close on Demand	4.92E-04	1.72E-03	4.50E+00
1BBH_1BDC2BOP	ELEC, 6.9kV SWGR 31BBH to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.10E-05	3.92E+00
1BBT081BBHBCL	ELEC, Transformer 31BBT08 to 6.9kV SWGR 31BBH Circuit Breaker, Fails to Remain Open (SO)	7.20E-06	2.10E-05	3.92E+00
1BBT081BBHBFO	ELEC, Transformer 31BBT08 to 6.9kV SWGR 31BBH Circuit Breaker, Fails to Open on Demand	4.82E-04	1.69E-03	4.50E+00
1BDA_1BDC2BCL	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Remain Open (SO)	7.20E-06	2.10E-05	3.92E+00
1BDA_1BDC2BFO	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDC Circuit Breaker, Fails to Open on Demand	4.82E-04	1.69E-03	4.50E+00
1BDA_1BDD1BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.11E-05	2.54E+00
1BDA_1BDD2BOP	ELEC, 6.9kV SWGR 31BDA to 6.9kV SWGR 31BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.11E-05	2.54E+00
1BDB1BMT02BOP	ELEC, 6.9kV SWGR 31BDB to Transformer 31BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.32E-05	1.12E+01
1BDC_1BDB1BOP	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.32E-05	1.12E+01
1BDC_1BDB2BOP	ELEC, 6.9kV SWGR 31BDC to 6.9kV SWGR 31BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.32E-05	1.12E+01
1BDD1BMT04BOP	ELEC, 6.9kV SWGR 31BDD to Transformer 31BMT04 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.11E-05	2.54E+00
1BMB1BNB01BOP	ELEC, 480V Load Center 31BMB to 480V MCC 31BNB01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.16E-05	2.62E+00
1BMB1BNT01BOP	ELEC, 480V Load Center 31BMB to Transformer 31BNT01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	4.04E-05	6.62E+00
1BMT021BMBBOP	ELEC, Transformer 31BMT02 to 480V Load Center 31BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	7.32E-05	1.12E+01
1BMT041BMDBOP	ELEC, Transformer 31BMT04 to 480V Load Center 31BMD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	1.11E-05	2.54E+00
1BNB021BNB031BOP	ELEC, 480V MCC 31BNB02 to 480V MCC 31BNB03 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.71E-06	2.21E+00
1BNB021BNB032BOP	ELEC, 480V MCC 31BNB02 to 480V MCC 31BNB03 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.71E-06	2.21E+00
1BNT011BNB02BOP	ELEC, Transformer 31BNT01 to 480V MCC 31BNB02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	4.04E-05	6.62E+00
31BBH____OFL	ELEC, 6.9kV SWGR 31BBH, Fails During Operation	2.40E-05	7.64E-05	4.18E+00
31BDB____OFL	ELEC, 6.9kV SWGR 31BDB, Fails During Operation	2.40E-05	3.05E-04	1.37E+01
31BDC____OFL	ELEC, 6.9kV SWGR 31BDC, Fails During Operation	2.40E-05	3.05E-04	1.37E+01
31BDD____OFL	ELEC, 6.9kV SWGR 31BDD, Fails During Operation	2.40E-05	5.64E-05	3.35E+00
31BMB____OFL	ELEC, 480V Load Center 31BMB, Fails During Operation	2.40E-05	3.05E-04	1.37E+01
31BMD____OFL	ELEC, 480V Load Center 31BMD, Fails During Operation	2.40E-05	5.64E-05	3.35E+00
31BMT02___TFL	ELEC, 6.9kV-480V Transformer 31BMT02, Fails During Operation	2.40E-05	3.05E-04	1.37E+01
31BMT04___TFL	ELEC, 6.9kV-480V Transformer 31BMT04, Fails During Operation	2.40E-05	5.64E-05	3.35E+00
31BNB01___OFL	ELEC, 480V MCC 31BNB01, Fails During Operation	2.40E-05	5.03E-05	3.10E+00
31BNB01___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB01 Control Power, Fails to Run	1.53E-04	3.95E-04	3.58E+00
31BNB02___OFL	ELEC, 480V MCC 31BNB02, Fails During Operation	2.40E-05	1.61E-04	7.70E+00
31BNB02___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB02 Control Power, Fails to Run	1.53E-04	1.66E-04	2.08E+00
31BNB03___OFL	ELEC, 480V MCC 31BNB03, Fails During Operation	2.40E-05	3.96E-05	2.65E+00
31BNB03___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 31BNB03 Control Power, Fails to Run	1.53E-04	3.50E-04	3.28E+00
31BNT01___TFL	ELEC, Constant Voltage Transformer 31BNT01, Fails During Operation	2.40E-05	1.61E-04	7.70E+00
31BRV31BUVOFL	ELEC, 24V DC I&C Power Rack 31BRV/31BUV, Fails During Operation	2.40E-05	7.64E-05	4.18E+00
31BTB01___BOP	ELEC, 250V Battery 31BTB01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.10E-05	3.92E+00
31BTB01_BATST	ELEC, 250V Non 1E 12-hr Battery 31BTB01, Fails on Demand	6.53E-04	2.34E-03	4.58E+00
31BTD01___BOP	ELEC, 250V Battery 31BTD01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	4.74E-05	7.59E+00

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31BTD01_BATST	ELEC, 250V 1E 2-hr Battery 31BTD01, Fails on Demand	6.50E-04	5.96E-03	1.02E+01
31BUC____OFL	ELEC, 250V DC Distribution Panel 31BUC, Fails During Operation	2.40E-05	1.93E-04	9.05E+00
31BUD____OFL	ELEC, Non 1E 250V DC Distribution Panel 31BUD, Fails During Operation	2.40E-05	1.12E-04	5.67E+00
32BUD____OFL	ELEC, Non 1E 250V DC Distribution Panel 32BUD, Fails During Operation	2.40E-05	4.06E-05	2.69E+00
33BDD____OFL	ELEC, 6.9kV SWGR 33BDD, Fails During Operation	2.40E-05	2.52E-05	2.05E+00
34BDA____OFL	ELEC, 6.9kV SWGR 34BDA, Fails During Operation	2.40E-05	3.32E-04	1.48E+01
34BDB____OFL	ELEC, 6.9kV SWGR 34BDB, Fails During Operation	2.40E-05	1.19E-03	5.06E+01
34BDC____OFL	ELEC, 6.9kV SWGR 34BDC, Fails During Operation	2.40E-05	1.19E-03	5.06E+01
34BDD____OFL	ELEC, 6.9kV SWGR 34BDD, Fails During Operation	2.40E-05	2.53E-04	1.16E+01
34BMB____OFL	ELEC, 480V Load Center 34BMB, Fails During Operation	2.40E-05	1.19E-03	5.06E+01
34BMC____OFL	ELEC, 480V Load Center 34BMC, Fails During Operation	2.40E-05	3.96E-05	2.65E+00
34BMD____OFL	ELEC, 480V Load Center 34BMD, Fails During Operation	2.40E-05	2.53E-04	1.16E+01
34BMT02___TFL	ELEC, 6.9kV-480V Transformer 34BMT02, Fails During Operation	2.40E-05	1.19E-03	5.06E+01
34BMT03___TFL	ELEC, 6.9kV-480V Transformer 34BMT03, Fails During Operation	2.40E-05	3.96E-05	2.65E+00
34BMT04___TFL	ELEC, 6.9kV-480V Transformer 34BMT04, Fails During Operation	2.40E-05	2.53E-04	1.16E+01
34BNB02___OFL	ELEC, 480V MCC 34BNB02, Fails During Operation	2.40E-05	1.00E-03	4.28E+01
34BNB03___OFL	ELEC, 480V MCC 34BNB03, Fails During Operation	2.40E-05	4.68E-05	2.95E+00
34BNB03___RFR	ELEC, 480V AC to 24V DC Rectifier for MCC 34BNB03 Control Power, Fails to Run	1.53E-04	4.14E-04	3.70E+00
34BNT01___TFL	ELEC, Constant Voltage Transformer 34BNT01, Fails During Operation	2.40E-05	1.00E-03	4.28E+01
34BTD01_BATST	ELEC, 250V 1E 2-hr Battery 34BTD01, Fails on Demand	6.50E-04	9.90E-04	2.52E+00
34BUC____OFL	ELEC, 250V DC Distribution Panel 34BUC, Fails During Operation	2.40E-05	2.16E-04	1.00E+01
4BDA_4BDC1BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.86E-05	4.97E+00
4BDA_4BDC2BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.86E-05	4.97E+00
4BDA_4BDD1BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.60E-05	8.78E+00
4BDA_4BDD2BOP	ELEC, 6.9kV SWGR 34BDA to 6.9kV SWGR 34BDD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.60E-05	8.78E+00
4BDB4BMT02BOP	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.34E-04	4.74E+01
4BDC_4BDB1BOP	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.34E-04	4.74E+01
4BDC_4BDB2BOP	ELEC, 6.9kV SWGR 34BDC to 6.9kV SWGR 34BDB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.34E-04	4.74E+01
4BDC4BMT03BOP	ELEC, 6.9kV SWGR 34BDB to Transformer 34BMT03 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.71E-06	2.21E+00
4BDD4BMT04BOP	ELEC, 6.9kV SWGR 34BDD to Transformer 34BMT04 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.60E-05	8.78E+00
4BMB4BNT01BOP	ELEC, 480V Load Center 34BMB to Transformer 34BNT01 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.92E-04	4.16E+01
4BMT024BMBBOP	ELEC, Transformer 34BMT02 to 480V Load Center 34BMB Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	3.34E-04	4.74E+01
4BMT034BMCBOP	ELEC, Transformer 34BMT03 to 480V Load Center 34BMC Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	8.71E-06	2.21E+00
4BMT044BMDBOP	ELEC, Transformer 34BMT04 to 480V Load Center 34BMD Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	5.60E-05	8.78E+00
4BNB024BNB031BOP	ELEC, 480V MCC 34BNB02 to 480V MCC 34BNB03 Circuit Break, Fails to Remain Closed (SO)	7.20E-06	8.77E-06	2.22E+00
4BNB024BNB032BOP	ELEC, 480V MCC 34BNB02 to 480V MCC 34BNB03 Circuit Break, Fails to Remain Closed (SO)	7.20E-06	8.77E-06	2.22E+00
4BNT014BNB02BOP	ELEC, Transformer 34BNT01 to 480V MCC 34BNB02 Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.92E-04	4.16E+01
BRW10BUW11OFL	ELEC, 24V DC I&C Power Rack 31BRW10/31BUW11, Fails During Operation	2.40E-05	5.11E-05	3.13E+00
BRX10BUX11OFL	ELEC, 24V DC I&C Power Rack 31BRX10/31BUX11, Fails During Operation	2.40E-05	3.96E-05	2.65E+00
BRX70BUX71OFL	ELEC, 24V DC I&C Power Rack 34BRX70/34BUX71, Fails During Operation	2.40E-05	3.96E-05	2.65E+00

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Shutdown Basic Events ID	Description	Nom.val.	FV	RAW
JMQ40AA001ECL	SAHR, Suction Line Containment Isolation MOV JMQ40AA001, Fails to Remain Open (SO)	8.40E-06	1.06E-05	2.27E+00
JMQ40AA001EFO	SAHR, Suction Line Containment Isolation MOV JMQ40AA001, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
JMQ40AA001PANS	SAHR, Suction Cont Iso MOV JMQ40AA001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	8.39E-04	3.50E+00
JMQ40AA001PASM	SAHR, Suction Cont Iso MOV JMQ40AA001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	9.88E-06	2.27E+00
JMQ40AA002MEC1	SAHR, Suction Manual Valve JMQ40AA002, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
JMQ40AA003MEC1	SAHR, Discharge Manual Valve JMQ40AA003, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
JMQ40AA004MEC1	SAHR, HTX Discharge Manual Valve JMQ40AA004, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
JMQ40AC001TLK	SAHR, HTX JMQ40AC001, Tube Leakage	2.40E-05	3.96E-05	2.65E+00
JMQ40AP001EFR	SAHR, Motor Driven Pump JMQ40AP001, Fails to Run	2.37E-04	5.76E-04	3.43E+00
JMQ40AP001EFS	SAHR, Motor Driven Pump JMQ40AP001, Fails to Start on Demand	3.76E-04	9.58E-04	3.55E+00
JMQ40AP001PBNS	SAHR, Pump JMQ40AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	8.39E-04	3.50E+00
JMQ40AP001PBSM	SAHR, Pump JMQ40AP001, Priority Module (AV42) Fails (Self-Monitored)	7.80E-06	9.88E-06	2.27E+00
JMQ42AA001ECL	SAHR, Active Cooling Line MOV JMQ42AA001, Fails to Remain Open (SO)	8.40E-06	1.06E-05	2.27E+00
JMQ42AA001EFO	SAHR, Active Cooling Line MOV JMQ42AA001, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
JMQ42AA001PANS	SAHR, Active Coolin Line MOV JMQ42AA001,PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	8.39E-04	3.50E+00
JMQ42AA001PASM	SAHR, Active Cooling Line MOV JMQ42AA001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	9.88E-06	2.27E+00
JMQ42AA002CCL	SAHR, Active Cooling Line Check Valve JMQ42AA002, Fails to Remain Open	4.80E-06	5.67E-06	2.18E+00
JMQ42AA002CFO	SAHR, Active Cooling Line Check Valve JMQ42AA002, Fails to Open on Demand	5.00E-05	9.96E-05	2.99E+00
JNA10AA101EIR	RHR, LHSI Train 1 HTX Bypass MOV JNA10AA101, Internal Rupture	2.40E-06	3.03E-06	2.26E+00
JNA10AA101EOP	RHR, LHSI Train 1 HTX Bypass MOV JNA10AA101, Fails to Remain Closed (SO)	8.40E-06	1.36E-05	2.62E+00
JNA10AA191SPO	RHR, LHSI Train 1 Safety Valve JNA10AA191, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNA20AA191SPO	RHR, LHSI Train 2 Safety Valve JNA20AA191, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNA30AA191SPO	RHR, LHSI Train 3 Safety Valve JNA30AA191, Premature Opening	7.20E-05	1.66E-02	2.31E+02
JND10AA003CIR	MHSI, MHSI Pump 10 Discharge Manual CHECK Valve JND10AA003, Internal Rupture	1.20E-05	6.93E-03	5.79E+02
JND20AA003CIR	MHSI, MHSI Pump 20 Discharge Manual CHECK Valve JND20AA003, Internal Rupture	1.20E-05	7.92E-03	6.61E+02
JND30AA003CIR	MHSI, MHSI Pump 30 Discharge Manual CHECK Valve JND30AA003, Internal Rupture	1.20E-05	3.79E-03	3.17E+02
JNG10AA001EIR	LHSI, LHSI Pump 10 Suction from IRWST MOV JNG10AA001, Internal Rupture	2.40E-06	2.19E-03	9.14E+02
JNG10AA001EOP	LHSI, LHSI Pump 10 Suction from IRWST MOV JNG10AA001, Fails to Remain Closed (SO)	8.40E-06	7.92E-03	9.44E+02
JNG10AA003EIR	LHSI, LHSI Trn 1 to Radial Miniflow Motor Operated Check Vlv JNG10AA003, Internal Rupture	2.40E-06	1.35E-03	5.62E+02
JNG10AA003EOP	LHSI, LHSI Trn 1 to Radial Miniflow Motor Operated Check Vlv JNG10AA003, Fails to Remain Closed (SO)	8.40E-06	4.84E-03	5.77E+02
JNG10AA004EIR	LHSI, LHSI Trn 1 to Radial Miniflow Motor Operated Check Vlv JNG10AA004, Internal Rupture	2.40E-06	1.34E-03	5.61E+02
JNG10AA004EOP	LHSI, LHSI Trn 1 to Radial Miniflow Motor Operated Check Vlv JNG10AA004, Fails to Remain Closed (SO)	8.40E-06	4.82E-03	5.75E+02
JNG10AA006CCL	LHSI, LHSI Pump 10 Discharge Manual CHECK Valve JNG10AA006, Fails to Remain Open	4.80E-06	7.10E-06	2.48E+00
JNG10AA006CFO	LHSI, LHSI Pump 10 Discharge Manual CHECK Valve JNG10AA006, Fails to Open on Demand	4.65E-05	1.06E-04	3.28E+00
JNG10AA009CCL	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009 (CIV), Fails to Remain Open	4.80E-06	7.10E-06	2.48E+00
JNG10AA009CFO	LHSI, LHSI Pump 10 Discharge Check Valve JNG10AA009 (CIV), Fails to Open on Demand	4.65E-05	1.06E-04	3.28E+00
JNG10AA060ECL	LHSI, LHSI Pump 10 Discharge MOV JNG10AA060, Fails to Remain Open (SO)	8.40E-06	1.36E-05	2.62E+00
JNG10AA102ECL	LHSI, LHSI Pump 10 Flow Control MOV JNG10AA102, Fails to Remain Open (SO)	8.40E-06	1.36E-05	2.62E+00
JNG10AA192SPO	LHSI, LHSI/RHR Train 10 Overpressure Protection Safety Valve JNG10AA192, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNG10AC001TLK	LHSI, LHSI Train 1 HTX JNG10AC001, Tube Leakage	2.40E-05	6.54E-05	3.73E+00

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JNG10AP001EFR	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Run	2.40E-04	6.25E-04	3.60E+00
JNG10AP001EFS	LHSI, LHSI Train 1 Motor Driven Pump JNG10AP001, Fails to Start on Demand	3.94E-04	1.05E-03	3.66E+00
JNG10AP001PANS	LHSI, Train 1 Pump JNG10AP001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	8.86E-04	3.64E+00
JNG10AP001PASM	LHSI, Train 1 Pump JNG10AP001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	1.26E-05	2.62E+00
JNG13AA005CCL	LHSI, MHSI/LHSI Train 1 First SIS Isolation Check Valve JNG13AA005, Fails to Remain Open	4.80E-06	8.16E-06	2.70E+00
JNG13AA005CFO	LHSI, MHSI/LHSI Train 1 First SIS Isolation Check Valve JNG13AA005, Fails to Open on Demand	8.96E-04	3.25E-03	4.63E+00
JNG20AA001EIR	LHSI, LHSI Pump 20 Suction from IRWST MOV JNG20AA001, Internal Rupture	2.40E-06	2.19E-03	9.14E+02
JNG20AA001EOP	LHSI, LHSI Pump 20 Suction from IRWST MOV JNG20AA001, Fails to Remain Closed (SO)	8.40E-06	7.92E-03	9.44E+02
JNG20AA003EIR	LHSI, LHSI Train 2 to Radial Miniflow Motor Operated Check Valve JNG20AA003, Internal Rupture	2.40E-06	1.51E-03	6.31E+02
JNG20AA003EOP	LHSI, LHSI Trn 2 to Radial Miniflow Motor Operated Check Vlv JNG20AA003, Fails to Remain Closed (SO)	8.40E-06	5.53E-03	6.60E+02
JNG20AA004EIR	LHSI, LHSI Train 2 to Tangential Miniflow Motor Operated CV JNG20AA004, Internal Rupture	2.40E-06	1.34E-03	5.61E+02
JNG20AA004EOP	LHSI, LHSI Train 2 to Tangential Miniflow Motor Operated CV JNG20AA004, Fails to Remain Closed (SO)	8.40E-06	4.82E-03	5.75E+02
JNG20AA192SPO	LHSI, LHSI/RHR Train 20 Overpressure Protection Safety Valve JNG20AA192, Premature Opening	7.20E-05	4.25E-02	5.91E+02
JNG23AA005CFO	LHSI, MHSI/LHSI Train 2 First SIS Isolation Check Valve JNG23AA005, Fails to Open on Demand	8.96E-04	1.49E-03	2.66E+00
JNG30AA001EIR	LHSI, LHSI Pump 30 Suction from IRWST MOV JNG30AA001, Internal Rupture	2.40E-06	1.12E-03	4.67E+02
JNG30AA001EOP	LHSI, LHSI Pump 30 Suction from IRWST MOV JNG30AA001, Fails to Remain Closed (SO)	8.40E-06	4.06E-03	4.84E+02
JNG30AA003EIR	LHSI, LHSI Train 3 to Radial Miniflow Motor Operated Check Valve JNG30AA003, Internal Rupture	2.40E-06	7.12E-04	2.98E+02
JNG30AA003EOP	LHSI, LHSI Trn 3 to Radial Miniflow Motor Operated Check Vlv JNG30AA003, Fails to Remain Closed (SO)	8.40E-06	2.64E-03	3.15E+02
JNG30AA004EIR	LHSI, LHSI Train 3 to Tangential Miniflow Motor Operated CV JNG30AA004, Internal Rupture	2.40E-06	6.24E-04	2.61E+02
JNG30AA004EOP	LHSI, LHSI Train 3 to Tangential Miniflow Motor Operated CV JNG30AA004, Fails to Remain Closed (SO)	8.40E-06	2.25E-03	2.69E+02
JNG30AA192SPO	LHSI, LHSI/RHR Train 30 Overpressure Protection Safety Valve JNG30AA192, Premature Opening	7.20E-05	2.00E-02	2.78E+02
JNG30AC001TLK	LHSI, LHSI Train 3 HTX JNG30AC001, Tube Leakage	2.40E-05	2.52E-05	2.05E+00
JNG30AP001EFR	LHSI, LHSI Train 3 Motor Driven Pump JNG30AP001, Fails to Run	2.40E-04	3.07E-04	2.28E+00
JNG30AP001EFS	LHSI, LHSI Train 3 Motor Driven Pump JNG30AP001, Fails to Start on Demand	3.94E-04	5.28E-04	2.34E+00
JNG30AP001PANS	LHSI, Train 3 Pump JNG30AP001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	4.42E-04	2.32E+00
JNG33AA005CFO	LHSI, MHSI/LHSI Train 3 First SIS Isolation Check Valve JNG33AA005, Fails to Open on Demand	8.96E-04	2.01E-03	3.24E+00
JNG40AC001TLK	LHSI, LHSI Train 4 HTX JNG40AC001, Tube Leakage	2.40E-05	2.94E-05	2.23E+00
JNK11AA009ECL	IRWST, SAHR Sump Containment Isolation MOV JNK11AA009, Fails to Remain Open (SO)	8.40E-06	1.06E-05	2.27E+00
JNK11AA009EFO	IRWST, SAHR Sump Containment Isolation MOV JNK11AA009, Fails to Open on Demand	3.50E-03	1.00E-02	3.85E+00
JNK11AA009PBNS	SAHR, Sump Cont. Iso. MOV JNK11AA009, PAC B Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	8.39E-04	3.50E+00
JNK11AA009PBSM	SAHR, Sump Cont. Iso. MOV JNK11AA009, PAC B Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	9.88E-06	2.27E+00
JNK11AT003SPG	IRWST, SAHR Sump Strainer JNK11AT003, Plugs	8.65E-06	1.10E-05	2.27E+00
KAA10AA004CCL	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004, Fails to Remain Open	4.80E-06	6.87E-06	2.43E+00
KAA10AA004CFO	CCWS, Train 1 Discharge from CCW HTX 10 Check Valve KAA10AA004, Fails to Open on Demand	4.76E-05	1.02E-04	3.14E+00
KAA10AA112EIR	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112, Internal Rupture	2.40E-06	2.85E-06	2.19E+00
KAA10AA112EOP	CCWS, Train 1 Heat Exchanger Bypass MOV KAA10AA112, Fails to Remain Closed (SO)	8.40E-06	1.36E-05	2.62E+00
KAA10AC001SEL	CCWS, Train 1 HTX 10 KAA10AC001, Shell - External Leakage	7.20E-06	1.11E-05	2.54E+00
KAA10AP001EEL	CCWS, Train 1 Motor Driven Pump KAA10AP001, External Leakage	7.20E-05	1.94E-04	3.69E+00
KAA10AP001EFRSD	CCWS, Train 1 Motor Driven Pump KAA10AP001, Fails to Run (Shutdown)	4.70E-05	1.21E-04	3.57E+00
KAA10AP001EFS	CCWS, Train 1 Motor Driven Pump KAA10AP001, Fails to Start on Demand	1.33E-03	3.44E-03	3.58E+00

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Shutdown Basic Events ID	Description	Nom.val.	FV	RAW
KAA10AP001PANS	CCWS, Train 1 Pump KAA10AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	8.26E-04	3.46E+00
KAA10AP001PASM	CCWS, Train 1 Pump KAA10AP001, Priority Module (AV42) Fails (Self-Monitored)	7.80E-06	1.16E-05	2.49E+00
KAA10BB001TEL	CCWS, Train 1 Surge Tank KAA10BB001, External Leakage	1.20E-05	2.37E-05	2.97E+00
KAA12AA005ECL	CCWS, Train 1 to LHSI HTX 10 Cooling MOV KAA12AA005, Fails to Remain Open (SO)	8.40E-06	1.25E-05	2.49E+00
KAA12AA012CCL	CCWS, Train 1 LHSI HTX Discharge Check Valve KAA12AA012, Fails to Remain Open	4.80E-06	6.65E-06	2.39E+00
KAA12AA012CFO	CCWS, Train 1 LHSI HTX Discharge Check Valve KAA12AA012, Fails to Open on Demand	4.76E-05	1.02E-04	3.14E+00
KAA20AP001EEL	CCWS, Train 2 Motor Driven Pump KAA20AP001 External Leakage	7.20E-05	8.91E-05	2.24E+00
KAA20AP001EFRSD	CCWS, Train 2 Motor Driven Pump KAA20AP001, Fails to Run (Shutdown)	4.70E-05	5.00E-05	2.06E+00
KAA30AP001EEL	CCWS, Train 3 Motor Driven Pump KAA30AP001, External Leakage	7.20E-05	1.12E-04	2.55E+00
KAA30AP001EFRSD	CCWS, Train 3 Motor Driven Pump KAA30AP001, Fails to Run (Shutdown)	4.70E-05	6.34E-05	2.35E+00
KAA30AP001EFS	CCWS, Train 3 Motor Driven Pump KAA30AP001, Fails to Start on Demand	1.33E-03	1.69E-03	2.27E+00
KAA30AP001PANS	CCWS, Train 3 Pump KAA30AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	3.62E-04	2.08E+00
KAA80AA001MEC1	CCWS, SA-CCW Pump Suction Manual Valve KAA80AA001, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA80AA002MEC1	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA002, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA80AA003MEC1	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA003, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA80AA004MEC1	CCWS, SA-CCW Pump Discharge Manual Valve KAA80AA004, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA80AA005MEC1	CCWS, SA-CCW Pump Cooling Manual Valve KAA80AA005, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA80AA020ECL	CCWS, SA-CCW Surge Tank to Pump Suction Line MOV KAA80AA020, Fails to Remain Open (SO)	8.40E-06	1.06E-05	2.27E+00
KAA80AA191SPO	CCWS, SA-CCW Surge Tank to Pump Suction Line Safety Valve KAA80AA191, Premature Opening	7.20E-05	1.49E-04	3.07E+00
KAA80AC001SEL	CCWS, SA-CCW Heat Exchanger KAA80AC001, Shell - External Leakage	7.20E-06	8.71E-06	2.21E+00
KAA80AC001TLK	CCWS, SA-CCW Heat Exchanger KAA80AC001, Tube Leakage	2.40E-05	3.96E-05	2.65E+00
KAA80AP001EFR	CCWS, SA-CCW Motor Driven Pump KAA80AP001, Fails to Run	2.42E-04	5.90E-04	3.43E+00
KAA80AP001EFS	CCWS, SA-CCW Motor Driven Pump KAA80AP001, Fails to Start on Demand	4.02E-04	1.03E-03	3.56E+00
KAA80BB001TEL	CCWS, SA-CCW Surge Tank to Pump Suction KAA80BB001, External Leakage	1.20E-05	1.69E-05	2.41E+00
KAA82AA001MEC1	CCWS, SA-CCW to SAHR Pump Coolers Manual Valve KAA82AA001, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA82AA002MEC1	CCWS, SA-CCW from SAHR Pump Seal Water Cooler Manual Valve KAA82AA002, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA82AA003MEC1	CCWS, SA-CCW from SAHR Pump Motor Air Cooler Manual Valve KAA82AA003, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KAA82AA004MEC1	CCWS, SA-CCW to SAGR Pump Bearing Cooler Manual Valve KAA82AA004, Left in Wrong Position	2.00E-04	4.67E-04	3.34E+00
KBA14AA004ECL	CVCS, Low Pressure Reducing Station Isolation MOV KBA14AA004, Fails to Remain Closed (SO)	8.40E-06	2.40E-04	2.96E+01
KBA14AA004EFC	CVCS, Low Pressure Reducing Station Isolation MOV KBA14AA004, Fails to Close on Demand	3.44E-03	9.96E-02	2.99E+01
KBA14AA004EIR	CVCS, Low Pressure Reducing Station Isolation MOV KBA14AA004, Internal Rupture	2.40E-06	6.83E-05	2.94E+01
KBA14AA004PANS	CVCS, LP Reducing Iso MOV KBA14AA004, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	9.69E-03	2.99E+01
KBA14AA004PASM	CVCS, LP Reducing Iso MOV KBA14AA004, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	2.23E-04	2.96E+01
KBA14AA106EFC	CVCS, CVCS Low Power Reducing Station MOV KBA14AA106, Fails to Close on Demand	3.44E-03	3.67E-02	1.16E+01
KBA14AA106EIR	CVCS, CVCS Low Power Reducing Station MOV KBA14AA106, Internal Rupture	2.40E-06	6.78E-05	2.93E+01
KBA14AA106EOP	CVCS, CVCS Low Power Reducing Station MOV KBA14AA106, Fails to Remain Closed (SO)	8.40E-06	2.63E-04	3.23E+01
KBA14AA106PBNS	CVCS, CVCS LP Redu Stn MOV KBA14AA106, PAC B Priority Module (Type PC10) Fails (Non-Self-Monitored)	3.35E-04	3.55E-03	1.16E+01
KBA14AA106PBSM	CVCS, CVCS LP Redu Stn MOV KBA14AA106, PAC B Priority Module (Type PC10) Fails (Self-Monitored)	7.80E-06	7.66E-05	1.08E+01
PEB20AP001EFRSD	ESWS, Train 2 Motor Driven Pump PEB20AP001, Fails to Run	1.08E-04	1.14E-04	2.05E+00
PEB30AP001EFRSD	ESWS, Train 3 Motor Driven Pump PEB30AP001, Fails to Run	1.08E-04	1.29E-04	2.19E+00

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Shutdown Basic Events ID	Description	Nom.val.	FV	RAW
PEB40AA004CIR	ESWS, Train 4 Pump Discharge Check Valve PEB40AA004, Internal Rupture	1.20E-05	1.53E-05	2.27E+00
PEB80AA002CCL	ESWS, SA-ESWS Pump Discharge Manual CHECK Valve PEB80AA002, Fails to Remain Open	4.80E-06	5.23E-06	2.09E+00
PEB80AA002CFO	ESWS, SA-ESWS Pump Discharge Manual CHECK Valve PEB80AA002, Fails to Open on Demand	5.00E-05	9.04E-05	2.81E+00
PEB80AA002MEC1	ESWS, SA-ESWS Pump Suction MANUAL Check Valve PEB80AA002, Left in Wrong Position	2.00E-04	4.20E-04	3.10E+00
PEB80AA003MEC1	ESWS, SA-CCWS HTX Suction Manual Valve PEB80AA003, Left in Wrong Position	2.00E-04	4.20E-04	3.10E+00
PEB80AA004MEC1	ESWS, SA-CCWS HTX Discharge Manual Valve PEB80AA004, Left in Wrong Position	2.00E-04	4.20E-04	3.10E+00
PEB80AA008MEC1	ESWS, SA-CCWS HTX Discharge Manual Valve PEB80AA008, Left in Wrong Position	2.00E-04	4.20E-04	3.10E+00
PEB80AP001EFR	ESWS, SA-ESWS Motor Driven Pump PEB80AP001, Fails to Run	2.42E-04	5.31E-04	3.19E+00
PEB80AP001EFS	ESWS, SA-ESWS Motor Driven Pump PEB80AP001, Fails to Start on Demand	4.02E-04	9.25E-04	3.30E+00
PEB80AP001PBNS	ESWS, SA-ESWS Pump PEB80AP001, Priority Module (AV42) Fails (Non-Self-Monitored)	3.35E-04	7.57E-04	3.26E+00
PEB80AP001PBSM	ESWS, SA-ESWS Pump PEB80AP001, Priority Module (AV42) Fails (Self-Monitored)	7.80E-06	9.17E-06	2.18E+00
PEB80AT001FPG	ESWS, SA-ESWS Debris Filter PEB80AT001, Plugs	1.20E-04	2.36E-04	2.96E+00
QKA10AA003CCL	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Remain Open	4.80E-06	7.88E-06	2.64E+00
QKA10AA003CFO	SCWS, Train 1 Safety Chiller Pump Discharge Check Valve QKA10AA003, Fails to Open	4.76E-05	1.11E-04	3.32E+00
QKA10AA101ECF	SCWS, Train 1 Chiller By-pass MOV QKA10AA101, Fails to Control Flow	8.40E-06	1.57E-05	2.86E+00
QKA10AP107EEL	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, External Leakage	7.20E-05	2.04E-04	3.84E+00
QKA10AP107EFR	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Run	2.37E-04	7.61E-04	4.21E+00
QKA10AP107EFS	SCWS, Train 1 Motor Driven Safety Chiller Pump QKA10AP107, Fails to Start on Demand	3.85E-04	1.06E-03	3.74E+00
QKA10GH001_FR	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Run	6.98E-04	2.36E-03	4.37E+00
QKA10GH001_FS	SCWS, Train 1 Chiller Unit QKA10GH001, Fails to Start on Demand	4.85E-03	1.47E-02	4.01E+00
QKA10GH001PANS	SCWS, Train 1 Chiller Unit QKA10GH001, PAC A Priority Module (Type AV42) Fails (Non-Self-Monitored)	3.35E-04	9.14E-04	3.72E+00
QKA10GH001PASM	SCWS, Train 1 Chiller Unit QKA10GH001, PAC A Priority Module (Type AV42) Fails (Self-Monitored)	7.80E-06	1.20E-05	2.54E+00
QKA40AP107EFR	SCWS, Train 4 Motor Driven Safety Chiller Pump QKA40AP107, Fails to Run	2.37E-04	2.79E-04	2.18E+00
QKA40GH001_FR	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Run	6.98E-04	9.23E-04	2.32E+00
QKA40GH001_FS	SCWS, Train 4 Chiller Unit QKA40GH001, Fails to Start on Demand	4.85E-03	5.12E-03	2.05E+00
XKA50_____DFR	ELEC, SBO Diesel Generator XKA50, Fails to Run	5.44E-02	2.02E-01	4.51E+00
XKA50_____DFS	ELEC, SBO Diesel Generator XKA50, Fails to Start on Demand	4.43E-03	1.61E-02	4.62E+00
XKA50_1BBHBFC	ELEC, SBO DG XKA50 to 6.9kV SWGR 31BBH Circuit Breaker, Fails to Close on Demand	4.97E-04	1.74E-03	4.50E+00
XKA50_1BBHBOP	ELEC, SBO DG XKA50 to 6.9kV SWGR 31BBH Circuit Breaker, Fails to Remain Closed (SO)	7.20E-06	2.10E-05	3.92E+00

All Basic Events with RAW >= 2E+00

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Basic Event	Description	Nom Value	FV	RAW
OPE-ISOCSLPRS	Operator Fails to Isolate the CVCS Low Pressure Reducing Station	5.5E-05	0.249	4,531.0
OPF-ISORHRFD-CB	Operator Fails to Isolate RHR Flow Diversion (LOCA) in State CB	1.0E+00	0.185	1.0
OPF-ULD	Operator Fails to Stop Draindown at Mid-Loop	1.0E-02	0.107	
OPF-ISORHRFD-D	Operator Fails to Isolate RHR Flow Diversion (LOCA) in State D	1.0E+00	0.072	1.0
OPF-XTDIVSBO-2H	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Divison 3 During SBO Considitions	5.8E-02	0.036	1.6
OPF-XTDIV-NSC	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Divison 3 During Non-SBO Conditions	5.0E-01	0.030	1.0
OPF-ISORHRBRK	Operator Fails to Isolate RHR Pipe Break	1.1E-01	0.025	1.2
OPD-SAC2H/SAC1H	Dependency (MED) Between OAs for Starting HVAC Maintenance Trains Recovering Room Cooling Locally	1.5E-01	0.019	1.1
OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	2.0E-04	0.019	96.6
OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.018	2.4
OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBO DGs to Div 1 or 4 During Non-SBO Conditions	1.0E-01	0.011	1.1
OPF-ISOIRWSTFD-CB	Operator Fails to Isolate RHR Suction to IRWST (Valve JNGX0AA001) in CB	1.0E+00	0.011	1.0
OPF-ISOIRWSTFD-CA	Operator Fails to Isolate RHR Suction to IRWST (Valve JNGX0AA001) in CA	1.0E+00	0.010	1.0

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Basic Event	Description	Nom Value	RAW	FV
OPE-ISOCSLPRS	Operator Fails to Isolate the CVCS Low Pressure Reducing Station	5.5E-05	4,531.0	0.249
OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	2.0E-04	96.6	0.019
OPF-LHSIRHR-DU	Operator Fails to Start LHSI Pump in DU, given a loss of RHR	2.0E-04	7.4	0.001
OPF-XTLDSBO-2H	Operator Fails to Connect and Load SBO DGs to Div 1 and 4	7.0E-04	5.6	0.003
OPF-SAHR/IRWST-4H	Operator Fails to Initiate IRWST Cooling with SAHR	4.0E-04	3.6	0.001
OPF-LHSIRHR-DD	Operator Fails to Start LHSI Pump in DD, given a loss of RHR	2.0E-04	3.1	0.000
OPE-RHRLO-CBD	Operator Fails to Start RHR in CBd (LOCA Initiator)	1.1E-03	2.7	0.002
OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	2.4	0.018

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System	ID	Description	Nominal Value	RAW
SIS/RHRS	JNG13AA005CFO_D-ALL	CCF to Open LHSI/MHSI Common Injection Check Valves (SIS First Isolation Valves)	4.5E-06	50,890.0
IRWST	JNK10AT001SPG_P-ALL	CCF of IRWST Sump Strainers - Plugged	5.7E-07	50,250.0
ELEC	BTD01_BAT__ST_D-ALL	CCF of Safety Related Batteries on Demand	2.9E-07	30,590.0
HVAC	SAC31AN001EFR_D-ALL	CCF to Run Normal Air Exhaust Fans	1.3E-06	5,100.0
HVAC	SAC01AN001EFR_D-ALL	CCF to Run Normal Air Supply Fans	1.3E-06	5,100.0
SCWS	QKA10AP107EFR_D-ALL	CCF of SCWS Pumps to Run	6.4E-07	5,078.0
CVCS	KBA14AA004EFC_B-ALL	CCF to Close CVCS Low Pressure Reducing Station MOVs	6.2E-05	2,099.0
ESWS	PEB10AP001EFS_D-ALL	CCF of the ESWS Pumps to Start	1.4E-05	1,977.0
ELEC	XKA10_____DFR_D-ALL	CCF of EDGs to Run	1.0E-04	1,933.0
ELEC	XKA10_____DFS_D-ALL	CCF of EDGs to Start	7.0E-06	1,916.0
ESWS	PEB10AA004CFO_D-ALL	CCF to Open ESWS Pump Discharge Check Valves	4.5E-07	1,902.0
ELEC	BDT01_BDA_BFO_D-ALL	CCF to Open Normal Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	1,884.0
ELEC	XKA10_1BDABFO_D-ALL	CCF to Close EDG Supply Breakers	1.4E-06	1,884.0
ELEC	BDT02_BDA_BFO_D-ALL	CCF to Open Backup Supply 6.9kV Circuit Breakers from Aux. Xfrm to Safety Related SWGRs	1.4E-06	1,884.0
SIS/RHRS	JND10AP001EFR_D-ALL	CCF of MHSI Pumps to Run	3.8E-05	751.6
SIS/RHRS	JND10AP001EFS_D-ALL	CCF of MHSI Pumps to Start	4.6E-06	694.9
SIS/RHRS	JND10AA007CFO_D-ALL	CCF to Open MHSI Discharge CVs (CIVs)	7.3E-07	558.3
SIS/RHRS	JND10AA003CFO_D-ALL	CCF to Open MHSI Pump Discharge Motor Operated CHECK Valves	7.3E-07	558.3
SIS/RHRS	JNG10AP001EFS_D-ALL	CCF of LHSI Pumps to Start	1.8E-06	525.0
SCWS	QKA10AP107EFS_D-ALL	CCF of SCWS Pumps to Start	2.6E-06	401.0
SCWS	QKA10AA003CFO_D-ALL	CCF to Open SCWS Pump Discharge Check Valves	4.5E-07	398.8
HVAC	SAC01AN001EFS_D-ALL	CCF to Start Normal Air Supply Fans	8.1E-07	398.0
HVAC	SAC31AN001EFS_D-ALL	CCF to Start Normal Air Exhaust Fans	8.1E-07	398.0
HVAC	SAC31AA003CFO_D-ALL	CCF to Open Normal Air Exhaust Fan Discharge Check Damper	4.3E-08	397.5
HVAC	SAC01AA005CFO_D-ALL	CCF to Open Normal SAC Supply Fan Discharge Check Dampers	4.5E-07	397.5
SIS/RHRS	JNG10AA009CFO_D-ALL	CCF to Open LHSI Discharge CVs (CIVs)	2.3E-07	287.2
SIS/RHRS	JNG10AA006CFO_D-ALL	CCF to Open LHSI Check Valves (SIS Second Isolation Valves)	2.3E-07	287.2
CCWS	KAA10AP001EFS_D-ALL	CCF of the CCWS Pumps to Start	9.1E-06	52.4

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ID	Description	Nominal Value	RAW
CL-TXS-OSCCF	SW CCF of TXS operating system or multiple diversity groups	1.0E-07	8,059.0
SAS CCF-ALL	CCF of SAS Divisions	5.0E-07	5,673.0
CL-PS-B-SWCCF	SW CCF of Protection System diversity group B	5.0E-06	617.3
HL LVL CCF-ALL	CCF of hotleg loop level	1.3E-06	552.6
APU3 CCF NS-ALL	CCF of APU-3 Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	368.7
ALU-B CCF NS-ALL	CCF of ALU-B Protection System Computer Processors (Non-Self-Monitored)	3.3E-07	368.7
APU3 CCF SM-ALL	CCF of APU-3 Protection System Computer Processors (Self-Monitored)	9.0E-08	290.8
ALU-B CCF SM-ALL	CCF of ALU-B Protection System Computer Processors (Self-Monitored)	9.0E-08	290.8
PAS	Proccess Automation System (PAS) Fails (Estimate)	1.0E-03	54.6
HL TEMP CCF-ALL	CCF of hotleg WR temperature sensors	4.3E-06	53.6
HL PRES CCF-ALL	CCF of hotleg WR pressure sensors	6.7E-07	42.5
CL WRTEMP CCF-ALL	CCF of cold leg WR temp sensors	4.3E-06	29.5

t19.1-99b

ID	Description	Nominal Value	FV	RAW
PRA Modeling Parameters				
JEF-PSRV-FRC	PZR, Pressurizer Safety Relief Valve Fails to Reclose or to Reseat	3.0E-03	0.003	2.0
RHR TR1 PIPE BRK	Pipe Break in RHR Train 1	3.1E-07	0.012	39,520.0
RHR TR2 PIPE BRK	Pipe Break in RHR Train 2	3.1E-07	0.012	39,490.0
RHR TR3 PIPE BRK	Pipe Break in RHR Train 3	3.1E-07	0.003	8,767.0
RHR TR4 PIPE BRK	Pipe Break in RHR Train 4	3.1E-07	0.001	3,296.0
SA-ESWS UHS4 SBO	Failure of SA-ESWS/UHS4 in SBO Conditions	1.0E-01	0.031	1.3
SIG P14 PERM	Failure of P-14 Permissive - MSRT Set Point to 145 psia	1.0E-04	0.000	5.3
Offsite Power Related Events				
SD LOOP24+REC	Loss Of Offsite Power During Shutdown and Failure of Recovery Within 1 Hour	2.2E-04	0.373	1,695.0

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Table 19.1-93—U.S. EPR Risk-Significant Equipment based on FV Importance – Level 1 Shutdown

Rank	System	Component ID	Description	FV	RAW
1	ELEC	30XKA10/20/30/40	ELEC, Emergency Diesel Generator Train	0.291	1.8
2	SIS/RHRS	30JNG13/23/33/43AA005	LHSI, First SIS CL Isolation Check Valve Train	0.244	3.2
3	CVCS	30KBA14AA004/106	CVCS, Low Pressure Reducing Station Isolation MOV Train	0.239	~~1~~IE-NA[1]
4	ELEC	30XKA50/80	ELEC, SBO Diesel Generator Train	0.226	4.6
5	SIS/RHRS	30JNA10/20/30AA191 30JNG10/20/30AA192	RHR, LHSI Safety Valve Train	0.042	~~1~~IE-NA[1]
6	SIS/RHRS	30JND10/20/30/40AP001	MHSI, Motor Driven Pump Train	0.041	1.6
7	IRWST	30JNK10AT001/002 30JNK11AT001/002	IRWST, SIS Sump Strainer to MHSI/LHSI Pumps	0.029	1.2
8	IRWST	30JNK11AT003	IRWST, SAHR Sump Strainer	0.028	2.3
9	SCWS	30QKA10/40GH001	SCWS, Chiller Unit Train	0.019	4.4
10	ELEC	31/32/33/34BTD01_BAT	ELEC, 250V 1E 2-hr Battery Train	0.018	10.2
11	CCWS	30KAA10/20/30/40AP001	CCWS, Motor Driven Pump Train	0.012	3.7
12	SIS/RHRS	30JNG10/20AA001	LHSI, LHSI Pump Suction from IRWST MOV Train	0.011	~~1~~IE-NA[1]
13	SAHRS	30JMQ42AA001	SAHR, Recirculation Line MOV	0.011	3.8
14	EFWS	30LAS11AP001	EFWS, Motor Driven Pump	0.011	1.7
15	HVAC	30SAC01/02/03/04AN001 30SAC31/32/33/34AN001	SAC, Normal Air Supply/Exhaust Fan	0.010	1.6

1. NOTE: IE-NA denotes a component whose failure also leads to an initiating event, hence, the calculated RAW value is not valid; it is produced due to software limitations.

Table 19.1-95—U.S. EPR Risk-Significant Human Actions at Shutdown based on FV Importance – Level 1 Shutdown

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Rank	Basic Event	Description	Nom Value	FV	RAW
1	OPE-ISOCSLPRS	Operator Fails to Isolate the CVCS Low Pressure Reducing Station	5.5E-05	0.249	4,531.0
2	OPF-ISORHRFD-CB	Operator Fails to Isolate RHR Flow Diversion (LOCA) in State CB	1.0E+00	0.185	1.0
3	OPF-ULD	Operator Fails to Stop Draindown at Mid-Loop	1.0E-02	0.107	~~1~~IE-NA[1]
4	OPF-ISORHRFD-D	Operator Fails to Isolate RHR Flow Diversion (LOCA) in State D	1.0E+00	0.072	1.0
5	OPF-XTDIVSBO-2H	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Division 3 During SBO Conditions	5.8E-02	0.036	1.6
6	OPF-XTDIV-NSC	Operator Fails to Xtie Division 1 to Division 2 or Division 4 to Division 3 During Non-SBO Conditions	5.0E-01	0.030	1.0
7	OPF-ISORHRBRK	Operator Fails to Isolate RHR Pipe Break	1.1E-01	0.025	1.2
8	OPD-SAC2H/ SAC1H	Dependency (MED) Between OAs for Starting HVAC Maintenance Trains Recovering Room Cooling Locally	1.5E-01	0.019	1.1
9	OPF-SAC-1H	Operator Fails to Start Maintenance HVAC Trains After Failure of Normal SAC Safety Train	2.0E-04	0.019	96.6
10	OPF-SAC-2H	Operator Fails to Recover Room Cooling Locally	1.3E-02	0.018	2.4
11	OPF-XTLDSBO-NSC	Operator Fails to Connect and Load SBODGs to Div 1 or 4 During Non-SBO Conditions	1.0E-01	0.011	1.1
12	OPF-ISOIRWSTFD-CB	Operator Fails to Isolate RHR Suction to IRWST (Valve JNGX0AA001) in CB	1.0E+00	0.011	1.0
13	OPF-ISOIRWSTFD-CA	Operator Fails to Isolate RHR Suction to IRWST (Valve JNGX0AA001) in CA	1.0E+00	0.010	1.0

1. NOTE: IE-NA denotes a component whose failure also leads to an initiating event, hence, the calculated RAW value is not valid; it is produced due to software limitations.