Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
Systems With Functions in 4 Divisions / Trains								
1	Fuel Building Ventilation System (FBVS)	Isolation of FBVS on Containment Isolation (Figure 7.3-62)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
2	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	RHR Isolation Valves Interlock (Figure 7.6-11)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
3	Electrical Division of Safeguard Building Ventilation System (SBVSE)	SBVSE CCWS Pump Room Heat Removal (Figure 7.3-59)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
4	Component Cooling Water System (CCWS)	CCWS Emergency Temperature Control (Figure 7.3-34)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
5	Deleted							
6	Emergency Feedwater System (EFWS)	SG Level Control (Figure 7.3-4)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
7	Emergency Feedwater System (EFWS)	EFWS Pump Flow Protection (Figure 7.3-4)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
8	Essential Service Water System (ESWS)	ESW Flood Prevention in the Safeguard Building (Figure 7.3-69)	Master CU in 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs and the function remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division/train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
9	Essential Service Water Pump Building Ventilation System (ESWPBVS)	ESWPBVS ESWS Pump Rooms Temperature Control (Figure 7.3-38)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
10	Main Steam System (MSS)	Steam Generator MSRCV Regulation during Pressure Control (Figure 7.3-12)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Mastery/Standby CU switchover occurs in faulted division. Voting logic remains 2/4 in faulted division. Voting logic in other divisions is modified to 2/3.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Voting in other divisions becomes 1/3.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Voting in other divisions becomes 2/3.	
11	Main Steam System (MSS)	Steam Generator MSRCV Regulation during Standby Position Control (Figure 7.3-12)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Mastery/Standby CU switchover occurs in faulted division. Voting logic remains 2/4 in faulted division. Voting logic in other divisions is modified to 2/3.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Voting in other divisions becomes 1/3.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Voting in other divisions becomes 2/3.	
12	Safeguard Building Controlled-Area Ventilation System (SBVS)	SIS/RHRS Pump Rooms Heat Removal (Figure 7.3-46)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
13	Safeguard Building Controlled-Area Ventilation System (SBVS)	Isolation of Mechanical Areas of Safeguard Building on Containment Isolation (Figure 7.3-65)	Master CU in 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs and the function remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division/train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
14	Safeguard Building Controlled-Area Ventilation System (SBVS)	CCWS/EFWS Valve Rooms Heat Removal (Figure 7.3-47)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
15	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply and Recirculation Exhaust Air Flow Control (Figure 7.3-48)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
16	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Fan Safe Shut-off (Figure 7.3-49)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
17	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Recirculation Fan Safe Shut-off (Figure 7.3-50)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
18	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Exhaust Fan Safe Shut-off (Figure 7.3-51)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
19	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Heater Control (Figure 7.3-52)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
20	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Freeze Protection (Figure 7.3-53)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
21	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Control for Supply Air Cooling (Figure 7.3-54)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
22	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Heater Control (Figure 7.3-56)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
23	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Supply Air Temperature Control (Figure 7.3-57)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
24	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Emergency Feed Water System (EFWS) Pump Room Heat Removal (Figure 7.3-58)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
Sheet 7 of 28

No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
25	Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Loss of Pump/Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-5)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	
26	Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-6)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
27	Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-7)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	
28	Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Loss of Pump/Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-8)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
29	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic RHRS Flow Rate Control (Figure 7.3-60)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
30	Main Control Room Air Conditioning System (CRACS)	Cooler Temperature Control (Figure 7.3-45)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ train	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ train	Loss of one division / train. Three remaining divisions / trains provide safety function.	
Systems With Functions Within 2 Redundant Train Sets								
31	Main Control Room Air Conditioning System (CRACS)	Pressure Control (Figure 7.3-44)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
32	Annulus Ventilation System (AVS)	Accident Filtration Train Heater Control (Figure 7.3-31)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
33	Annulus Ventilation System (AVS)	Accident Train Switchover (Figure 7.3-32)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
34	Component Cooling Water System (CCWS)	SCWS Condenser Supply Water Flow Control (Figure 7.3-37)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
35	Fuel Building Ventilation System (FBVS)	Safety-Related Room Heater Control (Figure 7.3-39)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
36	Fuel Building Ventilation System (FBVS)	FBVS EBS / FPCS Pump Rooms Heat Removal (Figure 7.3-40)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
37	Fuel Building Ventilation System (FBVS)	Isolation of the Fuel Pool Hall (Figure 7.3-67)	Master CU in 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs and the function remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
38	Fuel Building Ventilation System (FBVS)	Isolation of the Emergency Airlock and Equipment Hatch (Figure 7.3-68)	Master CU in 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs and the function remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
39	Fuel Pool Cooling and Purification System (FPCPS)	FPCPS Pump Trip on Low Spent Fuel Pool (SFP) Level (Figure 7.3-41)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
40	Main Control Room Air Conditioning System (CRACS)	Iodine Filtration Train Heater Control (Figure 7.3-42)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
41	Main Control Room Air Conditioning System (CRACS)	Heater Control for Outside Inlet Air (Figure 7.3-43)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs and the function remains operable	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
42	Safeguard Building Controlled-Area Ventilation System (SBVS)	Iodine Filtration Train Electric Heater Control (Figure 7.3-66)	Master CU in 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs and the function remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
CCWS Switchover Functions								
43	Component Cooling Water System (CCWS)	CCWS Emergency Leak Detection (Figure 7.3-35)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious closure of switchover valve and isolation valve. Spurious closure of one pilot valve for other trains.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of switchover valve and isolation valve. Loss of one pilot valve for other trains.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
44	Component Cooling Water System (CCWS)	CCWS Common 1.b Automatic Backup Switchover of Train 1 to Train 2 and Train 2 to Train 1 (Figure 7.3-33)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious actuation of pumps and fans.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of pumps and fans. Remaining divisions/trains provide safety function.	
45	Component Cooling Water System (CCWS)	CCWS Common 2.b Automatic Backup Switchover of Train 3 to Train 4 and Train 4 to Train 3 (Figure 7.3-33)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious actuation of pumps and fans.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of pumps and fans. Remaining divisions/trains provide safety function.	
46	Component Cooling Water System (CCWS)	CCWS Emergency Leak Detection – Switchover Valves Leakage or Failure (Figure 7.3-36)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious closure of switchover valves in faulted train and associated train. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
47	Component Cooling Water System (CCWS)	CCWS Switchover Valves Interlock (Figure 7.6-1)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one division/train. Three remaining divisions/trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one division/train. Three remaining divisions/trains provide safety function.	
CCWS RCP Thermal Barrier Interlock Function								
48	Component Cooling Water System (CCWS)	CCWS RCP Thermal Barrier Containment Isolation Valve Interlock (Figure 7.6-2)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. The system automatically switches over to the other train pair. The other train pair performs the safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of two CIVs. The remaining valves and train set provides safety function.	
49	Component Cooling Water System (CCWS)	CCWS RCP Thermal Barrier Containment Isolation Valves Opening Interlock (Figure 7.6-12)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master/Standby CU switchover occurs. Functionality that depends on information from other divisions is lost due to lost connection to CUs. Functionality that does not depend on information from other CUs remains operable.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train pair. The system automatically switches over to the other train pair. The other train pair performs the safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of two CIVs. The remaining valves and train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
Systems With Functions Utilizing Voting Logic								
50	In-Containment Refueling Water Storage Tank System (IRWST)	IRWST Boundary Isolation for Preserving IRWST Water Inventory Interlock (Figure 7.6-4)	Master CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Master / Standby CU switchover occurs in faulted division. Voting logic remains 2/4 in faulted division. Voting logic in other divisions is modified to 2/3.	No effects on the system function
				b) Undetected - Spurious	None	Redundant divisions/ trains	Spurious trigger of one division / train. Voting in other divisions becomes 1/3.	
				c) Undetected - Blocking	None	Redundant divisions/ trains	Loss of one division / train. Voting in other divisions becomes 2/3.	
51	Deleted							
52	Deleted							
Systems With Functions in 4 Division/Trains								
53	Fuel Building Ventilation System (FBVS)	Isolation of FBVS on Containment Isolation (Figure 7.3-62)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
54	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	RHR Isolation Valves Interlock (Figure 7.6-11)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Affected division switches to the standby CU	Three remaining divisions / trains provide safety function.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
55	Component Cooling Water System (CCWS)	CCWS Emergency Temperature Control (Figure 7.3-34)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
56	Component Cooling Water System (CCWS)	CCWS Emergency Leak Detection (Figure 7.3-35)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one pilot valve. Remaining pilot valves provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one pilot valve. Remaining pilot valves provide safety function.	
57	Emergency Feedwater System (EFWS)	SG Level Control (Figure 7.3-4)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
58	Emergency Feedwater System (EFWS)	EFWS Pump Flow Protection (Figure 7.3-4)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
59	Essential Service Water Pump Building Ventilation System (ESWPBVS)	ESWPBVS ESWS Pump Rooms Temperature Control (Figure 7.3-38)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
60	Essential Service Water System (ESWS)	ESW Flood Prevention in the Safeguard Building (Figure 7.3-69)	Loss of 1 division.	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions/trains provide safety function.	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division/train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
61	Main Control Room Air Conditioning System (CRACS)	Cooler Temperature Control (Figure 7.3-45)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
62	Main Control Room Air Conditioning System (CRACS)	Pressure Control (Figure 7.3-44)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
63	Main Steam System (MSS)	Steam Generator MSRCV Regulation during Pressure Control (Figure 7.3-12)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
64	Main Steam System (MSS)	Steam Generator MSRCV Regulation during Standby Position Control (Figure 7.3-12)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
65	Safeguard Building Controlled-Area Ventilation System (SBVS)	SIS/RHRS Pump Rooms Heat Removal (Figure 7.3-46)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
66	Safeguard Building Controlled-Area Ventilation System (SBVS)	CCWS/EFWS Valve Rooms Heat Removal (Figure 7.3-47)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
67	Safeguard Building Controlled-Area Ventilation System (SBVS)	Isolation of Mechanical Areas of Safeguard Building on Containment Isolation (Figure 7.3-65)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions/trains provide safety function.	
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division/train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
68	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply and Recirculation Exhaust Air Flow Control (Figure 7.3-48)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
69	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Fan Safe Shut-off (Figure 7.3-49)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
70	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Recirculation Fan Safe Shut-off (Figure 7.3-50)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
71	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Exhaust Fan Safe Shut-off (Figure 7.3-51)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
72	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Heater Control (Figure 7.3-52)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
73	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Freeze Protection (Figure 7.3-53)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
74	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Supply Air Temperature Control for Supply Air Cooling (Figure 7.3-54)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
75	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Heater Control (Figure 7.3-56)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
76	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Battery Room Supply Air Temperature Control (Figure 7.3-57)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
77	Electrical Division of Safeguard Building Ventilation System (SBVSE)	Emergency Feed Water System (EFWS) Pump Room Heat Removal (Figure 7.3-58)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
78	Electrical Division of Safeguard Building Ventilation System (SBVSE)	SBVSE CCWS Pump Room Heat Removal (Figure 7.3-59)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
79	Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Loss of Pump/Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-5)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant cross-tied train sets	The error in the faulted division is alarmed. Loss of one cross-tied train set. One remaining cross-tied train set provides safety function.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	
80	Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-6)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant cross-tied train sets	The error in the faulted division is alarmed. Loss of one cross-tied train set. One remaining cross-tied train set provides safety function.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	
81	Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-7)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant cross-tied train sets	The error in the faulted division is alarmed. Loss of one cross-tied train set. One remaining cross-tied train set provides safety function.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
82	Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Loss of Pump/Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-8)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant cross-tied train sets	The error in the faulted division is alarmed. Loss of one cross-tied train set. One remaining cross-tied train set provides safety function.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Two redundant cross-tied train sets	Loss of one division / train. Unable to perform automatic SCWS train switchover function for the faulted cross-tied train set. One remaining cross-tied train set provides the safety function.	
83	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic RHRS Flow Rate Control (Figure 7.3-60)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.	
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / train. Three remaining divisions / trains provide safety function.	
Systems With Functions Within 2 Redundant Train Sets								
84	Annulus Ventilation System (AVS)	Accident Filtration Train Heater Control (Figure 7.3-31)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
85	Annulus Ventilation System (AVS)	Accident Train Switchover (Figure 7.3-32)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
86	Component Cooling Water System (CCWS)	SCWS Condenser Supply Water Flow Control (Figure 7.3-37)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
87	Fuel Building Ventilation System (FBVS)	Safety-Related Room Heater Control (Figure 7.3-39)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
88	Fuel Building Ventilation System (FBVS)	FBVS EBS / FPCS Pump Rooms Heat Removal (Figure 7.3-40)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
89	Fuel Building Ventilation System (FBVS)	Isolation of the Fuel Pool Hall (Figure 7.3-67)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	None	Loss of one train set. One remaining train set provides safety function.	
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
90	Fuel Building Ventilation System (FBVS)	Isolation of the Emergency Airlock and Equipment Hatch (Figure 7.3-68)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
91	Fuel Pool Cooling and Purification System (FPCPS)	FPCPS Pump Trip on Low Spent Fuel Pool (SFP) Level (Figure 7.3-41)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
92	Main Control Room Air Conditioning System (CRACS)	Iodine Filtration Train Heater Control (Figure 7.3-42)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	
93	Main Control Room Air Conditioning System (CRACS)	Heater Control for Outside Inlet Air (Figure 7.3-43)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	One train set remains functional
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one train set. One remaining train set provide safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one train set. One remaining train set provides safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
94	Safeguard Building Controlled-Area Ventilation System (SBVS)	Iodine Filtration Train Electric Heater Control (Figure 7.3-66)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one train pair. One remaining train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. One remaining train set provides safety function.	
Systems With Functions Utilizing Voting Logic								
95	In-Containment Refueling Water Storage Tank System (IRWST)	IRWST Boundary Isolation for Preserving IRWST Water Inventory Interlock (Figure 7.6-4)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Redundant divisions/ trains	Loss of Master CU and Standby CU in faulted division. Voting logic in other divisions is modified to 2/3.	No effects on the system function
				b) Undetected - Spurious	None	Redundant divisions/ trains	One division sends a spurious actuation. Voting logic in other divisions becomes 1/3.	
				c) Undetected - Blocking	None	Redundant divisions/ trains	Loss of Master CU and Standby CU in faulted division. Voting logic in other divisions becomes 2/3.	
96	Deleted							
97	Deleted							
CCWS Switchover Functions								
98	Component Cooling Water System (CCWS)	CCWS Common 1.b Automatic Backup Switchover of Train 1 to Train 2 and Train 2 to Train 1 (Figure 7.3-33)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Failed sensor marked invalid; two redundant train pairs.	Unable to automatically perform switchover function in the faulted division.	A second pair serves its associated heat loads. Adequate cooling is provided by the second train pair.
				b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one pilot valve. Remaining pilot valves provide safety function.	
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. Remaining pilot valves provide safety function.	
99	Component Cooling Water System (CCWS)	CCWS Common 2.b Automatic Backup Switchover of Train 3 to Train 4 and Train 4 to Train 3 (Figure 7.3-33)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Failed sensor marked invalid; two redundant train pairs.	Unable to automatically perform switchover function in the faulted division.	A second pair serves its associated heat loads. Adequate cooling is provided by the second train pair
				b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one pilot valve. Remaining pilot valves provide safety function.	
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. Remaining pilot valves provide safety function.	

Table 7.1-7—SAS FMEA Results
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No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
100	Component Cooling Water System (CCWS)	CCWS Emergency Leak Detection – Switchover Valves Leakage or Failure (Figure 7.3-36)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Failed sensor marked invalid; two redundant train pairs.	Unable to automatically perform switchover function in the faulted division.	A second pair serves its associated heat loads. Adequate cooling is provided by the second train pair
				b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one pilot valve. Remaining pilot valves provide safety function.	
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. Remaining pilot valves provide safety function.	
101	Component Cooling Water System (CCWS)	CCWS Switchover Valves Interlock (Figure 7.6-1)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Failed sensor marked invalid; two redundant train pairs.	Unable to automatically perform switchover function in the faulted division.	A second pair serves its associated heat loads. Adequate cooling is provided by the second train pair
				b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one pilot valve. Remaining pilot valves provide safety function.	
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. Remaining pilot valves provide safety function.	
CCWS RCP Thermal Barrier Interlock Function								
102	Component Cooling Water System (CCWS)	CCWS RCP Thermal Barrier Containment Isolation Valve Interlock (Figure 7.6-2)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets in two divisions	The failed division's valves fail as-is. The other division provides the interlock function.	No effects on the system function.
				b) Undetected - Spurious	None	Two redundant train sets	Unable to automatically perform safety function in the faulted division and train set. Loss of 1 train set, redundant train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Unable to close valves in the faulted division. Other divisions isolate the faulted division's train set. Redundant train set provides safety function.	
103	Component Cooling Water System (CCWS)	CCWS RCP Thermal Barrier Containment Isolation Valves Opening Interlock (Figure 7.6-12).	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant train sets in two divisions	The failed division's valves fail as-is. The other division provides the interlock function.	No effects on the system function.
				b) Undetected - Spurious	None	Two redundant train sets	Unable to automatically perform safety function in the faulted division and train set. Loss of 1 train set, redundant train set provides safety function.	
				c) Undetected - Blocking	None	Two redundant train sets	Unable to close valves in the faulted division. Other divisions isolate the faulted division's train set. Redundant train set provides safety function.	

Table 7.1-7—SAS FMEA Results
Sheet 28 of 28

No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SAS Function	Comments
All SAS Functions								
104	All systems for which SAS performs a function.	All SAS functions	Standby CU in 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Master/Standby CU configuration.	None - Master CU in affected division remains functional	No effects on the system function
				b) Undetected - Spurious	None	Master/Standby CU configuration.	None - Master CU in affected division remains functional	
				c) Undetected - Blocking	None	Master/Standby CU configuration.	None - Master CU in affected division remains functional	

Notes:

1. Failure Mode – The failure cause is not identified in the system-level analysis. The failure modes are selected to bound the results of any specific failure cause. Specific failure causes can be identified only after specific equipment is selected and application software is developed.

2. This FMEA has been analyzed for loss of a CU and loss of a division failure. These types of failures encompass any single failure within a division, (i.e. loss of a sensor, hardwired logic failure / fault).

Next File