# Table 7.1-7—SAS FMEA Results Sheet 1 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	
				Systems W	ith Functions in 4 Divis	sions / Trains			
1	Fuel Building Ventilation System (FBVS)	Isolation of FBVS on Containment Isolation	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	
		(Figure 7.3-62)		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	Residual Heat Removal System (SIS/	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	
	RHRS)			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	Ventilation System	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	
	(SBVSE)			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)	ling CCWS Emergency Temperature Control (Figure 7.3-34)	Temperature Control	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 2 of 28

	1		1									
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											
	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.					
	Emergency Feedwater System (EFWS)		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.					
	Essential Service Water System (ESWS)	Safeguard Building	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				
		(Figure 7.3-69)	.3-69)	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.					
	Water Pump Building Pump Rooms	Building Pump Rooms /stem Temperature Control	Pump Rooms	Pump Rooms Temperature Control	Pump Rooms Temperature Control	Pump Rooms	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
			:e 7.3-38)	b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.					
			c	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 3 of 28

r	o 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	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							
		(Figure 7.3-12)		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	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							
		(Figure 7.3-12)	.3-12)	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	SIS/RHRS Pump Rooms Heat Remova (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							
	(SBVS)			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	Isolation of Mechanical Areas of Safeguard Building on Containment Isolation (Figure 7.3-65)	Mechanical Areas of	Mechanical Areas of	Mechanical Areas of	a Mechanical Areas of tem Safeguard Building	Mechanical Areas of	Mechanical Areas of	Mechanical Areas of	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
	(SBVS)		ation	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 4 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
14	Ventilation System	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
	(SBVS)			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	Ventilation System	Supply and Recirculation Exhaust Air Flow	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
	(SBVSE) Cont	Control (Figure 7.3-48)	7.3-48)	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	Supply Fan Safe Shut- off (Figure 7.3-49)	1 Division igure 7.3-49)	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
	(SBVSE)			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 (Figure 7.3-50)	lding Safe Shut-off 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
	(SBVSE)			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 5 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
18	Ventilation System	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
	(SBVSE)			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		Supply Air Temperature Heater Control	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
	(SBVSE)	(Figure 7.3-52)	3-52)	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	Ventilation System	Freeze Protection (Figure 7.3-53)		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
	(SBVSE)			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	Safeguard Building Ventilation System	Supply Air Temperature Control for Supply Air	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
	(SBVSE)	Cooling (Figure 7.3-54)		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 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
22	Ventilation System	Battery Room Heater Control (Figure 7.3-56)	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
	(SBVSE)			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		uard Building Air Temperature	Air Temperature 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
	(SBVSE)	(Figure 7.3-57)	57)	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 BuildingEmergency Feed Water SystemVentilation System(EFWS) Pump Room	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	
	(SBVSE)	Heat Removal (Figure 7.3-58)	7.3-58)	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 Res	sults
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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
25	5 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	in 2 Switchover1 DivisionTrain 1 Loss ofmp/Loss of ChillerCWS Chilleraporator Water	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
		Re-start Failure (Figure 7.6-5)		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)	CWS) Train 1 Switchover 1 Division on Train 2 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water		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
	Re-start 1	Flow Control / LOOP Re-start Failure (Figure 7.6-6)		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	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	System (SCWS) Train 4 Switcho on Train 3 Loss Pump/Loss of C / Loss of UHS-C / SCWS Chiller Evaporator Wat Flow Control / I Re-start	Evaporator Water	itchover 1 Division Loss of of Chiller HS-CCWS niller	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	System (SCWS)		Train 3 Switchover 1 Division on Train 4 Loss of Pump/Loss of Chiller / SCWS Chiller Evaporator Water Flow Control / LOOP Re-start Failure (Figure 7.6-8)	a) Detected Failure	TXS inherent or engineered fault detection mechanism	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	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 9 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
29	Safety Injection and Residual Heat Removal System (SIS/	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
	RHRS)			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	0	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 F	unctions Within 2 Redu	undant Train Sets		
31		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 Sheet 10 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
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	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	
		(Figure 7.3-37)		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	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
		(Figure 7.3-40)		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 Sheet 11 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					
37	Ventilation System	ilation System Pool Hall 1 division	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	Ventilation System (FBVS)	Isolation of the Emergency Airlock and Equipment	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					
		Hatch (Figure 7.3-68)					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	Purification System	FPCPS Pump Trip on Ma Low Spent Fuel Pool 1 I (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					
			(Figure 7.3-41)	(Figure 7.3-41)	(Figure 7.3-41)	(Figure 7.3-41)	(Figure 7.3-41)	(Figure 7.3-41)		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.						
		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 Sheet 12 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		
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	Iodine Filtration Train Electric Heater Control	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		
	(SBVS)	(Figure 7.3-66)	(Figure 7.3-66)	(Figure 7.3-66)	,ure 7.3-66)	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.			
				C	CWS Switchover Functi	ons				
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 R	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.	

				Sileet 14 01 20						
No	System	SAS Function	Name of Sensor, Functional Unit, or Equipment (2)	Failure Mode (1)	Method of Detection	Inherent Compensating Provision	Effect on the SA			
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 sw Functionality that dependent information from other due to lost connection Functionality that does information from other operable.			
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one Three remaining division provide safety function			
				c) Undetected - Blocking	None	Two redundant train sets	Loss of one division/tra remaining divisions/tra safety function.			
				CCWS RCF	P Thermal Barrier Interle	ock 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 sw Functionality that dependent information from other due to lost connection Functionality that does information from other operable.			
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one system automatically sy the other train pair. Th performs the safety fun			
				c) Undetected - Blocking	None	Two redundant train sets	Loss of two CIVs. The and train set provides s			
	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 sw Functionality that dependent information from other due to lost connection Functionality that does information from other operable.			
				b) Undetected - Spurious	None	Two redundant train sets	Spurious trigger of one system automatically sy the other train pair. Th performs the safety fun			
				c) Undetected - Blocking	None	Two redundant train sets	Loss of two CIVs. The and train set provides s			

# Table 7.1-7—SAS FMEA Results Sheet 14 of 28

AS Function	Comments
witchover occurs. bends on er divisions is lost n to CUs. es not depend on er CUs remains	No effects on the system function
e division/train. sions/trains n.	
rain. Three rains provide	
witchover occurs. bends on er divisions is lost in to CUs. es not depend on er CUs remains	No effects on the system function
e train pair. The switches over to he other train pair nction.	
e remaining valves safety function.	
witchover occurs. bends on er divisions is lost n to CUs. es not depend on er CUs remains	No effects on the system function
e train pair. The switches over to he other train pair nction.	
e remaining valves 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 SA
				Systems W	/ith Functions Utilizing	Voting Logic	1
50	In-Containment Refueling Water Storage Tank System (IRWST)	IRWST Boundary Isolation for Preserving IRWST Water Inventory	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 sw in faulted division. Voti 2/4 in faulted division. other divisions is modif
		Interlock (Figure 7.6-4)		b) Undetected - Spurious	None	Redundant divisions/ trains	Spurious trigger of one Voting in other divisior
				c) Undetected - Blocking	None	Redundant divisions/ trains	Loss of one division / tra other divisions becomes
51	Deleted						
52	Deleted						
				Systems	With Functions in 4 Div	ision/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 division provide safety function.
				b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one Three remaining divisio provide safety function.
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / tra remaining divisions / tra safety function.
54	Safety Injection and Residual Heat Removal System (SIS/	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 division provide safety function.
	RHRS)			b) Undetected - Spurious	None	Four redundant divisions/ trains	Spurious trigger of one Three remaining divisio provide safety function.
				c) Undetected - Blocking	None	Four redundant divisions/ trains	Loss of one division / tra remaining divisions / tra safety function.

AS Function	Comments
AS Function	Comments
switchover occurs oting logic remains a. Voting logic in lified to 2/3.	No effects on the system function
e division / train. ons becomes 1/3.	
train. Voting in les 2/3.	
sions / trains n.	No effects on the system function
e division / train. sions / trains m.	
train. Three trains provide	
sions / trains on.	No effects on the system function
e division / train. sions / trains m.	
train. Three trains provide	

# Table 7.1-7—SAS FMEA Results Sheet 16 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	
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 Sheet 17 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			
59	Water Pump Building Ventilation System	Temperature Control	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			
	(ESWPBVS)	(Figure 7.3-38)		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	Water System (ESWS)	Safeguard Building	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			
		(Figure 7.3-69)	(Figure 7.3-69)	(Figure 7.3-69)	(Figure 7.3-69)		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	Air Conditioning	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		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 Sheet 18 of 28

			Name of Sensor, Functional Unit, or			Inherent Compensating					
No	System	SAS Function	Equipment (2)	Failure Mode (1)	Method of Detection	Provision	Effect on the SAS Function	Comments			
63	Main Steam System (MSS)	Steam Generator MSRCV Regulation during Pressure	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			
		Control (Figure 7.3-12)		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	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			
		Position Control (Figure 7.3-12)			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	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			
	(SBVS)		VS)	VS)		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	rolled-Area Rooms Heat Removal (Figure 7.3-47) (S) b) Un	Rooms Heat Removal	ea Rooms Heat Removal	ontrolled-Area Rooms Heat Removal	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
	(SBVS)		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 R	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	Isolation of Mechanical Areas of Safeguard Building	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.									
	(SBVS)	on Containment Isolation (Figure 7.3-65)		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.									
	Electrical Division of Safeguard Building Ventilation System	Supply and Recirculation Exhaust Air Flow	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								
	(SBVSE)	Control (Figure 7.3-48)			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.								
	Safeguard Building Ventilation System	f Supply Fan Safe Shut- off (Figure 7.3-49)		off	off	off	off	off	off	off	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
	(SBVSE)				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		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								
	(SBVSE)		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 20 of 28

			Name of Sensor, Functional Unit, or			Inherent Compensating						
No	System	SAS Function	Equipment (2)	Failure Mode (1)	Method of Detection	Provision	Effect on the SAS Function	Comments				
71	Electrical Division of Safeguard Building Ventilation System	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				
	(SBVSE)			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	Supply Air Temperature Heater Control	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				
	(SBVSE)	(Figure 7.3-52)	(Figure 7.3-52)	(Figure 7.3-52)	(Figure 7.3-52)	(Figure 7.3-52)	SE) (Figure 7.3-52) b) U	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	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				
	(SBVSE)				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	ard Building Temperature Control	afeguard Building Temperature Control	rd Building Temperature Control	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		
	(SBVSE)	Cooling (Figure 7.3-54)	ure 7.3-54)	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 21 of 28

			N ( 0	I	1			1					
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	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					
	(SBVSE)			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	Battery Room Supply Air Temperature Control	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					
	(SBVSE)	(Figure 7.3-57)	(Figure 7.3-57)	(Figure 7.3-57)	(Figure 7.3-57)	(Figure 7.3-57)		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	f Emergency Feed Water System (EFWS) Pump Room Heat Removal (Figure 7.3-58)	guard Building Water System tilation System (EFWS) Pump Room /SE) Heat Removal	uilding Water System System (EFWS) Pump Room Heat Removal (b) Undetected - Spurious None Four redu	Water System (EFWS) Pump Room	Water System (EFWS) Pump Room	ling Water System (EFWS) Pump Room	Loss of 1 Division	a) Detected Failure	0	Four redundant divisions/ trains	Three remaining divisions / trains provide safety function	No effects on the system function
	(SBVSE)				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	g Pump Room Heat	eguard Building Pump Room Heat	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				
	(SBVSE)	(Figure 7.3-59)		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 22 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		
79	Safety Chilled Water System (SCWS)	SCWS Train 1 to Train 2 Switchover on Train 1 Loss of Pump/Loss of Chiller	Train 2 Switchover on Train 1 Loss of Pump/Loss of Chiller	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	
		/ SCWS Chiller Evaporator Water Flow Control / LOOP Re-start		b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.			
		Failure (Figure 7.6-5)		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	) Train 1 Switchover on Train 2 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water	(SCWS) Train 1 Switchover on Train 2 Loss of Pump/Loss of Chiller	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.		
	Flow Control / LO Re-start Failure (Figure 7.6		Re-start	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	System (SCWS) Train on Tra Pump / Loss / SCW Evapo	Train 4 Switchover on Train 3 Loss of Pump/Loss of Chiller / Loss of UHS-CCWS / SCWS Chiller Evaporator Water	Train 4 Switchover on Train 3 Loss of	Train 4 Switchover on Train 3 Loss of	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.			
		Flow Control / LOOP Re-start Failure (Figure 7.6-7)		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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			Name of Sensor,								
No	System	SAS Function	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	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			
		/ SCWS Chiller Evaporator Water Flow Control / LOOP Re-start		OP	<sup>7</sup> ater	b) Undetected - Spurious	None	Two redundant cross-tied train sets	Spurious trigger of one division / train. Three remaining divisions / trains provide safety function.		
		Failure (Figure 7.6-8)		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		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			
	RHRS)			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 F	unctions Within 2 Redu	undant 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) Ui	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)	Switchover	Switchover	em (AVS) Switchover	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 Sheet 24 of 28

N	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	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			
		(Figure 7.3-37)		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)	Pump Rooms Heat Removal	Pump Rooms Heat Removal	Pump Rooms Heat Removal	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
						(Figure 7.3-40) b) Undetected - Spurious None	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 Sheet 25 of 28

			Name of Sensor,								
No	System	SAS Function	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	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.				
		Hatch (Figure 7.3-68)		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	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			
		(Figure 7.3-41)	Figure 7.3-41)	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)	Train Heater Control	Train Heater Control	Train Heater Control	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	93 Main Control Room Air Conditioning System (CRACS)	Conditioning Outside Inlet Air	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.				

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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
94	Safeguard Building Controlled-Area Ventilation System	Iodine Filtration Train Electric Heater Control	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Two redundant divisions/ trains	Loss of one train set. On train set provides safety :
	(SBVS)	(Figure 7.3-66)		b) Undetected - Spurious	None	Two redundant divisions/ trains	Spurious trigger of one the remaining train set prove function.
				c) Undetected - Blocking	None	Two redundant divisions/ trains	Loss of one train set. On train set provides safety
				Systems W	ith Functions Utilizing	Voting Logic	
95	In-Containment Refueling Water Storage Tank System	IRWST Boundary Isolation for Preserving IRWST	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	Redundant divisions/ trains	Loss of Master CU and S faulted division. Voting divisions is modified to 2
	(IRWST)	Water Inventory Interlock (Figure 7.6-4)		b) Undetected - Spurious	None	Redundant divisions/ trains	One division sends a spur Voting logic in other div 1/3.
				c) Undetected - Blocking	None	Redundant divisions/ trains	Loss of Master CU and S faulted division. Voting divisions becomes 2/3.
96	Deleted						
97	Deleted						
				C	CWS Switchover Functi	ons	
98	Component Cooling Water System (CCWS)	CCWS Common 1.b Automatic Backup Switchover of Train 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 switchover function in t division.
		to Train 2 and Train 2 to Train 1 (Figure 7.3-33)		b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one p Remaining pilot valves p function.
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. I valves provide safety fun
99	Component Cooling Water System (CCWS)	CCWS Common 2.b Automatic Backup Switchover of Train 3		a) Detected Failure	TXS inherent or engineered fault detection mechanism	Failed sensor marked invalid; two redundant train pairs.	Unable to automatically switchover function in t division.
		to Train 4 and Train 4 to Train 3 (Figure 7.3-33)		b) Undetected - Spurious	None	Two redundant trains pairs	Spurious trigger of one p Remaining pilot valves p function.
				c) Undetected - Blocking	None	Two redundant trains pairs	Loss of one pilot valve. H valves provide safety fun

# Table 7.1-7—SAS FMEA Results Sheet 26 of 28

AS Function	Comments
One remaining ty function.	No effects on the system function
e train pair. One ovides safety	
One remaining ty function.	
l Standby CU in ng logic in other o 2/3.	No effects on the system function
purious actuation. livisions becomes	
l Standby CU in ng logic in other	
ly perform	A second pair serves its associated
n the faulted	heat loads. Adequate cooling is provided by the second train pair.
e pilot valve. s provide safety	
. Remaining pilot function.	
ly perform n the faulted	A second pair serves its associated heat loads. Adequate cooling is provided by the second train pair
e pilot valve. s provide safety	
. Remaining pilot 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	Water System Leak De (CCWS) Switcho Leakage	CCWS Emergency Leak Detection – Switchover Valves	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	invalid; two redundant	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
		Leakage or Failure (Figure 7.3-36)		b) Undetected - Spurious	None	_	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	Water System Valves Inte	CCWS Switchover Valves Interlock (Figure 7.6-1)	Loss of 1 Division	a) Detected Failure	TXS inherent or engineered fault detection mechanism	invalid; two redundant	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		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 RCF	P Thermal Barrier Interlo	ock Function		
102 Component Coo Water System (CCWS)	-	ng CCWS RCP Thermal Barrier Containment Isolation Valve Interlock (Figure 7.6-2)	e	a) Detected Failure	TXS inherent or engineered fault detection mechanism		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		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		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 Coolin Water System (CCWS)	2	g 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		The failed division's valves fail as-is. The other division provides the interlock function.	
				b) Undetected - Spurious	None		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		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		Master/Standby CU configuration.	None - Master CU in affected division remains functional	No effects on the system function			
				b) Undetected - Spurious		Master/Standby CU configuration.	None - Master CU in affected division remains functional				
				c) Undetected - Blocking		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).

<u>Next File</u>