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	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 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.	
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 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
9	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	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.	
10	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	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.	
11	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.	
12	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.	

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
13	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.	
14	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.	
15	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.	
16	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.	

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
17	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.	
18	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.	
19	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.	
20	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.	

Table 7.1-7—SAS FMEA Results
Sheet 6 of 26

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
21	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.	
22	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.	
23	Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Low Evaporator Flow / Chiller Black Box Internal Fault / 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 and the error 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
Sheet 7 of 26

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
24	Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Low Evaporator Flow / Chiller Black Box Internal Fault / 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 and the error 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.	
25	Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Low Evaporator Flow / Chiller Black Box Internal Fault / 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 and the error 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
26	Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Low Evaporator Flow / Chiller Black Box Internal Fault / 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 and the error 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.	
27	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.	
Systems With Functions Within 2 Redundant Train Sets								
28	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	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
29	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.	
30	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.	
31	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.	
32	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.	

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	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.	
34	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.	
35	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.	
36	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
37	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.	
CCWS Switchover Functions								
38	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 and the error is alarmed. Loss of one train set. One remaining train set provides safety function.	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.	
39	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 and the error is alarmed. Loss of one train set. One remaining train set provides safety function.	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	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 and the error is alarmed. Loss of one train set. One remaining train set provides safety function.	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	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 and the error is alarmed. Loss of one train set. One remaining train set provides safety function.	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.	
CCWS RCP Thermal Barrier Interlock Function								
42	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 and the function remains operable. The function operates differently because a division cannot actuate the devices in another division after the master/ standby CU switchover occurs.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	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 and two CU pairs per division, one CU pair per train set	Loss of two CIVs. The remaining valves and train set provides safety function.	
43	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 and the function remains operable. The function operates differently because a division cannot actuate the devices in another division after the master/ standby CU switchover occurs.	No effects on the system function
				b) Undetected - Spurious	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	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 and two CU pairs per division, one CU pair per train set	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								
44	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.	
45	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low ΔPsat (Figure 7.6-9)	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.	
46	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low-Low RCS Loop Level (Figure 7.6-10)	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.	
Systems With Functions in 4 Division/Trains								
47	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.	

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
48	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.	
49	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.	
50	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 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.	
51	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.	

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
52	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.	
53	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.	
54	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.	
55	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
56	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.	
57	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.	
58	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.	
59	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
60	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.	
61	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.	
62	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.	
63	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.	

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
64	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.	
65	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.	
66	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.	
67	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.	

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
68	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.	
69	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.	
70	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
71	Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Low Evaporator Flow / Chiller Black Box Internal Fault / 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.	
72	Safety Chilled Water System (SCWS)	SCWS Train 2 to Train 1 Switchover on Train 2 Low Evaporator Flow / Chiller Black Box Internal Fault / 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.	
73	Safety Chilled Water System (SCWS)	SCWS Train 3 to Train 4 Switchover on Train 3 Low Evaporator Flow / Chiller Black Box Internal Fault / 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
Sheet 21 of 26

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
74	Safety Chilled Water System (SCWS)	SCWS Train 4 to Train 3 Switchover on Train 4 Low Evaporator Flow / Chiller Black Box Internal Fault / 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.	
75	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								
76	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	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.	
77	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	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
78	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	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.	
79	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	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.	
80	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	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.	
81	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	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
82	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	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.	
83	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	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.	
Systems With Functions Utilizing Voting Logic								
84	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.	
85	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low ΔPsat (Figure 7.6-9)	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.	

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	Safety Injection and Residual Heat Removal System (SIS/ RHRS)	Automatic Trip of LHSI Pump (in RHR Mode) on Low-Low RCS Loop Level (Figure 7.6-10)	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.	
CCWS Switchover Functions								
87	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. Loss of 1 train pair	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	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
				c) Undetected - Blocking	None	Two redundant trains pairs	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
88	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. Loss of 1 train pair	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	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
				c) Undetected - Blocking	None	Two redundant trains pairs	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
89	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. Loss of 1 train pair	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	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
				c) Undetected - Blocking	None	Two redundant trains pairs	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	

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	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. Loss of 1 train pair	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	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
				c) Undetected - Blocking	None	Two redundant trains pairs	Unable to automatically perform switchover function in the faulted division. Loss of 1 train pair	
CCWS RCP Thermal Barrier Interlock Function								
91	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.	In each division one CU pair will detect one train set and provide the necessary actuations. The other CU pair in a division will detect the other train set and provide it's necessary actuations. This provides additional reliability, because if one CU is inoperable in a division, the system can still perform its interlock function. An undetected failure of a whole division for this function would be an undetected failure of multiple CU pairs in a division, which is beyond a single failure and over conservative. Therefore a undetected failure of a whole division is not considered for this function.
				b) Undetected - Spurious	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	See Comments.	
				c) Undetected - Blocking	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	See Comments.	

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
92	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.	In each division one CU pair will detect one train set and provide the necessary actuations. The other CU pair in a division will detect the other train set and provide it's necessary actuations. This provides additional reliability, because if one CU is inoperable in a division, the system can still perform its interlock function. An undetected failure of a whole division for this function would be an undetected failure of multiple CU pairs in a division, which is beyond a single failure and over conservative. Therefore a undetected failure of a whole division is not considered for this function.
				b) Undetected - Spurious	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	See Comments.	
				c) Undetected - Blocking	None	Two redundant train sets and two CU pairs per division, one CU pair per train set	See Comments.	
All SAS Functions								
93	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).