Component	Function	FSSD	HSD	CSD	Comments / Discussion
826	Control Building Ventilation and Cooling is required to maintain cooling of safe shutdown equipment in the control tower (e.g. electrical buses).	No	-	-	Testing and analysis have been completed which demonstrate that acceptable equipment operating conditions for safe shutdown can be maintained by de-energizing one half of the control room AC lighting and by opening the doors between inverter rooms and battery rooms within 24 hours (NOTE 5). Restoration of control building ventilation is not required to achieve safe shutdown. No circuit analysis is required because the same action will be performed in response to loss of control building ventilation in any area, and the mitigation strategy assumes it is lost in all areas.
831	Diesel Generator Bldg Ventilation is required to maintain cooling for the diesel generators.	No	-	-	Testing and analysis have been completed which demonstrate that acceptable equipment operating conditions for EG-Y-1A or EG-Y-1B can be maintained by opening doors, which allows the EDG radiator fan to draw sufficient air to maintain room ambient temperature less than 120°F (NOTE 5). No circuit analysis is required because the same action will be performed in response to loss of diesel room ventilation in any area, and the mitigation strategy assumes it is lost in all areas.
838	ISPH ventilation is required to maintain cooling for safe shutdown required river water pump motors.	No	-	-	Portable ventilation can provide adequate cooling if neither ventilation & cooling train is operable.
AH-E-15A AH-E-15B	Decay Closed Pump & NSCCW Pump Area Ventilation	No	-	-	Testing and analysis have been completed which demonstrate that acceptable equipment operating conditions for safe shutdown can be maintained without these cooling units. (NOTE 5). Restoration of DC/NSCCW Pump Area Ventilation is not required to achieve safe shutdown.
AH-E-24A AH-E-24B	EFW Pump Area Ventilation	No	-	-	Testing and analysis have been completed which demonstrate that acceptable equipment operating conditions for safe shutdown can be maintained without these cooling units (NOTE 5). Restoration of EFW area ventilation is not required to achieve safe shutdown.
AS-V-4	The valve provides a steam supply to operate EF-P-1 when the OTSG are not available.	No	-	-	This valve is a stop check valve. The check valve feature prevents loss of steam even if the valve spuriously opens. It is normally closed, but no action is needed if it spuriously opens.
BS-P-1A	If the Building Spray (BS) system inadvertently actuates, then the pump must be shutdown to minimize the loss of BWST inventory.	Yes	X	-	This function is only required in fire areas where the fire could cause an inadvertent BS system actuation (i.e. valves open and pump starts).
BS-P-1B	Same as BS-P-1A	Yes	X	-	Same remark as BS-P-1A
BS-PS-283	Measure high-high Reactor Building pressure	No (S)	-	-	Degradation of at least two of three instruments (BS-PS-283, BS-PS-286, and BS-PS-289) coincidental with an “A” HPI actuation or “A” 30 psig RB isolation will start BS-P-1A.
BS-PS-284	Measure high-high Reactor Building pressure	No (S)	-	-	Degradation of at least two of three instruments (BS-PS-284, BS-PS-287, and BS-PS-290) coincidental with a “B” HPI actuation or “B” 30 psig RB isolation will start BS-P-1B.
BS-PS-286	Same as BS-PS-283	No (S)	-	-	Same remark as BS-PS-283.
BS-PS-287	Same as BS-PS-284	No (S)	-	-	Same remark as BS-PS-284.
BS-PS-289	Same as BS-PS-283	No (S)	-	-	Same remark as BS-PS-283.
BS-PS-290	Same as BS-PS-284	No (S)	-	-	Same remark as BS-PS-284.
BS-PS-932	Measure high-high Reactor Building pressure	No (S)	-	-	Degradation of at least two of three instruments (BS-PS-932, BS-PS-933, and BS-PS-934) could cause actuation of the Reactor Building isolation for “A” train components (IC-V-3 and IC-V-4).
BS-PS-933	Same as BS-PS-932	No (S)	-	-	Same remark as BS-PS-932.
BS-PS-934	Same as BS-PS-932	No (S)	-	-	Same remark as BS-PS-932.
BS-PS-935	Measure high-high Reactor Building pressure.	No (S)	-	-	Degradation of at least two of three instruments (BS-PS-935, BS-PS-936, and BS-PS-937) could cause actuation of the Reactor Building Isolation for “B” train components (IC-V-2 and IC-V-4).
BS-PS-936	Same as BS-PS-935	No (S)	-	-	Same remark as BS-PS-935.
BS-PS-937	Same as BS-PS-935.	No (S)	-	-	Same remark as BS-PS-935.
BS-PT-1186	Provide Reactor Building Pressure indication and HSPS input	No	-	-	Containment Pressure Train A - Same remark as FW-LT-1040.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
BS-PT-1187	Same as BS-PT-1186	No	-	-	Containment Pressure Train B - Same remark as FW-LT-1040.
BS-PT-1188	Same as BS-PT-1186	No	-	-	Containment Pressure Train C - Same remark as FW-LT-1040.
BS-PT-1189	Same as BS-PT-1186	No	-	-	Containment Pressure Train D - Same remark as FW-LT-1040.
BS-PT-282	Provide Reactor Building Pressure indication and ESAS input	No (S)	-	-	Degradation of at least two instruments could lead to “A” and “B” train HPI actuation.
BS-PT-285	Same as BS-PT-282	No (S)	-	-	Same remark as BS-PT-282.
BS-PT-288	Same as BS-PT-282	No (S)	-	-	Same remark as BS-PT-282.
BS-V-3A	Prevent loss of reactor coolant during decay heat system operation. Valve must be closed before DH removal is initiated.	Yes	-	X	If fire causes spurious opening (ESAS signal or hot short), this valve on DH pump suction header must be manually closed to prevent loss of RCS inventory. Action must be completed before opening DH-V-1 or 2 to initiate DH removal to reach cold shutdown.
BS-V-3B	Same function as BS-V-3A	Yes	-	X	Same remark as BS-V-3A.
CF-V-1A	Core Flood Tank A Outlet isolation Valve This valve must be closed to complete cooldown to cold shutdown.	Yes	-	X	Failure to close CF-V-1A & CF-V-1B during a cooldown would not adversely affect the ability to achieve cold shutdown. However, for fires in Appendix R III.G.3 fire areas, there is a requirement to reach cold shutdown within 72 hours. In these fire areas, these valves must be closed (remotely or locally) to permit continued depressurization of RCS. See NOTE 3.
CF-V-1B	Core Flood Tank B Outlet isolation Valves This valve must be closed to complete cooldown to cold shutdown.	Yes	-	X	Same remark as CF-V-1A. See NOTE 3.
CO-LI-1004	Provide local indication of the condensate storage tank A water level.	Yes	X	X	CST A Tank Level
CO-LI-1005	Provide local indication of the condensate storage tank B water level.	Yes	X	X	CST B Tank Level
CO-LT-1060	Provide condensate storage tank A level indication.	No	-	-	CST A Level (Train A) - One indication for each tank is desirable. These instruments are not required. Local indicators CO-LI-1004 and CO-LI-1005 are relied upon for lineup to alternate EFW sources.
CO-LT-1061	Same as CO-LT-1060.	No	-	-	CST A Level (Train B) - Same remark as CO-LT-1060.
CO-LT-1062	Provide condensate storage tank B level indication.	No	-	-	CST B Level (Train A) - Same remark as CO-LT-1060.
CO-LT-1063	Same as CO-LT-1062.	No	-	-	CST B Level (Train B) - Same remark as CO-LT-1060.
CO-P-1A, CO-P-1B, CO-P-1C	Prevent OTSG overfill	Yes	-	X	Tripping of the condensate pumps is one method to prevent OTSG overfill. The condensate pumps are tripped immediately from the Main Control Room for fires in III.G.3 areas. This method is a backup to tripping the Main FW pumps (HSD), and supports plant cooldown (CSD). See remarks for FW-V-5A.
CO-P-2A, CO-P-2B, CO-P-2C	Prevent OTSG overfill	Yes	-	X	Tripping of the condensate booster pumps is one method to prevent OTSG overfill. The condensate booster pumps are tripped immediately from the Main Control Room for fires in III.G.3 areas. This method is a backup to tripping the Main FW pumps (HSD), and supports plant cooldown (CSD). See remarks for FW-V-5A
CO-T-1A & B	Condensate supply for EFW	Yes	X	X	At minimum level of 16 feet, the total volume exceeds the condensate requirement for 72 hours. No additional supply is required.
CO-V-7	Valve must remain closed to prevent loss of CO-T-1A/B inventory to the hotwell.	No (S)	-	-	See remarks for CO-V-8

Component	Function	FSSD	HSD	CSD	Comments / Discussion
CO-V-8	Valve must remain closed to prevent inadvertent transfer of CO-T-1B inventory to the hotwell.	Yes	X	X	If fire causes CO-V-7 or CO-V-8 to fail open concurrent with spurious opening of CO-V-111A, CO-T-1A and CO-T-1B will drain to the condenser hotwell. CO-V-8 and CO-V-108 will be locally closed within an hour to ensure sufficient inventory remains directly available to EFW. After condenser vacuum is eliminated, CO-V-8 can be re-opened to allow EFW to utilize the water which was transferred to the hotwell. CB-FA-1 is the only fire zone where CO-V-111A and IA are both affected. CO-V-111A is not affected by a fire in TB-FA-1.
CO-V-10A	This valve must remain open to provide Condensate Storage Tank “A” supply to emergency feedwater.	No	-	-	These motor operated valves are normally open and the breaker is maintained open.
CO-V-10B	This valve must remain open to provide Condensate Storage Tank “B” supply to emergency feedwater.	No	-	-	Same remark as CO-V-10A.
CO-V-12	This valve is normally closed in series with normally closed valve, CO-V-14A between the EFW suction header and the hotwell.	No	-	--	These are two closed valves in series. A single hot short would have no effect on the EFW condensate supply.
CO-V-13	This valve is normally open in series with normally open valve, CO-V-14B and CO-V-8, between the EFW suction header and the hotwell. This valve is closed in the event of a fire to prevent inadvertent transfer to the hotwell.	No	-	-	This valve is used to isolate CO-V-8 and CO-V-7 and prevent inadvertent transfer from CO-T-1B to the hotwell. This action is not credited due to BOP power source. See CO-V-8 remarks.
CO-V-14A	This valve is normally closed in series with normally closed valve, CO-V-12 between the EFW suction header and the hotwell.	No	-	-	These are two closed valves in series. A single hot short would have no effect on the EFW condensate supply.
CO-V-14B	This valve is normally open in series with normally open valve, CO-V-13 and CO-V-8, between the EFW suction header and the hotwell.	No	-	-	The position of this valve cannot adversely affect the EFW condensate supply. If the valve spuriously closes, the condensate supply to EFW is protected.
CO-V-108	Closed to isolate CO-V-7, if the flow path is not isolated by CO-V-13	Yes	X	-	See remarks for CO-V-8
CO-V-111A	This valve is normally closed in series with CO-V-111B in the Condensate Cross Connect line.	No	-	-	EFW condensate supply from CO-T-1A and CO-T-1B can be fully utilized with CO-V-111A and CO-V-111B open or closed.
CO-V-111B	This valve is normally open in series with CO-V-111A in the Condensate Cross Connect line.	No	-	-	Same remark as CO-V-111A.
DC-P-1A	Pump is required to operate to provide cooling water to the decay heat removal coolers, decay heat removal pumps, and makeup pumps MU-P-1A and MU-P-1C.	Yes	X	X	Only one DC pump is required to operate during shutdown. It must match the operating DH river water pump, decay heat pump, and makeup pump.
DC-P-1B	Same function as DH-P-1A.	Yes	X	X	Same remark as DC-P-1A.
DC-V-2A	This valve must be throttled to control DH Train A cooling after DH removal is initiated. (i.e. RCS heat removal).	Yes	-	X	This valve and DC-V-65A are throttled to control DH Train A heat removal rate. DC-V-2A electro-pneumatic valve fails open upon loss of power or instrument air. If spurious closure occurs or remote control failure occurs, the valve will be locally operated to support initiation of DH removal.
DC-V-2B	This valve must be throttled to control DH Train B cooling after DH removal is initiated. (i.e. RCS heat removal).	Yes	-	X	This valve and DC-V-65B are throttled to control DH Train B heat removal rate. DC-V-2B electro-pneumatic valve fails open upon loss of power or instrument air. If spurious closure occurs or remote control failure occurs, the valve will be locally operated to support initiation of DH removal.
DC-V-65A	Same as DC-V-2A	Yes	-	X	Same as DC-V-2A except that DC-V-65A fails closed on loss of power or air. If spurious opening or remote control failure occurs, the valve will be locally operated to support initiation of DH removal.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
DC-V-65B	Same as DC-V-2B	Yes	-	X	Same as DC-V-2B except that DC-V-65B fails closed on loss of power or air. If spurious opening or remote control failure occurs, the valve will be locally operated to support initiation of DH removal.
DF-LI-152	Provide local indication of the diesel fuel tank fuel level	No	-	-	Diesel Fuel Tank Level DF-T-1 contains sufficient fuel oil for operation of one emergency diesel generator for 7 days or both diesels for greater than 72 hours. Level indication is not required to achieve and maintain safe shutdown.
DF-LS-244A	Control the diesel generator A day tank pump operation.	Yes	X	X	DG Day Tank Level Control
DF-LS-244B	Control the diesel generator B day tank pump operation.	Yes	X	X	DG Day Tank Level Control
DF-P-1A	Transfer diesel fuel from the Diesel Fuel Tank, DF-T-1, to the diesel generator day tanks, DF-T-2A(B).	Yes	-	X	The diesel fuel transfer pumps are required only for long term scenarios to transfer diesel fuel to the day tank of the operating diesel generator.
DF-P-1B	Same as DF-P-1A	Yes	-	X	Same as DF-P-1A
DF-P-1C	Same as DF-P-1A	Yes	-	X	Same as DF-P-1A
DF-P-1D	Same as DF-P-1A	Yes	-	X	Same as DF-P-1A
DF-T-1	EG-Y-1A or B Diesel Fuel Storage Tank	Yes		X	Tech Spec. minimum level satisfies FSSD function
DF-T-2A	EG-Y-1A short term diesel fuel “Day tank”	Yes	X	X	
DF-T-2B	EG-Y-1B short term diesel fuel “Day tank”	Yes	X	X	
DH2-TE-1	Decay heat cooler outlet temperature indication is required to control the rate of RCS cooldown when the DH System is in service.	Yes	-	X	DH Cooler 1A Outlet Temperature - these instruments provide indication of the decay heat removal system temperature. They are required to monitor the coolant temperature when the DH System is in service. Only one set of inlet/outlet temperature indications is needed for safe shutdown. In FH-FZ-1 and FH-FZ-5, temporary local temperature indication can be used if required.
DH2-TE-2	Same as DH2-TE-1	Yes	-	X	DH Cooler 1B Outlet Temperature. Same remark as DH-2-TE-1.
DH6-TE-1	This temperature element provides DH suction temperature indication.	No	-	-	DH Pump 1A Inlet Header Temperature - These instruments are not required for safe shutdown. DH2-TE-1 & DH2-TE-2 provide adequate information for DH system operation.
DH6-TE-2	Same as DH6-TE-1.	No	-	-	DH Pump 1B Inlet Header Temperature. Same remark as DH6-TE-1. NOTE: Operability of DH-TI-980 is required by TS Table 3.5-4.
DH-DPT-802	Decay heat removal system flow.	No	-	-	The instrument is not required. DH flow is controlled locally using DH-V-19A or DH-V-19B. Local indication DH-FI-299A (B) can be used to support that operation.
DH-DPT-803	Same as DH-DPT-802	No	-	-	Same remark as DH-DPT-802. NOTE: Operability of DH-FI-803A is required by TS Table 3.5-4.
DH-FI-299A	Decay heat removal system flow indication	Yes	-	X	Local indication DH-FI-299A will be used to control DH system flow rate.
DH-FI-299B	Decay heat removal system flow indication	Yes	-	X	Local indication DH-FI-299B will be used to control DH system flow rate.
DH-LT-808	Provide indication of BWST water level.	Yes	X	X	BWST Level (Train A) – This is required to ensure availability of the primary source of makeup water for RC inventory and reactivity control. One BWST level indicator is required for shutdown. In the YARD area, a temporary indicator or another “repair” may be required.
DH-LT-809	Same as DH-LT-808	Yes	X	X	BWST Level (Train B) – Same remark as DH-LT-808.
DH-P-1A	Decay heat pump operation is required for RCS heat removal to complete cooldown to cold shutdown.	Yes	-	X	The DH pump available must have an available decay heat river water pump and decay heat closed cycle pump.
DH-P-1B	Same function as DH-P-1A.	Yes	-	X	Same remark as DH-P-1A.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
DH-T-1	Provides the borated water source for RCS makeup for leakages, transient losses and compensation for RCS fluid density change during cooldown.	Yes	X	X	Tech Spec. minimum level satisfies FSSD function
DH-V-1	Valve must be opened to initiate decay heat removal to reach cold shutdown.	Yes	-	X	DH-V-2 is closed with breaker open to eliminate potential spurious operation. If not remotely operable, DH-V-1 will be manually opened to imitate DH removal.
DH-V-2	1. This valve must remain closed to maintain RCS pressure boundary and protect DH from high pressure. This valve is an App R “high-low pressure boundary” valve. 2. Valve must be opened to initiate decay heat removal to reach cold shutdown.	Yes	-	X	DH-V-2 is closed with breaker open to eliminate potential spurious operation. If not remotely operable, DH-V-2 will be manually opened to imitate DH removal.
DH-V-3	Valve must be opened to initiate decay heat removal to reach cold shutdown.	Yes	-	X	DH-V-2 is closed with breaker open to eliminate potential spurious operation. This motor operated valve will be opened manually if required.
DH-V-4A	Valve must be opened to initiate decay heat removal to reach cold shutdown.	Yes	-	X	This motor operated valve will be opened manually if required.
DH-V-4B	Valve must be opened to initiate decay heat removal to reach cold shutdown.	Yes	-	X	This motor operated valve will be opened manually if required.
DH-V-5A	Valve must be closed during decay heat removal system operation to prevent filling RCS from BWST after RCS pressure is reduced to near atmospheric.	No	-	-	The position of this valve does not affect the ability to reach cold shutdown.
DH-V-5B	Same function as DH-V-5A	No	-	-	Same remark as DH-V-5A.
DH-V-6A	Valve must remain closed to prevent loss of BWST to the reactor sump or loss of RCS inventory when DHR is initiated.	No	-	-	Spurious operation of the valve has been eliminated by modification per ECR 08-00786.
DH-V-6B	Same function as DH-V-6A	No	-	-	Same remark as DH-V-6A.
DH-V-7A	Valve must be closed prior to initiating decay heat removal to prevent loss of RCS inventory through MU tank relief valve.	Yes	-	X	The valve will be closed manually if required prior to initiating DH removal. If a hot short caused DH-V-7A to spuriously open, then when DH removal is initiated, MU tank pressure would rise above MU tank design pressure and lift MU-RV-1. This occurs because DH pump discharge pressure is above 100 psig, a MU pump is operating and MU-V-36 & MU-V-37 are open.
DH-V-7B	Same function as DH-V-7A	Yes	-	X	Same remarks as DH-V-7A.
DH-V-12A	Valve must be opened to place A train of DH removal in service.	Yes	-	X	This manual valve is normally closed, and will be opened manually if required.
DH-V-12B	Valve must remain open to place B train of DH removal in service.	No	-	-	This manual valve is normally open.
DH-V-19A	This manual valve is throttled to control Decay Heat Removal flow.	No	-	-	ES standby position provides flow to reach CSD. Throttling is not required to reach CSD.
DH-V-19B	This manual valve is throttled to control Decay Heat Removal flow.	No	-	-	ES standby position provides flow to reach CSD. Throttling is not required to reach CSD.
DH-V-38A	DH-V-38A and DH-V-38B are normally closed valves which isolate the DH trains A & B.	No	-	-	Cross-tying the DH trains provides defense in depth but is not required.
DH-V-38B	Same function as DH-V-38A	No	-	-	Same remark as DH-V-38A

Component	Function	FSSD	HSD	CSD	Comments / Discussion
DH-V-64	Valve must be open to provide pressurizer spray capability while in decay heat removal mode.	No	-	-	Auxiliary pressurizer spray is not required to reach cold shutdown. Cold shutdown (< 200°F) can be achieved with RCS pressure as high as 280 psig.
DR-P-1A	Pump is required to provide cooling water through the decay heat service coolers.	Yes	X	X	DH River water pump must match the operating train of the decay heat closed cycle cooling water.
DR-P-1B	Same function as DR-P-1A	Yes	X	X	Same remark as DR-P-1A.
DR-S-1A	Strainer must permit flow through the decay heat service coolers.	Yes	-	X	Loss of the motor drive for the strainer or spurious closure of the backwash valve could affect flow through the strainer after a period of time. Strainers, power supply and backwash valves (DR-V-24A/B) are all located in the same fire zone with the associated DR pump. These components are not affected in any fire where their associated DR pump is available.
DR-S-1B	Same function as DR-S-1A	Yes	-	X	Same remark as DR-S-1A.
DR-V-1A	This valve must remain open for DR-P-1A to provide flow through DH service cooler (DC-C-2A).	Yes	X	X	
DR-V-1B	This valve must remain open for DR-P-1B to provide flow through DH service cooler (DC-C-2B)	Yes	X	X	
DW-V-30 DW-V-35 DW-T-2	Line up DW-T-2 to EFW suction header for additional EFW inventory.	No	-	-	CO-T-1A and CO-T-1B inventory satisfies the EFW inventory requirement.
EED-B-1A	Provide DC storage capacity on “A” DC distribution system, which supplies power to safe shutdown loads	Yes	X	X	A Battery – These 125/250V batteries supply DC power to the 1A Main DC distribution panel. Consists of series “A” and “C” 125V batteries.
EED-B-1B	Provide DC storage capacity on “B” DC distribution system, which supplies power to safe shutdown loads	Yes	X	X	B Battery – These 125/250V batteries supply DC power to the 1B Main DC distribution panel. Consists of series “B” and “D” 125V batteries.
EED-BC-1A	Supply DC power to “A” battery of “A” DC Distribution system.	Yes	X	X	Battery Charger 1A
EED-BC-1B	Supply DC power to “B” battery of “B” DC Distribution system.	Yes	X	X	Battery Charger 1B
EED-BC-1C	Supply DC power to “C” battery of “A” DC Distribution system.	Yes	X	X	Battery Charger 1C
EED-BC-1D	Supply DC power to “D” battery of “B” DC Distribution system.	Yes	X	X	Battery Charger 1D
EED-BC-1E	Supply DC power to “A” or “C” battery of “A” DC Distribution system.	No	-	-	Battery Charger 1E. Backup charger normally off.
EED-BC-1F	Supply DC power to “B” or “D” battery of “B” DC Distribution system.	No	-	-	Battery Charger 1F. Backup charger normally off.
EED-PNL-1A	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1A – Main DC panel for A DC system.
EED-PNL-1B	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1B – Main DC panel for B DC system
EED-PNL-1C	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1C

Component	Function	FSSD	HSD	CSD	Comments / Discussion
EED-PNL-1D	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1D
EED-PNL-1E	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1E – includes power supply to “A” train 4160V & 480V switchgear, Remote Shutdown Transfer Switch Panel “A” (for IC-V-3 and MU-V-3), and other required loads
EED-PNL-1F	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1F – includes power supply to “B” train 4160V & 480V switchgear and other required loads
EED-PNL-1M	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1M – includes power supply to Remote Shutdown Transfer Switch Panel “B” (for IC-V-4, MU-V-18 and MU-V-20), DC Control Room lighting, and other required loads
EED-PNL-1M-EX1	This switch is used to maintain safe shutdown DC power supply	Yes	X	X	1M DC Panel Transfer Switch - align the 1M DC panel to A or B DC distribution system.
EED-PNL-1P	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1P – supplies DC power to EG-Y-1A.
EED-PNL-1Q	Supply DC power to safe shutdown loads	Yes	X	X	125/250VDC Distribution Panel 1Q – supplies DC power to EG-Y-1B.
EE-INV-1A	Supply AC power to safe shutdown loads	Yes	X	X	Supply power to VBA
EE-INV-1B	Supply AC power to safe shutdown loads	Yes	X	X	Supply power to VBB
EE-INV-1C	Supply AC power to safe shutdown loads	Yes	X	X	Supply power to VBC
EE-INV-1D	Supply AC power to safe shutdown loads	Yes	X	X	Supply power to VBD
EE-INV-1E	Supply AC power to safe shutdown loads	Yes	X	X	Supply power to ATB
EE-INV-1F	Supply AC power to safe shutdown loads	Yes	X	X	Provides an alternate source of power to VBB and VBD
EE-MCC-ES-1A	Supply AC power to safe shutdown loads	Yes	X	X	1A 480V ES MCC – This MCC supplies power to the 1A, 1C and 1E inverters, 1A, 1C and 1E battery chargers, and other required loads. If 1A ES MCC is lost and can not be restored, then the A and B train DC systems will be cross tied and the A train inverters will be supplied from the 1B, 1D & 1F battery chargers.
EE-MCC-ES-1B	Supply AC power to safe shutdown loads	Yes	X	X	1B 480V ES MCC – This MCC supplies power to the 1B, 1D and 1F inverters, 1B, 1D and 1F battery chargers, and other required loads. If 1B ES MCC is lost and can not be restored, then the A and B train DC systems will be cross tied and the B train inverters will be supplied from the 1A, 1C & 1E battery chargers.
EE-MCC-ESV-1A	Supply AC power to safe shutdown loads	Yes	X	X	1A 480V ES Valves MCC – This MCC supplies power to (A train required loads) pumps MU-P-2A and MU-P-2B and some train A valves of the NR, DH. BS, IC and MU systems.
EE-MCC-ESV-1B	Supply AC power to safe shutdown loads	Yes	X	X	1B 480V ES Valves MCC – This MCC supplies power to (B train required loads) pumps MU-P-2C and MU-P-3B and some train B valves of the NR, DH, BS, IC and MU Systems.
EE-MCC-ESV-1C	Supply AC power to safe shutdown loads	Yes	X	X	1C 480V ES Valves MCC – This MCC supplies power to some valves of the MS, DH, RC, MU and NR systems and other required loads.
EE-MCC-ESV-1C-EX1 (1C ESV MCC Transfer Switch)	Supply AC power to safe shutdown loads	Yes	X	X	1C ES Valves MCC Transfer Switch – This transfer switch supplies power to 1C ES valves MCC from the 1P 480V or 1S 480V switchgear.
EE-MCC-SH-1A	Supply AC power to safe shutdown loads	Yes	X	X	1A 480V ES Screen House MCC – This MCC supplies power to (A train required loads) AH-E-27A and some train A valves of the DR and NR systems.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
EE-MCC-SH-1B	Supply AC power to safe shutdown loads	Yes	X	X	1B 480V ES Screen House MCC – This MCC supplies power to (B train required loads) the AH-E-27B and some train B valves of the DR and NR systems.
EE-PNL-ATA	Supply AC power to safe shutdown loads	Yes	X	X	120 VAC Distribution panel ATA – This distribution panel supplies ICS AUTO power, Remote Shutdown Transfer Switch Panel “A” and other required loads.
EE-PNL-ATB	Supply AC power to safe shutdown loads	Yes	X	X	120 VAC Distribution Panel ATB – This distribution panel supplies power to the Remote Shutdown Transfer Switch Panel B, ICS Hand Power and other required loads.
EE-PNL-CT-2	Supply AC power to safe shutdown loads	Yes	X	X	277/480 V Lighting Panel – Supplies power to the AC Control Room lights.
EE-PNL-TRA	Supply Backup AC power to safe shutdown loads	No	-	-	TRA and TRB can be used as alternate cross train feeds to vital buses. This function is not required.
EE-PNL-TRB	Supply Backup AC power to safe shutdown loads	No	-	-	TRA and TRB can be used as alternate cross train feeds to vital buses. This function is not required.
EE-PNL-VBA	Supply AC power to safe shutdown loads	Yes	X	X	120VAC Distribution Panel VBA – This distribution panel supplies power to ESAS, HSPS, Remote Shutdown Transfer Switch Panel A, Remote Shutdown Panel A, Signal Conditioning Cabinet A, and other required loads.
EE-PNL-VBB	Supply AC power to safe shutdown loads	Yes	X	X	120VAC Distribution Panel VBB – This distribution panel supplies power to the ESAS, HSPS, Signal Conditioning Cabinet B, Remote Shutdown Panel B, MS-V-4A and 4B manual loaders and other required loads.
EE-PNL-VBC	Supply AC power to safe shutdown loads	Yes	X	X	120VAC Distribution Panel VBC – This distribution panel supplies power to the ESAS, HSPS, Remote Shutdown Transfer Switch Panels B and C, EFW Flow Instruments, and other required loads.
EE-PNL-VBD	Supply AC power to safe shutdown loads	Yes	X	X	120VAC Distribution Panel VBD – This distribution panel supplies power to the ESAS, HSPS, and other required loads.
EE-SWG-4160V-1D	Supply AC power to safe shutdown loads	Yes	X	X	1D 4160V ES Switchgear – This switchgear supplies power to the 1P and 1R 480 V switchgear and pumps BS-P-1A, EF-P-2A, MU-P-1A, MU-P-1B, and DH-P-1A.
EE-SWG-4160V-1E	Supply AC power to safe shutdown loads	Yes	X	X	1E 4160V ES Switchgear – This 4160V switchgear supplies power to the 1S and 1T 480 switchgear and pumps BS-P-1B, EF-P-2B, MU-P-1B, MU-P-1C and DH-P-1B.
EE-SWG-480V-1R	Supply AC power to safe shutdown loads	Yes	X	X	1R 480V ES Screen House Switchgear – This 480V switchgear supplies power to 1A ES SH MCC and pumps NR-P-1A, NR-P-1B and DR-P-1A.
EE-SWG-480V-1P	Supply AC power to safe shutdown loads	Yes	X	X	1P 480V ES Switchgear – This 480V switchgear supplies power to 1A ES, 1A ESV, and 1C ESV MCCs, pumps NS-P-1A, NS-P-1B and DC-P-1A, and group 8 Pressurizer Heaters.
EE-SWG-480V-1S	Supply AC power to safe shutdown loads	Yes	X	X	1S 480V ES Switchgear – This 480V switchgear supplies power to 1B ES, 1B ESV, and 1B ESV MCCs, pumps NS-P-1B, NS-P-1C and DC-P-1B, and group 9 Pressurizer Heaters.
EE-SWG-480V-1T	Supply AC power to safe shutdown loads	Yes	X	X	1T 480V ES Screen House Switchgear – This 480V switchgear supplies power to 1B ES SH MCC and pumps and NR-P-1B, NR-P-1C and DR-P-1B.
EF-FT-779	Provides indication of EFW Flow to OTSG A	No	-	-	Emergency feedwater flow monitoring will be used when available. Protection is not required. OTSG level indication is an acceptable alternative. In addition to Control Room indication, EF-FT-788 and EF-FT-782 provide flow indication on RSP “B” and EF-FT-779 and EF-FT-791 provide flow indication on RSP “A”.
EF-FT-782	Provides indication of EFW Flow to OTSG B	No	-	-	Same remark as EF-FT-779.
EF-FT-788	Provides indication of EFW Flow to OTSG A	No	-	-	Same remark as EF-FT-779
EF-FT-791	Provides indication of EFW Flow to OTSG B	No	-	-	Same remark as EF-FT-779.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
EF-P-1	These pumps are required to operate to deliver water from the condensate system to the steam generators.	Yes	X	X	One motor-driven or one turbine-driven pump is sufficient to achieve and maintain HSD conditions and support cooldown to DHR. Flow-limiting (cavitating) venturis are installed between the EFW pumps and the OTSGs to limit EFW flow to a depressurized OTSG. The flow-limiting venturis minimize RCS overcooling potential as well as EFW pump runout potential. See NOTE 1
EF-P-2A	Same function as EF-P-1	Yes	X	X	EFW Motor Driven Pump A - same remark as EF-P-1.
EF-P-2B	Same function as EF-P-1	Yes	X	X	EFW Motor Driven Pump B - same remark as EF-P-1.
EF-V-1A	EF-V-1A or EF-V-1B must remain open to provide a flow path from CO-T-1A or CO-T-1B to EF-P-1. EF-V-1A and EF-V-1B must be open to allow any EFW pump to be supplied from CO-T-1A, CO-T-1B or the hotwell.	Yes	-	X	EF-P-1 is available in all events where EFW is credited (i.e. all except IB-FZ-3). Therefore, with a single hot short which closes EF-V-1A or B, EF-P-1 has the inventory of CO-T-1A or B in the short term. For cooldown, EF-V-1A and EF-V-1B will be open, by local manual operation if required. Once both valves are open, any EFW pump can use both condensate supplies for cooldown.
EF-V-1B	Same function as EF-V-1A	Yes	-	X	Same remark as EF-V-1B.
EF-V-2A	This valve and EF-V-2B must remain open to provide a flow path to allow any EFW pump to feed either OTSG.	Yes	-	X	Either EF-V-2A or EF-V-2B is required to remain open to provide feedwater to one steam generator when the turbine driven emergency feedwater pump is used. A hot short could spuriously close one valve. Hot shutdown can be achieved and maintained using feed to only one OTSG. No manual correction of the spuriously closed valve is required for HSD. Both valves must be open to support use of any EFW pump and both OTSGs for cooldown to CSD.
EF-V-2B	Same function as EF-V-2A	Yes	-	X	Same remark as EF-V-2A.
EF-V-4	One of multiple boundaries to prevent loss of water from the EFW suction header.	No	-	-	EF-V-4 and EF-V-5 are normally closed series valves which isolate RR from the EFW. This boundary is not an Appendix R high-low pressure interface. The valves do not have any common automatic opening interlocks. Even if both EF-V-4 and EF-V-5 were spuriously opened, if the RBEC system is operating water will flow into EFW suction header. If RBEC is in standby, check valves RR-V-8A &B, or two additional valves (RR-V-4 and RR-V-5 or 6) in series prevent loss of water through this path.
EF-V-5	Same as EF-V-4	No	-	-	Same remark as EF-V-4.
EF-V-8A	Provides a minimum flow path for the EFW pumps.	No	-	-	This valve is mechanically blocked open with air and electrical service to the valve removed in order to maintain it in the open position.
EF-V-8B	Same as EF-V-8A	No	-	-	Same as EF-V-8A
EF-V-8C	Same as EF-V-8A	No	-	-	Same as EF-V-8A
EF-V-30A	This valve or EF-V-30D must be throttled open to provide flow and control OTSG A level.	Yes	X	X	EF-V-30A, 30B, 30C, and 30D control the flow of feedwater into the steam generators. One valve for at least one steam generator is required to maintain hot shutdown, while the valves not being used are required to stay closed to prevent overfilling of the steam generators. One valve to each OTSG is required to achieve the desired cooldown rate to cold shutdown. (1) If IA system is lost, then the 2-hour backup air supply will maintain remote operation until local control is established. (2) In IB-FZ-2 or DG-FA-2, where the 2-hour backup air supply may be lost, all four valves would close. In FH-FZ-5 or CB-FA-2g, a fire could cause all four valves to close. In IB-FZ-2, DG-FA-2, FH-FZ-5 or CB-FA-2g, local operation is required within 20 minutes. (3) In CB-FA-3d or CB-FA-4b, all four valves may close. Transfer of control to the RSD panel restores flow, and OTSG level will be controlled from the RSD panel. (4) In IB-FZ-3 or IB-FZ-8, all four valves may be affected and local operation unavailable. In these cases, HPI Cooling will be used until RCS heat removal via OTSG can be restored (2 hours). See NOTE 1.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
EF-V-30B	This valve or EF-V-30C must be throttled open to provide flow and control OTSG B level.	Yes	X	X	Same remark as EF-V-30A.
EF-V-30C	Same function as EF-V-30B	Yes	X	X	Same remark as EF-V-30A.
EF-V-30D	Same function as EF-V-30A	Yes	X	X	Same remark as EF-V-30A.
EF-V-52A	This valve may be closed if EF-V-30A fails open to prevent overfilling OTSG.	No	-	-	EF-V-52 valves are located in series with EF-V-30 valves. Failures of EF-V-30s can be mitigated by local operation of EF-V-30s. Therefore, EF-V-52 valves are not required components.
EF-V-52B	This valve may be closed if EF-V-30B fails open to prevent overfilling OTSG.	No	-	-	Same remark as EF-V-52A.
EF-V-52C	This valve may be closed if EF-V-30C fails open to prevent overfilling OTSG.	No	-	-	Same remark as EF-V-52A.
EF-V-52D	This valve may be closed if EF-V-30D fails open to prevent overfilling OTSG.	No	-	-	Same remark as EF-V-52A.
EG-Y-1A	Supply AC power to safe shutdown loads	Yes	X	X	Diesel Generator A – This diesel generator is the source of train “A” AC power when off-site power is lost. The FSSD strategy does not credit offsite power in any fire area/zone.
EG-Y-1B	Supply AC power to safe shutdown loads	Yes	X	X	Diesel Generator B – This diesel generator is the source of train “B” AC power when off-site power is lost. The FSSD strategy does not credit offsite power in any fire area/zone.
ESAS	Provides automatic actuation of: - HPI (ECCS High Pressure Injection) - LPI (ECCS Low Pressure Injection) - BS (Reactor Building Spray) - RBEC (Reactor Building Emergency Cooling) - Initiates cooling water and emergency ventilation systems to support functions above - RBI (Reactor Building Isolation) - Initiation of Emergency Power & Load Control - Initiates Control Bldg Ventilation Recirc The features are actuated by low RCS pressure, high Reactor Building pressure, RPS actuation, or Low NSCCW or ICCW Surge Tank Level	No(S)	-	-	No automatic control or protective action from ESAS is credited in the fire safe shutdown analysis. Spurious actions caused by the effects of fire on ESAS or its inputs can challenge the fire safe shutdown strategy (e.g. isolate letdown, close MU pump recirculation valves, isolate RCP thermal barrier cooling). ESAS circuits are not protected from fire. The inputs to ESAS are listed in Attachment 3-3. The consequences of specific ESAS actuations are addressed when evaluating individual component availability. To prevent additional system level actuations, alternate power supplies from the opposite ES power train to the vital buses are used to ensure long-term power for ESAS. Action is required after a loss of one ES power train before the DC supply to the inverters is depleted. The ESAS defeat switches in the Control Room can be utilized where available to defeat the ESAS signal and restore control of affected components.
FS-PNL-CB-1	For a fire in the ESAS room, the Relay Room CARDOX System actuation must be defeated to ensure continued access to the 1E 4160V swgr room.	No(S)	X	-	CARDOX CO_2 Fire Extinguishing System - This system can be actuated automatically via heat detection or manually via switches in the patio (FH-FZ-5) and ESAS (CB-FA-3c) rooms. A fire in the ESAS room could cause hot shorts in cables for the ESAS manual actuation switch that are located in the ESAS room. This would cause a spurious actuation of the CARDOX system. This causes a problem for operators that need to enter the relay room to get to the 1E 4kV switchgear for a fire in the ESAS room. To prevent this, power to the system will be disconnected by opening the 1A ES MCC Unit 8A breaker prior to operators entering the relay room. A fire in FH-FZ-5 could actuate the CO_2 system. The system will be disabled. Access to the relay room or affected areas is not required for safe shutdown. Therefore, opening the breaker is not a safe shutdown action in FH-FZ-5. With the breaker open automatic actuation is disabled, but the system can be manually actuated if required.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
FW-LT-775	Provide indication of the A steam generator water level. At least one level transmitter must be available for shutdown.	Yes	X	X	OTSG-A Level (Full Range-Train A) - This is required to assure OTSG level is being maintained by the main steam and the emergency feedwater systems, or for manual level control. In addition to control room indication, FW-LT-775 and FW-LT-789 provide steam generator A water level indication on RSP “A” and RSP “B”, respectively.
FW-LT-776	Same as FW-LT-788	Yes	X	X	OTSG-B Level (Full Range-Train B) – Same remark as FW-LT-788.
FW-LT-788	Provide indication of the B steam generator water level.	Yes	X	X	OTSG-B Level (Full Range-Train A) - At least one level transmitter must be available for shutdown. This is required to assure OTSG level is being maintained by the main steam and the emergency feedwater systems, or for manual level control. In addition to control room indication, FW-LT-788 and FW-LT-776 provide steam generator B water level indication on RSP “A” and RSP “B”, respectively.
FW-LT-789	Same as FW-LT-775	Yes	X	X	OTSG-A Level (Full Range-Train B) – Same remark as FW-LT-775.
FW-LT-1040	Provides OTSG A Operating Range Level Indication and input to HSPS.	No	-	-	OTSG-A Level-Operate Range Train B One OTSG Full Range Level Indication (FW-LT-775, 776, 788, 789) is available for each OTSG in each fire area except CB-FA-3b (Refer to Attachment 3-0). Operating Range and Startup Range Level Instruments are not required for fire safe shutdown. Fire induced failures of these instruments would not challenge fire safe shutdown. Spurious actuation of HSPS would not cause a condition inconsistent with fire safe shutdown. Effects in automatic control of EFW can be overridden by manual control from the control room. Fire induced failure of HSPS is addressed independently of the effects on HSPS inputs.
FW-LT-1041	Same as FW-LT-1040.	No	-	-	OTSG-A Level-Operate Range Train D See remarks for FW-LT-1040
FW-LT-1042	Provides OTSG A Start Up Range Level Indication and input to HSPS.	No	-	-	OTSG-A Level-Startup Range Train B See remarks for FW-LT-1040
FW-LT-1043	Same as FW-LT-1042	No	-	-	OTSG-A Level-Startup Range Train D See remarks for FW-LT-1040
FW-LT-1044	Same as FW-LT-1040	No	-	-	OTSG-A Level-Operate Range Train A See remarks for FW-LT-1040
FW-LT-1045	Same as FW-LT-1040.	No	-	-	OTSG-A Level-Operate Range Train C See remarks for FW-LT-1040
FW-LT-1046	Same as FW-LT-1042.	No	-	-	OTSG-A Level-Startup Range Train A See remarks for FW-LT-1040
FW-LT-1047	Same as FW-LT-1042.	No	-	-	OTSG-A Level-Startup Range Train C See remarks for FW-LT-1040
FW-LT-1048	Provides OTSG B Operating Range Level Indication and input to HSPS.	No	-	-	OTSG-B Level-Operate Range Train B See remarks for FW-LT-1040
FW-LT-1049	Same as FW-LT-1048.	No	-	-	OTSG-B Level-Operate Range Train D See remarks for FW-LT-1040
FW-LT-1050	Provides OTSG B Start Up Range Level Indication and input to HSPS.	No	-	-	OTSG-B Level-Startup Range Train B See remarks for FW-LT-1040
FW-LT-1051	Same as FW-LT-1050.	No	-	-	OTSG-B Level-Startup Range Train D See remarks for FW-LT-1040

Component	Function	FSSD	HSD	CSD	Comments / Discussion
FW-LT-1052	Same as FW-LT-1048.	Yes	X	X	OTSG-B Level-Operate Range Train A This instrument is required to provide OTSG B level for a fire in CB-FA-3b. See remarks for FW-LT-1040
FW-LT-1053	Same as FW-LT-1048.	No	-	-	OTSG-B Level-Operate Range Train C See remarks for FW-LT-1040
FW-LT-1054	Same as FW-LT-1050.	No	-	-	OTSG-B Level-Startup Range Train A See remarks for FW-LT-1040
FW-LT-1055	Same as FW-LT-1050.	No	-	-	OTSG-B Level-Startup Range Train C See remarks for FW-LT-1040
FW-P-1A FW-P-1B	Feedwater Pumps must be tripped to prevent OTSG overfill.	Yes	X	-	Trip of the Main Feedwater Pump Turbines is required to mitigate spurious opening of the feedwater turbine control valves to prevent steam generator overfill.
FW-TE-1044	OTSG ‘A’ OP & SU Range Level Instrument Reference Leg Temperature.	No	-	-	OTSG-A Temperature Train B Temperature indication is not required. See remarks for FW-LT-1040
FW-TE-1045	Same as FW-TE-1044.	No	-	-	OTSG-A Temperature Train D See remarks on FW-TE-1044
FW-TE-1046	Same as FW-TE-1044.	No	-	-	OTSG-A Temperature Train A See remarks on FW-TE-1044
FW-TE-1047	Same as FW-TE-1044.	No	-	-	OTSG-A Temperature Train C See remarks on FW-TE-1044
FW-TE-1048	OTSG ‘B’ OP & SU Range Level Instrument Reference Leg Temperature.	No	-	-	OTSG-B Temperature Train B Temperature indication is not required. The affect on the instrument is evaluated for impact on OTSG level or HSPS.
FW-TE-1049	Same as FW-TE-1048.	No	-	-	OTSG-B Temperature Train D See remarks on FW-TE-1048
FW-TE-1050	Same as FW-TE-1048.	Yes	X	X	OTSG-B Temperature Train A See remarks on FW-TE-1048 This instrument is required to provide OTSG B level for a fire in CB-FA-3b.
FW-TE-1051	Same as FW-TE-1048.	No	-	-	OTSG-B Temperature Train C See remarks on FW-TE-1048
FW-V-1A FW-V-1B	Main Feedwater Pumps Discharge Isolation valves can be closed to prevent OTSG overfill	No	-	-	Same remark as FW-V-5A.
FW-V-5A	This valve and FW-V-92A, or FW-V-17A and FW-V-16Amust close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG A overfill.	Yes	X	-	Main Feedwater is not required for safe shutdown but failure to control MFW could prevent achieving and maintaining a safe shutdown condition. The FSSD strategy relies upon diverse but not protected methods to mitigate MFW control failures. The equipment which must be operated or repositioned for the credited methods (i.e. tripping the main feedwater pumps, closing the MFW block valves or closing the MFW regulating valves) are classified FSSD “Yes” for HSD. Other defense in depth methods to accomplish this function (i.e. tripping condensate pumps or closing main FW pump discharge valves) are classified FSSD “No”. Once mitigated by tripping the Main FW Pumps, the condensate and booster pumps must be tripped during cooldown to prevent loss of control of OTSG level. For this reason, tripping the CO-P-1 & CO-P-2 are classified FSSD “Yes” for CSD

Component	Function	FSSD	HSD	CSD	Comments / Discussion
FW-V-5B	This valve and FW-V-92B, or FW-V-17B and FW-V-16B must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG B overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-16A	This valve and FW-V-17A, or FW-V-92A and FW-V-5A must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG A overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-16B	This valve and FW-V-17B, or FW-V-92B and FW-V-5B must close or FW-P-1A& B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG B overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-17A	This valve and FW-V-16A, or FW-V-92A and FW-V-5A must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG A overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-17B	This valve and FW-V-16B, or FW-V-92B and FW-V-5B must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG B overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-92A	This valve and FW-V-5A, or FW-V-16A and FW-V-17A must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG A overfill.	Yes	X	-	Same remark as FW-V-5A.
FW-V-92B	This valve and FW-V-5B, or FW-V-16B and FW-V-17B must close or FW-P-1A&B or CO-P-2A/B/C or CO-P-1A/B/C must be shutdown to prevent OTSG B overfill.	Yes	X	-	Same remark as FW-V-5A.
FX-Y-1A or FX-Y-1B	The FLEX diesel generators can be used to provide an alternate power supply to pressurizer heaters.	Yes	-	X	This is only required for fire in CB-FA-1.
HSPS	Provides automatic actuation and control of EFW on low OTSG level, Loss of RC Pumps, Loss of MFW Pumps or High RB Pressure and automatic Main Feedwater isolation on Low OTSG Pressure or High OTSG Level.	No	-	-	No automatic control or protective action form HSPS is credited in the fire safe shutdown analysis. Spurious actions caused by the effects of fire on HSPS or its inputs do not result in any failures where the response is not bounded by the fire safe shutdown strategy. Full or partial actuations of EFW or MFW isolation are consistent with the FSSD strategy. HSPS failures could also result in a loss of control of EFW regulating valves (closed or open). If the failures are associated with HSPS inputs (i.e. fire outside of FH-FZ-5), then manual control of the EF-V-30s from the control room is available to mitigate these conditions. For a fire inside FH-FZ-5, the affects of HSPS are not different than the EF-V-30 circuit analysis. Therefore, there are no unique consequences of a fire affecting HSPS. All consequences are bounded by other actions required for other FSSD components. HSPS is not a fire safe shutdown component.
IA-P-1A	Provides IA supply to normal IA distribution system from A train ES / on site power.	Yes	X	X	To reduce the demand on operations resources, the normal IA is used where available for FSSD. See specific air operated components for discussion of alternatives when air is not available.
IA-P-1B	Provides IA supply to normal IA distribution system from B train ES / on site power.	Yes	X	X	See IA-P-1A.
IA-V-1621A IA-V-1625A IA-V-1626A	These air-operated valves must operate to supply 2HR backup instrument air when normal instrument air system is not available. These valves are associated with the A train bottle bank. The A train 2HR Backup IA system is required for EF-V-30A & C operation and MS-V-6.	Yes	X	X	These air-operated valves are all located in DG-FA-2. These components are not affected by fires in any other fire area/zone. No circuit analysis is required.
IA-V-1621B IA-V-1625B IA-V-1626B	Same function as IA-V-1621A. These valves are associated with the B train bottle bank. The B train 2HR Backup IA system is required for EF-V-30B & D operation.	Yes	X	X	These air-operated valves are all located in DG-FA-2. These components are not affected by fires in any other fire area/zone. No circuit analysis is required.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
IC5-DPT	Provides ICCW flow indication and interlock to start the standby IC pump when the suction header flow is low.	No (S)	-	-	IC5-DPT is used to indicate adequate RCP thermal barrier cooling
IC9-TE	Provides ICCW CRD Cooling Outlet Temperature and interlock to close letdown valves MU-V-1A & MU-V-1B. Spurious interlock actuation affects safe shutdown function for letdown.	No (S)	-	-	Indication of CRD cooler outlet temperature is not required. If failure causes closure of MU-V-1A/B, then these valves will be manually opened if required. Instrument circuits need no protection.
IC-LT-802	Provide indication of ICCW Surge Tank level.	No (S)	-	-	Degradation of this instrument coincidental with an HPI actuation could cause actuation of the RB isolation of “A” train components (IC-V-3 and IC-V-4). ICCW Surge Tank level is not required for safe shutdown.
IC-LT-803	Same as IC-LT-802	No (S)	-	-	Degradation of this instrument coincidental with an HPI actuation could cause actuation of the RB isolation of “B” train components (IC-V-2 and IC-V-4). ICCW Surge Tank level is not required for safe shutdown.
IC-P-1A	Provide cooling water to the letdown coolers and to the reactor coolant pump seal thermal barrier coolers.	Yes		X	One Intermediate Closed pump is desired for letdown restoration and thermal barrier cooling. One pump is required in fire zones/areas where restoration of letdown is required.
IC-P-1B	Same as pump A.	Yes	-	X	Same remark as IC-P-1A.
IC-V-1A	This valve or IC-V-1B must remain open to provide cooling water flow through either letdown cooler (MU-C-1A or MU-C-1B).	No	-	-	IC-V-1A and IC-V-1B are the letdown cooler inlet isolation valves. Both letdown coolers (MU-C-1A and MU-C-1B) are normally in service. Only one letdown cooler is required for safe shutdown. There are no automatic signals to close IC-V-1A or B. A single hot short can close one valve, but the other remains open to support restoration of letdown if required.
IC-V-1B	This valve or IC-V-1A must remain open to provide cooling water flow through either letdown cooler (MU-C-1A or MU-C-1B).	No	-	-	Same remark as IC-V-1A.
IC-V-2	This valve must remain open to provide ICCW cooling water through the letdown coolers.	Yes	-	X	This valve will be manually opened if it spuriously closes and letdown is required. IC-V-2 may not be manually operable in AB-FZ-5, AB-FZ-6A, or RB-FZ-1C due to IN 92-18 type fault.
IC-V-3	This valve must remain open to provide ICCW cooling water through the letdown coolers.	Yes	-	X	Same remark as IC-V-2.
IC-V-4	This valve must remain open to provide ICCW cooling water through the letdown coolers.	Yes	-	X	Same remark as IC-V-2.
IC-V-74	Provide minimum recirculation flow path for IC-P-1A/B protection if IC-V-2, 3 or 4 is closed.	No(S)	-	-	If spurious ICCW RB isolation occurs (IC-V-2, 3 or 4 shut) and IC-V-74 fails to open, then both IC pumps will be tripped within 2 hours to protect the pumps.
IC-V-79A	This valve must remain open for ICCW flow to RC-P-1A thermal barrier cooler.	No	-	-	Seal injection is maintained or restored in all fire zones. Spurious operation of these valves (IC-V-79A, 79B, 79C, and 79D) does not prevent achieving or maintaining safe shutdown.
IC-V-79B	This valve must remain open for ICCW flow to RC-P-1B thermal barrier cooler.	No	-	-	Same remark as IC-V-79A.
IC-V-79C	This valve must remain open for ICCW flow to RC-P-1C thermal barrier cooler.	No	-	-	Same remark as IC-V-79A.
IC-V-79D	This valve must remain open for ICCW flow to RC-P-1D thermal barrier cooler.	No	-	-	Same remark as IC-V-79A.
IM-SPND-3, 4, 5, 9, 12, 13, 17, 21, 24, 31, 34, 38, 42, 48, 49, 52	BIRO (Back up Incore Read Out) indication of incore temperature is required when HPI cooling is required. T_{HOT} and T_{COLD} are not valid indications of core temperature during HPI cooling.	Yes	X	X	In-core thermocouples of the backup incore thermocouple display system are required to provide indication for HPI cooling. Two out of four thermocouples in each quadrant (a total of eight out of sixteen) must be in service. Same remark as RC-TE-958.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MS-PT-950	Same as MS-PT-1180	Yes	X	X	OTSG-A Pressure Train A Same remark as MS-PT-1180
MS-PT-951	Same as MS-PT-1184	Yes	X	X	OTSG-B Pressure Train B One OTSG B pressure indicators (MS-PT-1184, MS-PT-951, SP6B-PT-1 or SP6B-PT-2) is required.
MS-PT-1180	Provides OTSG A Pressure indication and HSPS input.	Yes	X	X	OTSG-A Pressure Train B One OTSG A pressure indicators (MS-PT-1180, MS-PT-950, SP6A-PT-1 or SP6A-PT-2) is required.
MS-PT-1181	Provides OTSG A Pressure indication and HSPS input	No (S)	X	X	OTSG-A Pressure Train D
MS-PT-1182	Provides OTSG A Pressure indication and HSPS input	No (S)	X	X	OTSG-A Pressure Train C
MS-PT-1183	Provides OTSG B Pressure indication and HSPS input	No (S)	X	X	OTSG-B Pressure Train D
MS-PT-1184	Provides OTSG B Pressure indication and HSPS input.	Yes	X	X	One OTSG B pressure indicators (MS-PT-1184, MS-PT-951, SP6B-PT-1 or SP6B-PT-2) is required. This instrument is required to provide OTSG B level for a fire in CB-FA-3b.
MS-PT-1185	Provides OTSG B Pressure indication and HSPS input	No (S)	X	X	OTSG-B Pressure Train C
MS-V-2A	This valve must remain open to 1. Use MS-V-4A to reduce OTSG A pressure and cool RCS to cold shutdown. 2. Provide one of two available steam supplies to turbine-driven EFW pump, EF-P-1.	Yes	-	X	MS-V-2A and MS-V-2B are normally open motor operated valves with no automatic closure signals. Since only one OTSG is required for hot shutdown, spurious closure of either MS-V-2A or B does not require action. If a valve closes, it will be locally opened to support cooldown. Both OTSG are utilized for cooldown to cold shutdown.
MS-V-2B	This valve must remain open to 1. Use MS-V-4B to reduce OTSG B pressure and cool RCS to cold shutdown. 2. Provide one of two available steam supplies to turbine-driven EFW pump, EF-P-1.	Yes	-	X	Same remark as MS-V-2A
MS-V-3A	Turbine Bypass Line valves (MS-V-3A, B, C) must remain closed to allow stable OTSG B pressure control with MS-V-4B.	No (S)	-	-	Spurious opening of MS-V-3A, MS-V-3B, and/or MS-V-3C will be corrected by closing MS-V-8B remotely.
MS-V-3B	Same function as MS-V-3A	No (S)	-	-	Same remark as MS-V-3A.
MS-V-3C	Same function as MS-V-3A	No (S)	-	-	Same remark as MS-V-3A.
MS-V-3D	Turbine Bypass Line valves (MS-V-3D, E, F) must remain closed to allow stable OTSG A pressure control with MS-V-4A.	No (S)	-	-	Spurious opening of MS-V-3D, MS-V-3E, and/or MS-V-3F will be corrected by closing MS-V-8A remotely.
MS-V-3E	Same function as MS-V-3D	No (S)	-	-	Same remark as MS-V-3D.
MS-V-3F	Same function as MS-V-3D	No (S)	-	-	Same remark as MS-V-3D.
MS-V-4A	(1) This valve must be throttled or closed to maintain hot shutdown conditions. The valve must be throttled open to control OTSG pressure and reduce RCS temperature to allow DH to be initiated to reach cold shutdown.	Yes	X	X	If valve cannot be remotely operated, steam will flow through the main steam safety valves until control of the valve is restored. Spurious opening of the valve will be corrected by taking local control of the affected valve. When valve is required for cooldown, manual control will be used if instrument air is not available.
MS-V-4B	Same function as MS-V-4A	Yes	X	X	Same remark as MS-V-4A.
MS-V-5A MS-V-5B	When the main feedwater system is used instead of the emergency feedwater system, the valve corresponding to the pump in service must remain open.	No	-	-	Main Feedwater is not required for safe shutdown.
MS-V-6	This valve must be open to provide a steam supply to EF-P-1.	Yes	-	-	This air-operated valve fails open on loss of instrument air. There are no electrical components required for the pressure controller or valve to perform its function.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MS-V-8A	This valve must be closed to mitigate spurious opening of MS-V-3D, 3E or 3F	Yes	X	-	See remark for MS-V-3A.
MS-V-8B	This valve must be closed to mitigate spurious opening of MS-V-3A, 3B or 3C	Yes	X	-	See remark for MS-V-3A.
MS-V-10A	MS-V-10A(B) provides adequate steam flow to the turbine-driven EFW pump at low OTSG pressure (during cooldown).	Yes	-	X	MS-V-10A & B are normally closed with power removed. These valves will be manually operated if EF-P-1 is required and remote control is unavailable.
MS-V-10B	Same function as MS-V-10A	Yes	-	X	Same remark as MS-V-10A.
MS-V-13A	MS-V-13A and MS-V-13B provide the steam supply to the turbine-driven EFW pump. One open valve is sufficient to provide the steam supply at hot shutdown conditions.	Yes	X	-	These air-operated valves fail open on loss of air or loss of DC power. A hot short may cause one valve to fail closed, but not both. One MS-V-13 will be open to support EF-P-1 operation.
MS-V-13B	Same function as MS-V-13A	Yes	X	-	Same remarks as MS-V-10A and MS-V-13A.
MS-V-17 to 21A MS-V-17 to 20B	OTSG A Main Steam Safety Valves provide steam relief and maintain RCS heat removal if MS-V-4A is not available remotely.	Yes	X	-	Local control of MS-V-4A will be used to control OTSG pressure below the MSSV setpoint.
MS-V-17 to 20C MS-V-17 to 20D MS-V-21B	OTSG B Main Steam Safety Valves provide steam relief and maintain RCS heat removal if MS-V-4B is not available remotely.	Yes	X	-	Local control of MS-V-4B will be used to control OTSG pressure below the MSSV setpoint.
MU14-LT	This instrument provides indication of makeup tank level and an interlock to switch MU-V-8 to the THRU position.	No	-	-	This instrument monitors the water level of the makeup tank. This is required when the makeup system is taking suction from this tank and before suction is aligned to the BWST. If reliable level indication is not available, the pump suction will be lined up to the BWST. Makeup tank level indication is not relied upon for safe shutdown.
MU42-DPT	Provide indication of Seal Injection Flow and signal to control MU-V-32.	No (S)	-	-	Manual control can be used to override auto control. MU42-DPT is used to indicate adequate RCP seal cooling.
MU5-TE	Provides indication of letdown temperature and interlock to close MU-V-3.	No (S)	-	-	MU-V-3 will be manually controlled if restoration of letdown is required. Instrument circuits need no protection. Letdown temperature indication is not required for safe shutdown.
MU-FT-1126	Provide HPI Line A flow indication. Flow indication is required in each injection path for throttling HPI cooling.	Yes	X	-	HPI Flow through MU-V-16A - makeup flow indication in each injection path in use can be used for HPI cooling. Flow indication is required to ensure minimum makeup pump flow rate when throttling HPI.
MU-FT-1127	Same as MU-FT-1126	Yes	X	-	HPI Flow through MU-V-16B - Same remark as MU-FT-1126.
MU-FT-1128	Same as MU-FT-1126	Yes	X	-	HPI Flow through MU-V-16C - Same remark as MU-FT-1126.
MU-FT-1129	Same as MU-FT-1126	Yes	X	-	HPI Flow through MU-V-16D - Same remark as MU-FT-1126.
MU-LT-778	Provide indication of makeup tank level. Level indication can be used for letdown switch over to the RC Bleed Tanks	No	-	-	Same remark as MU-14-LT.
MU-P-1A	One makeup pump is required to provide makeup water to the reactor coolant (RC) system for pressure, inventory, and reactivity control. One makeup pump is required to provide seal injection. Any two makeup pumps are required for HPI cooling.	Yes	X	X	MU-P-1C is not normally lined up to be able to provide seal injection without taking manual action outside of the control room (not required). MU-P-1B is a swing pump, which can be manually transferred from the 1E 4160V switchgear (normal source) to the 1D 4160V switchgear (alternate source); however it is not required. For fire zones where MU-P-1B is the only credited makeup pump, MU-P-1B is required to be manually selected for ES at the 1E 4160V switchgear and started within one hour. Two pumps are required for high pressure injection (HPI) cooling in fire zones IB-FZ-3 and IB-FZ-8.
MU-P-1B	Same as MU-P-1A	Yes	X	X	See MU-P-1A.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MU-P-1C	Same as MU-P-1A	Yes	X	X	See MU-P-1A.
MU-P-2A	MU-P-2A or MU-P-3A is required for MU-P-1A lubrication and cooling of pump and motor bearings.	Yes	X	X	Aux. Oil Pump for MU-P-1A
MU-P-2B	MU-P-2B or MU-P-3B is required for MU-P-1B lubrication and cooling of pump and motor bearings.	Yes	X	X	Aux. Oil Pump for MU-P-1B
MU-P-2C	MU-P-2C or MU-P-3C is required for MU-P-1C lubrication and cooling of pump and motor bearings.	Yes	X	X	Aux. Oil Pump for MU-P-1C
MU-P-3A	Same as MU-P-2A	Yes	X	X	Main Oil Pump for MU-P-1A.
MU-P-3B	Same as MU-P-2B	Yes	X	X	Main Oil Pump for MU-P-1B
MU-P-3C	Same as MU-P-2C	Yes	X	X	Main Oil Pump for MU-P-1C
MU-P-4A	MU-P-4A or MU-P-5A is required for MU-P-1A lubrication and cooling of speed increaser gears & bearings	No	–	–	Lubrication Pump for MU-P-1A MU-P-5A is a shaft driven pump. This pump will provide adequate lubrication if MU-P-4A is unavailable.
MU-P-4B	MU-P-4B or MU-P-5B is required for MU-P-1B lubrication and cooling of speed increaser gears & bearings	No	–	–	Lubrication Pump for MU-P-1B MU-P-5B is a shaft driven pump. This pump will provide adequate lubrication if MU-P-4B is unavailable.
MU-P-4C	MU-P-4B or MU-P-5B is required for MU-P-1B lubrication and cooling of speed increaser gears & bearings	No	–	–	Lubrication Pump for MU-P-1C MU-P-5C is a shaft driven pump. This pump will provide adequate lubrication if MU-P-4C is unavailable.
MU-P-5A,B,C	MU-P-5 are shaft driven pumps which provide lubrication and cooling of MU-P-1 speed increaser gears & bearings	Yes	X	X	
MU-V-1A	Letdown Cooler A Inlet Valve. MU-V-1A or MU-V-1B must be open to provide flow if letdown is required.	Yes		X	During normal operation, both letdown coolers are in service. Motor operated valves MU-V-1A/B, MU-V-2A/B and IC-V-1A/B are all open. Each of three valves (MU-V-1, MU-V-2 & IC-V-1) must be open on the associated cooler to provide letdown. IC9-TE interlock may cause both MU-V-1A/B to close. Therefore, manual operation of one of these valves may be required to restore letdown. Uncontrolled letdown flow can be mitigated by closing (1) MU-V-2A and MU-V-2B, or (2) MU-V-3, or (3) MU-V-4 and MU-V-5.
MU-V-1B	Letdown Cooler B Inlet Valve. Same function as MU-V-1A	Yes		X	Same remark as MU-V-1A.
MU-V-2A	1) MU-V-2A or MU-V-2B must be open to provide flow if letdown is required. 2) MU-V-2A and MU-V-2B must be closed to mitigate uncontrolled letdown flow.	Yes	X	X	One of the outlet valves corresponding to the cooler in use must remain open if letdown is used. The valve will be manually corrected if it spuriously closes. Uncontrolled letdown can be mitigated by closing (1) MU-V-2A and MU-V-2B, or (2) MU-V-3, or (3) MU-V-4 and MU-V-5.
MU-V-2B	Same function as MU-V-2A	Yes	X	X	Same remark as MU-V-2A. Same remark as MU-V-1A.
MU-V-3	1) MU-V-3 must be open to provide flow if letdown is required. 2) MU-V-3 must be closed to mitigate uncontrolled letdown flow.	Yes	X	X	This pneumatic solenoid operated valve is normally opened and de-energized. If letdown is required and the valve spuriously closes, it can be manually opened. MU-V-3 can be operated from remote shutdown panel (RSP) “A”. Uncontrolled letdown can be mitigated by closing (1) MU-V-2A and MU-V-2B, or (2) MU-V-3, or (3) MU-V-4 and MU-V-5.
MU-V-4	1) MU-V-4 or MU-V-5 must be open to provide flow if letdown is required 2) MU-V-4 and 5 must be closed to mitigate uncontrolled letdown flow	Yes	X		MU-V-4 and MU-V-5 are air-operated valves that fail closed on loss of air. If fire causes MU-V-4 or MU-V-5 to close and letdown is required (see NOTE 2), then MU-V-98 will be opened to restore letdown. Uncontrolled letdown can be mitigated by closing (1) MU-V-2A and MU-V-2B, or (2) MU-V-3, or (3) MU-V-4 and MU-V-5.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MU-V-5	1) Valve is normally open to provide augmented letdown flow. 2) Valve must be closed to mitigate uncontrolled letdown flow.	Yes	X	X	Same remark as MU-V-4.
MU-V-6A	The valve isolates flow to demineralizer MU-K-1A.	No (S)	-	-	MU-V-6A and MU-V-6B are air-operated valves that fail closed on loss of air. If fire causes MU-V-6A or MU-V-6B to close and letdown is required (see NOTE 2), then MU-V-70A will be opened to bypass MU-K-1A and MU-K-1B.
MU-V-6B	Same function as MU-V-6A	No (S)	-	-	Same remarks as MU-V-6A.
MU-V-8	This valve diverts letdown flow to BLEED (RCBT or Deborating Demins) or THRU (Makeup tank). This valve must be in the THRU position for letdown to the Makeup tank.	No	-	-	This valve is normally positioned such that letdown flow is directed to the makeup tank. Spurious operation of MU-V-8 to the BLEED position will divert letdown flow from the makeup tank. This will not challenge the credited makeup pump suction source since the BWST is credited as the makeup pump suction source. The valve will be positioned to THRU (manually if required) prior to restoring letdown.
MU-V-11A	Inlet isolation valve to MU-F-1A	No (S)	-	-	Valve MU-V-110 can be manually opened to bypass the filter if MU-V-11A spuriously closes.
MU-V-11B	Inlet isolation valve to MU-F-1B	No (S)	-	-	Same remarks as MU-V-11A.
MU-V-12	Valve must remain open to provide suction path from makeup tank to makeup pumps unless MU-V-14A or MU-V-14B is open.	No	-	-	This valve is normally open. Removing power to the valve has prevented spurious closure. Pressure and level limits for the makeup tank have been established by analysis to prevent makeup tank cover gas entrainment in the makeup tank discharge piping. (Tech Spec 3.3)
MU-V-14A	Either MU-V-14A or MU-V-14B must be opened for any makeup pump to take suction from the BWST.	Yes	X	X	A fire in AB-FZ-4 close to the valve could damage the valve operator, but cable protection has been specified in AB-FZ-4 and the separation is sufficient (in this sprinklered area) to assure that both IC-V-3 and MU-V-14A are not affected. Valve operator damage does not prevent manual valve operation. For a fire in AB-FZ-4, this valve can be manually opened within two hours to restore makeup. The valve will be manually opened before starting the makeup pump.
MU-V-14B	Same function as MU-V-14A.	Yes	X	X	See MU-V-14A
MU-V-16A	MU-V-16A, MU-V-16B, MU-V-16C, and MU-V-16D are required for RC inventory control and HPI cooling.	Yes	X	X	The normal makeup path for RCS inventory control is through MU-V-17. MU-V-16A, 16B, 16C, and 16D may be used for RCS inventory control and are used for HPI cooling. These valves can be jog controlled. Manual control is acceptable for RCS inventory control Spurious opening of these valves would allow uncontrolled makeup flow, pressurizer overfill, and PORV cycling. Spurious opening can be mitigated by tripping the associated makeup pump or by manually closing the valve. Makeup pump minimum recirculation valves MU-V-36 and MU-V-37 must be ensured open prior to closing MU-V-16A/B or MU-V-16C/D. AREVA calculation 86-9101191-001 shows that for a pressurizer overfill event, RCS pressure remains below pressurizer pressure limits indefinitely. However, manual action will be taken within one hour to limit the uncontrolled makeup flow.
MU-V-16B	Same function as MU-V-16A	Yes	X	X	Same remark as MU-V-16A.
MU-V-16C	Same function as MU-V-16A	Yes	X	X	Same remark as MU-V-16A.
MU-V-16D	Same function as MU-V-16A	Yes	X	X	Same remark as MU-V-16A.
MU-V-17	Provides control of normal RCS makeup flow.	No (S)	-	-	MU-V-17 will be used to control RCS makeup flow if this flow path is available. If MU-V-17 cannot be controlled or fails open, then MU-V-18 will be closed or the associated makeup pump will be shutdown. If MU-V-17 is closed, MU-V-217 is not available or normal makeup flow path is otherwise unavailable, then MU-V-16A/B/C/D will be used to maintain RCS inventory (see MU-V-16A).
MU-V-18	Isolate normal RCS makeup flow if flow cannot be controlled with MU-V-17 or MU-V-217.	Yes	X	X	MU-V-18 is air-to-open, spring-to-close, fail-closed on loss of air. DC power is required to energize solenoid to vent air and close the valve. If MU-V-17 or MU-V-217 fails open, then MU-V-18 will be closed to control RCS makeup. If MU-V-17 or MU-V-217, and MU-V-18 fail open, manual action to fail closed MU-V-18 is required within one hour to mitigate pressurizer overfill.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MU-V-20	Required to be opened to establish RCP seal injection. (1) Seal injection to the RCP ensures seal reliability, prevents challenges to MU Pump or RB access due to high energy CBO flow. (2) Seal injection flow can provide a minimum flow path for MU pump operation.	Yes	X	X	MU-V-20 is required to remain open or be opened for RCP seal injection. MU-V-20 is an air to open, spring to close actuated valve. An air reservoir provides at least a 40-minute reserve to maintain the valve open if instrument air is lost. The seal injection flow path provides a minimum pump flow for one makeup pump. See the discussion on MU-V-36.
MU-V-25	Seal return containment isolation valve. Required to isolate seal return to protect the MU pumps, if all RCP seal cooling is lost, CBO cannot be isolated (MU-V-33A/D), and seal cooling cannot be restored within 1 hr.	Yes	X	-	
MU-V-26	Seal return containment isolation valve. Required to isolate seal return to protect the MU pumps, if all RCP seal cooling is lost, CBO cannot be isolated, and seal cooling cannot be restored within 1 hr.	Yes	X	-	
MU-V-32	Required to remain open or bypassed for RCP seal injection .	Yes	X	X	MU-V-32 is an air operated flow control valve controlled by a manual controller (MU-42-FIC) or automatic flow control from flow transmitter MU-42-DPT. Automatic control failure can be mitigated by manual control. The valve will fail to mid-position on loss of signal. On loss of instrument air pressure, the valve fails open. When MU-V-32 is not remotely operable, it may be bypassed using MU-V-89A and MU-V-90.
MU-V-36	Both MU-V-36 and MU-V-37 must be open to provide minimum acceptable flow (>40 GPM) through the makeup pumps to prevent pump damage.	Yes	X	X	Seal injection flow of ~ 40 gpm provides minimum flow protection for one makeup pump. If MU-V-36 or MU-V-37 closes spuriously, the valves must be opened within two hours if seal injection is available. The two-hour value is a conservative assumption, based on a letter from the pump manufacturer (NOTE 6), who states that the pumps can operate at flows as low as the design seal injection flow for days or weeks without serious effects. In AB-FZ-6, if MU-V-36 spuriously closes and instrument air is lost, the valve must be opened before MU-V-20 closes on loss of air (within 40 minutes) to prevent makeup pump damage.
MU-V-37	See MU-V-36	Yes	X	X	See MU-V-36.
MU-V-70A	This is a manual bypass around the MU-K-1A/B. This valve will be opened to restore letdown flow if MU-V-6A and 6B closes.	Yes	X	X	Same remarks as MU-V-6A.
MU-V-76A	Valve is opened to allow MU-P-1C to be used for seal injection or RC makeup and pressure control	Yes	X	X	Manual valves MU-V-76A and 76B are used to allow MU-P-1C to be used for seal injection or, if desired, RCS pressure control with the normal makeup path and control valves.
MU-V-76B	Same function as MU-V-76A	Yes	X	X	Same remarks as MU-V-76A.
MU-V-89A	Required to be closed when MU-V-32 is bypassed	Yes	X	X	MU-V-89A is a manual valve that is used to isolate MU-V-32 when remote operation of MU-V-32 is unavailable. MU-V-90 is used to control RCP seal injection flow when MU-V-89A is closed.
MU-V-90	Required to be throttled when MU-V-32 is bypassed	Yes	X	X	MU-V-90 is a manual valve that is used to throttle seal injection flow when remote operation of MU-V-32 is unavailable.
MU-V-97A	If letdown is required and MU-V-5 is failed open, then MU-V-97A must be closed to provide control of letdown flow with MU-V-98.	No	-	-	The purpose to close MU-V-97A in order to “control” letdown flow is primarily driven by concern with cyclic thermal stress on letdown coolers. In a fire event, this action (close MU-V-97A) is a process optimization and is not essential to performing the FSSD function. A more rapid introduction of letdown flow will not cause failure of the letdown cooler during this event.
MU-V-98	The valve provides a manual bypass for letdown flow around MU-V-4 and MU-V-5.	Yes	X	X	Same remark as MU-V-4.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
MU-V-99	If letdown is required and MU-V-4 is failed open, then MU-V-99 must be closed to provide control of letdown flow with MU-V-98.	No	-	-	The purpose to close MU-V-99 in order to “control” letdown flow is primarily driven by concern with cyclic thermal stress on letdown coolers. In a fire event, this action (close MU-V-99) is a process optimization and is not essential to performing the FSSD function. A more rapid introduction of letdown flow will not cause failure of the letdown cooler during this event.
MU-V-110	This is a manual bypass around the MU-F-1A/B. This valve will be opened to restore letdown flow if MU-V-11A or MU-V-11B closes.	Yes	X	X	Makeup Filter Bypass Valve
NI-11	Provide indication of reactor neutron flux level to confirm that the reactor is shutdown.	Yes	X	X	Full range neutron flux (Train A) - These instruments allow the operators to monitor the reactivity level of the core. They are utilized to verify reactor scram and to indicate if core reactivity is increasing or decreasing as a result of boron concentration, void formation or steam formation. Only one instrument is required for safe shutdown. See NOTE 3.
NI-12	Same as NI-11	Yes	X	X	Full range neutron flux (Train B) – Same remark as NI-11. See NOTE 3.
NR-P-1A	A nuclear river water pump is required to provide cooling water through the nuclear services closed cooling water and intermediate closed cooling water system coolers. One pump is required for shutdown.	Yes	X	X	These pumps can operate without pressurized lubricating water (WT-P-33A & B).
NR-P-1B	Same as NR-P-1A	Yes	X	X	Same remark as NR-P-1A. NR-P-1B is a swing pump that can be manually transferred from the 1T 480V switchgear (normal source) to the 1R 480V switchgear (alternate source). This transfer is required for a fire in CB-FA-2b, where NR-P-1B is the only credited NR pump, to support letdown restoration.
NR-P-1C	Same as NR-P-1A	Yes	X	X	Same remark as NR-P-1A. NR-P-1C can be controlled from Auxiliary Remote Shutdown Panel (Aux. RSP) “B”.
NR-S-1A	Strainer must permit flow through the NS & IC system coolers	Yes	X	X	Loss of the motor drive for the strainer or spurious closure of the backwash valve could affect flow through the strainer after a period of time. Strainers are available where their associated NR pump is available, except NR-S-1B in CB-FA-2c. Unavailability of NR-S-1B in this area results in unavailability of NR-P-1B.
NR-S-1B	See NR-S-1A	Yes	X	X	Same remark as NR-S-1A.
NR-S-1C	See NR-S-1A	Yes	X	X	Same remark as NR-S-1A.
NR-V-1A	The valve must be open for the corresponding to the NR pump to provide flow to the NS & IC coolers.	Yes	X	X	NR-P-1A Discharge Valve
NR-V-1B	Same as NR-V-1A	Yes	X	X	NR-P-1B Discharge Valve
NR-V-1C	Same as NR-V-1A	Yes	X	X	NR-P-1C Discharge Valve
NR-V-2	Stay closed to prevent NR water from diverting to the secondary river water system.	No	-	-	NR-V-2 is in series with NR-V-7. At least one valve must stay closed to prevent NR water from diverting to the secondary service. These are normally closed motor operated valves with no automatic opening signals. A hot short could cause one valve to open, but at least one valve will remain closed.
NR-V-3	This valve must remain open to allow flow of river water to the NS heat exchangers and IC coolers.	No	-	-	Maintaining the power supply breaker open prevents spurious closure of this valve.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
NR-V-4A	1. One of the valves must be closed to prevent excessive diversion of NR flow from the IC & NS coolers. 2. These valves are opened for CW makeup. CW makeup is required when the letdown from circulating water exceeds the capacity of the normal makeup source, secondary river water system.	Yes	X	X	Prior to the fire, these valves are closed or in use for CW makeup. When used for CW makeup, NR-V-4B is open with NR-V-4A throttled. Manual action to close NR-V-4A or NR-V-4B is required to support restoration of letdown. Tech Eval 09-00030 supports single NR pump operation with NR-V-4A/B open.
NR-V-4B	Same as NR-V-4A	Yes	X	X	Same remark as NR-V-4A.
NR-V-5	This valve must remain open to allow flow of river water to the NS heat exchangers and IC coolers.	No	-	-	Maintaining the power supply breaker open prevents spurious closure of this valve.
NR-V-6	This valve must remain closed to prevent NR water from diverting to the secondary river water system.	No	-	-	Maintaining the power supply breaker open prevents spurious opening of this valve.
NR-V-7	Either NR-V-2 or this valve must remain closed to prevent NR water from diverting to the secondary river water system.	No	-	-	NR-V-2 and NR-V-7 are normally closed motor operated valves with no automatic opening interlocks. A single hot short could not cause both valves to open. These valves do not affect fire safe shutdown.
NR-V-8A	This valve must be open to provide NR flow through NS-C-1A.	No	-	-	These valves (NR-V-8A, 8B, 8C & 8D) are normally open. Flow through one cooler is required to support safe shutdown. A hot short could cause one valve to close. The breaker for NR-V-8A is maintained open to ensure flow through at least one cooler.
NR-V-8B	This valve must be open to provide NR flow through NS-C-1B.	No	-	-	Same remark as NR-V-8A.
NR-V-8C	This valve must be open to provide NR flow through NS-C-1C.	No	-	-	Same remark as NR-V-8A.
NR-V-8D	This valve must be open to provide NR flow through NS-C-1D.	No	-	-	Same remark as NR-V-8A.
NR-V-10A	This valve must be open to provide NR flow through IC-C-1A.	No	-	-	NR-V-10A & NR-V-10B are normally open motor operated valves with no automatic closure signals. The breakers for these motor operators maintained open.
NR-V-10B	This valve must be open to provide NR flow through IC-C-1B.	No	-	-	Same remark as NR-V-10A.
NR-V-15A	This valve must be open to provide NR flow through IC-C-1A.	Yes	X	X	At least one ICCW cooler outlet valve is normally throttled open. One valve may be closed. Manual correction will be required when letdown cooling restoration is necessary.
NR-V-15B	Same function as NR-V-15A	Yes	X	X	Same remark as NR-V-15A. NR-V-15B can be controlled from the “B” Aux. RSP.
NR-V-16A	This valve must be open to provide NR flow through NS-C-1A.	No	-	-	The river water flow required to maintain NSCCW system temperature varies due to changes in Spent Fuel pool heat load, Evaporator system operation, river water temperature, and other smaller effects. The required cooling is obtained by sequential operation of the coolers. With a low demand and cold river water only NS-C-1A may be required. As the requirement increases additional coolers are placed in service by throttling open the associated NR-V-16 valve. The required river water flow for safe shutdown is assured by maintaining the breakers for NR-V-8A & NR-V-16A open to prevent spurious closure. Therefore, at least one cooler will be available, which is more than sufficient for MU-P-1B cooling.
NR-V-16B	This valve must be open to provide NR flow through NS-C-1B.	No	-	-	Same remark as NR-V-16A.
NR-V-16C	This valve must be open to provide NR flow through NS-C-1C.	No	-	-	Same remark as NR-V-16A.
NR-V-16D	This valve must be open to provide NR flow through NS-C-1D.	No	-	-	Same remark as NR-V-16A.
NR-V-18	Remain open to allow NR water flow through NS heat exchangers and IC coolers.	No	-	-	This valve is throttled in the required position for NR system operation. The breaker is maintained open to prevent spurious operation.
NR-V-19	Nuclear river system de-ice supply to ISPH.	No	-	-	This valve is normally closed. It is only open for emergency deicing operations (i.e. ambient temperature below freezing and Circ Water de-ice is not available). Spurious opening would increase flow through the NS & IC coolers, but would not challenge pump run out conditions or degrade heat exchanger tubes within the Appendix R 72-hour time frame. Therefore, no manual action is required.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
NS-P-1A	These pumps provide cooling water to makeup pump 1B. Only one pump is required for safe shutdown.	Yes	X	X	NS Cooling Pump A
NS-P-1B	Same as NS-P-1A	Yes	X	X	NS Cooling Pump B. NS-P-1B is a swing pump that can be manually aligned to either the 1P 480V switchgear (normal source) to the 1S 480V switchgear (alternate source).
NS-P-1C	Same as NS-P-1A	Yes	X	X	NS Cooling Pump C.
NS-V-4	NSCCW Containment Isolation Valve	No	-	-	NSCCW to the reactor building is not required because Reactor Coolant Pump operation is not required for safe shutdown.
NS-V-15	NSCCW Containment Isolation Valve	No	-	-	Same remark as NS-V-4.
NS-V-32	NSCCW isolation valve for Waste Evaporators, Waste Gas Compressors, and Seal Return Coolers	No	-	-	This valve is not required for safe shutdown since Operability Evaluation 429488-02 shows that MU-P-1B operation is acceptable without NS-V-32 closure.
NS-V-35	NSCCW Containment Isolation Valve	No	-	-	Same remark as NS-V-4.
NS-V-52A, B, C NS-V-53A, B, C	These valves isolate NSCCW flow to the reactor building fans (AH-E-1A, B, C).	No	-	-	Reactor Building Cooling is not required for safe shutdown.
NS-V-108A	NSCCW to Control Bldg. Chiller AH-C-4A	No	-	-	NSCCW to Control Bldg. Chiller See remarks for “826 Control Bldg Ventilation”
NS-V-108B	NSCCW to Control Bldg. Chiller AH-C-4B	No	-	-	NSCCW to Control Bldg. Chiller See remarks for “826 Control Bldg Ventilation”
RC1-LT-1	Provide indication of the water level in the pressurizer.	Yes	X	X	Pressurizer Level Indication: Both a level transmitter (RC1-LT-1, RC1-LT-3 or RC-LT-777) and an operable pressurizer temperature input (RC2-TE-1 or RC2-TE-2) are required to provide a valid pressurizer level indication. One pressurizer level indication is required for shutdown.
RC1-LT-3	Same as RC1-LT-1	Yes	X	X	Same remark as RC1-LT-1.
RC2-TE-1	Pressurizer temperature is used to provide a valid pressurizer level indication.	Yes	X	X	
RC2-TE-2	Same as RC2-TE-1	Yes	X	X	
RC3A-PT-1	Provide Narrow Range indication of RC pressure and input to the PORV (RC-RV-2) control logic.	No (S)	-	-	
RC3A-PT-3	Provide Wide Range indication of RC pressure and input to the PORV (RC-RV-2) control logic. Monitoring of this parameter is required to maintain primary system subcooling margin and operate within pressure temperature limits. Provides input to ESAS.	Yes	X	X	RC Pressure Wide Range (Loop A) - Only one wide range pressure transmitter (A or B loop) must be available for shutdown. Degradation of at least two of the following instruments could lead to “A” and “B” train HPI actuation. (RC3A-PT-3, RC3B-PT-3 & RC3A-PT-4)
RC3A-PT-4	Provide Wide Range indication of RC pressure and input to ESAS.	Yes	X	X	See RC3A-PT-3 remarks
RC3B-PT-3	Provide Wide Range indication of RC pressure and input to ESAS.	Yes	X	X	See RC3A-PT-3 remarks
RC4A-TE-1	Provide Narrow Range indication of reactor coolant temperature at the reactor outlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	X	RC Outlet Temp. Narrow Range (Loop A) Same remark as RC-TE-958 See NOTE 3. RC4A/B-TE1/4 provide narrow range indication on CR console and wide range indication on the PPC. In FH-FZ-1, if the PPC indication of wide range indication is unavailable, temporary provisions (“repair”) have been made to provide wide range indication from RC4A-TE-1 in the relay room.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
RC4A-TE-4	Provide Narrow Range indication of reactor coolant temperature at the reactor outlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	-	RC Outlet Temp. Narrow Range (Loop A) Same remark as RC-TE-958. See NOTE 3.
RC4B-TE-1	Provide Narrow Range indication of reactor coolant temperature at the reactor outlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	-	RC Outlet Temp. Narrow Range (Loop B) Same remark as RC-TE-958. See NOTE 3.
RC4B-TE-4	Provide Narrow Range indication of reactor coolant temperature at the reactor outlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	-	RC Outlet Temp. Narrow Range (Loop B) Same remark as RC-TE-958 See NOTE 3.
RC5A-TE-2	Provide Wide Range indication of reactor coolant temperature at the reactor inlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	X	RC Inlet Temp. Wide Range (Loop A) Same remark as RC-TE-959 See NOTE 3.
RC5A-TE-4	Provide Wide Range indication of reactor coolant temperature at the reactor inlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	X	RC Inlet Temp. Wide Range (Loop A) Same remark as RC-TE-959 See NOTE 3.
RC5B-TE-2	Provide Wide Range indication of reactor coolant temperature at the reactor inlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	X	RC Inlet Temp. Wide Range (Loop B) Same remark as RC-TE-959 See NOTE 3.
RC5B-TE-4	Provide Wide Range indication of reactor coolant temperature at the reactor inlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate.	Yes	X	X	RC Inlet Temp. Wide Range (Loop B) Same remark as RC-TE-959 See NOTE 3.
RC-GRP-8	One group of pressurizer heaters is required for RCS Pressure control.	Yes	X	X	In the normal configuration, both Group 8 and Group 9 pressurizer heaters are supplied by offsite power. If a loss of offsite power occurs, these heaters can be realigned to buses supplied by the diesel generators. For areas where the fire could cause loss of both trains of pressurizer heaters and two trains of Decay Heat Removal are available (RB-FZ-1d, and RB-FZ-2 and TB-FA-1), solid ops will be used for reactor coolant pressure control. For areas the fire could cause loss of both trains of pressurizer heaters and two trains of Decay Heat Removal are <u>not</u> available (CB-FA-1, and CB-FA-2b, CB-FA-2c and FH-FZ-5), one group of pressurizer heaters will be made available (i.e. repair) to support cooldown. See NOTE 3
RC-GRP-9	Same as RC-GRP-8	Yes	X	X	Same remark as RC-GRP-8.
RC-LT-777	Same as RC1-LT-1	Yes	X	X	Same remark as RC1-LT-1.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
RC-P-1A	Reactor Coolant Pump Operation is not required. The capability to shutdown the RCP is required to: 1) Prevent excessive loss of RCS inventory and RCP seal damage if RCP seal injection and RCP thermal barrier cooling are lost. 2) Maintain RCS pressure control if both RC-V-1 and RC-V-3 are failed open.	Yes	X	-	Reactor coolant pumps (RCP) are not required for safe shutdown. Natural circulation can be used for RCS heat removal. RC Pump shutdown can be accomplished by any one of the following methods: 1) Control Room: Operation of RC Pump Control switch 2) Control Room: Operation of 1A or 1B 6900V Bus feeder breaker control switch 3) Electrical switchgear room in Turbine Bldg: Using 69 switch for local trip 4) Electrical switchgear room in TB 322: Using “Plunger Trip” to mechanically actuate the RCP breaker Only three RC pumps must be shutdown to mitigate spray line failures. RC-P-1C or RC-P-1D may remain operating.
RC-P-1B	Same as RC-P-1A	Yes	X	-	Same remark as RC-P-1A.
RC-P-1C	Reactor Coolant Pump Operation is not required. RCP shutdown is required to 1) Prevent excessive loss of RCS inventory and RCP seal damage if RCP seal injection and RCP thermal barrier cooling are lost. 2) Maintain RCS pressure control if both RC-V-1 and RC-V-3 are failed open either RC-P-1C or RC-P-1D must be shutdown.	Yes	X	-	Same remark as RC-P-1A.
RC-P-1D	Same as RC-P-1C	Yes	X	-	Same remark as RC-P-1A.
RC-PT-949	Provide wide range indication of B Loop RC pressure. Monitoring of this parameter is required to maintain primary system sub-cooling margin and operate within pressure temperature limits.	Yes	X	X	RC Pressure Wide Range (Loop B) - Same remark as RC3A-PT-3.
RC-PT-963	Provide wide range indication of A Loop RC pressure. Monitoring of this parameter is required to maintain primary system sub-cooling margin and operate within pressure temperature limits.	Yes	X	X	RC Pressure Wide Range (Loop A) - Same remark as RC3A-PT-3.
RC-RV-2	1) This valve or RC-V-2 must be closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an App R “high-low pressure boundary” valve. 2) This valve and RC-V-2 are opened for HPI Cooling 3) This valve is cycled open with RC-V-2 open as a means of RCS reduction when RC pumps are not available.	Yes	X	-	RC-RV-2 is in series with RC-V-2. RC-RV-2 opens automatically on high RCS pressure. This solenoid-operated valve is normally closed and de-energized. Remote manual control is available. Spurious opening will cause rapid depressurization of the RC system. RC-V-2 is normally open and must be closed to mitigate the depressurization. Pressurizer ambient heat losses are sufficient for RCS pressure reduction. The PORV or Pzr vent flow paths are not required to reduce RCS pressure for fire safe shutdown.
RC-TE-958	Provide indication of reactor coolant temperature at the reactor outlet to verify that natural circulation has been achieved and to maintain primary system subcooling margin and cooling rate	Yes	X	X	RC Outlet Wide Range (Loop A) – Only one of the following instruments is required for shutdown: IM-SPND (BIRO), RC-TE-958, RC-TE-960, RC4A-TE-1, RC4A-TE-4, RC4B-TE-1, or RC4B-TE-4. A wide range indication must be available to cooldown.
RC-TE-959	Same as RC-TE-958	Yes	X	X	RC Inlet Temp. Wide Range (Loop A) – Only one of the following instruments is required for shutdown. RC-TE-959, RC-TE-961, RC5A-TE-2, RC5A-TE-4, RC5B-TE-2, or RC5B-TE-4
RC-TE-960	Same as RC-TE-958	Yes	X	X	RC Outlet Temp. Wide Range (Loop B) - Same remark as RC-TE-958.
RC-TE-961	Same as RC-TE-958	Yes	X	X	RC Inlet Temp. Wide Range (Loop B) – Same remark as RC-TE-959.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
RC-V-1	RC-V-1 is opened to reduce RCS pressure when RC pumps are operating.	No (S)	-	-	RC-V-1 is in series with normally open valve RC-V-3. RC-V-1 is opened to reduce RCS pressure. If RC-V-1 opens spuriously, then RC-V-3 will be closed or the reactor coolant pumps will be shutdown. Alternate means of RCS pressure reduction (Pressurizer vent, PORV, Pressurizer sample line and Pressurizer ambient heat loss) are available. Loss of the ability to reduce RCS pressure with RC-V-1 does not affect safe shutdown.
RC-V-2	1) Close to mitigate spurious opening of RC-RV-2. This valve or RC-RV-2 must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve. 2) This valve and RC-RV-2 are opened for HPI Cooling 3) This valve is opened and RC-RV-2 is cycled as a means of RCS pressure reduction when RC pumps are not available.	Yes	X	X	Same remarks as RC-RV-2. See NOTE 3
RC-V-3	This valve may be used to isolate the Pressurizer Spray line in the event of a failure of RC-V-1 in the open position.	No	-	-	This valve is not required, since tripping the RCPs, from the control room or locally for a fire in CB-FA-1, is the credited action for spurious RC-V-1 opening.
RC-V-4	This valve is opened during to provide pressurizer spray and reduce RCS pressure while the Decay Heat Removal system is in operation.	No	-	-	Auxiliary pressurizer spray is not required to reach cold shutdown. Cold shutdown (< 200°F) can be achieved with RCS pressure as high as 280 psig. The same method (RC-V-1 or pressurizer vents) used to reduce RCS pressure to initiate DHR can used if desired for further RCS pressure reduction. The valve can be manually opened if desired.
RC-V-28	1) Pressurizer vent valve. This valve or RC-V-44 must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve. 2) RC-V-28 and RC-V-44 (or PORV) flow path are opened to reduce RCS pressure when RC pumps are not operating.	No (S)	-	-	RC-V-28 is in series with RC-V-44. Both of these high-low pressure valves are normally closed. A control scheme modification has been made to RC-V-44 to prevent spurious opening due to any one hot short. Pressurizer ambient heat losses are sufficient for RCS pressure reduction. The PORV or Pressurizer vent flow paths are not required to reduce RCS pressure for fire safe shutdown. In III.G.3 fire areas where Appendix R requires the capability to reach cold shutdown with 72 hours, the manual Pressurizer vent path (RC-V-49 and RC-V-50) can be used.
RC-V-40A	RCS Hot leg A vent valve. This valve or RC-V-41A must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve.	No (S)	-	-	RC-V-40A is in series with RC-V-41A. Both of these high-low pressure valves are normally closed. A control scheme modification has been made to RC-V-41A to prevent spurious opening due to any one hot short.
RC-V-40B	RCS Hot leg B vent valve. This valve or RC-V-41B must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve.	No (S)	-	-	RC-V-40B is in series with RC-V-41B. Both on these high-low pressure valves are normally closed. A control scheme modification has been made to RC-V-41B to prevent spurious opening due to any one hot short.
RC-V-41A	RCS Hot leg A vent valve. This valve or RC-V-40A must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve.	No (S)	-	-	Same remark as RC-V-40A.
RC-V-41B	RCS Hot leg B vent valve. This valve or RC-V-40B must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R “high-low pressure boundary” valve.	No (S)	-	-	Same remark as RC-V-40B.

Component	Function	FSSD	HSD	CSD	Comments / Discussion
RC-V-42	Reactor Vessel Head vent valve. This valve or RC-V-43 must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R "high-low pressure boundary" valve.	No (S)	-	-	RC-V-42 is in series with RC-V-43. Both on these high-low pressure valves are normally closed. A control scheme modification has been made to RC-V-43 to prevent spurious opening due to any one hot short.
RC-V-43	Reactor Vessel Head vent valve. This valve or RC-V-42 must remain closed to maintain RCS pressure boundary and prevent a loss of RCS inventory. This valve is an Appendix R "high-low pressure boundary" valve.	No (S)	-	-	Same remark as RC-V-42.
RC-V-44	Same function as RC-V-28	No (S)	-	-	Same remark as RC-V-28.
RC-V-49	Pressurizer vent valve (in series with RC-V-50)	Yes	-	X	Pressurizer ambient heat losses are sufficient for RCS pressure reduction. The PORV or Pressurizer vent flow paths are no required to reduce RCS pressure for fire safe shutdown. In III.G.3 fire areas where Appendix R requires the capability to reach cold shutdown within 72 hours, the manual Pressurizer vent path (RC-V-49 and RC-V-50) can be used, if required.
RC-V-50	Pressurizer vent valve (in series with RC-V-49)	Yes	-	X	See RC-V-49
RM-L-1	Letdown line radiation monitor provides an interlock to close letdown isolation valves MU-V-2A & B.	No (S)	-	-	MU-V-2A/B will be manually controlled or controlled from remote shutdown if letdown is required after spurious closure. Instrument circuits need no protection.
RSP-A	Provide remote shutdown control for the A train of safe shutdown equipment	Yes	X	X	Remote Shutdown Panel A – This panel provides control facilities for the train "A" remote shutdown components. This panel is required only for remote shutdown.
RSP-B	Provide remote shutdown control for the B train of safe shutdown equipment	Yes	X	X	Remote Shutdown Panel B – These panels provide control facilities for the train "B" remote shutdown components. These panels are required only for remote shutdown.
RSP-B AUX	Provide remote shutdown control for the B train of safe shutdown equipment	Yes	X	X	Aux. Remote Shutdown Panel B – Same remark as RSP-B.
RSTSP-A	Provide transfer switches to isolate control circuits of components included in the Remote Shutdown System.	Yes	X	X	Remote Shutdown Transfer Switch Panel A - These panels are required only for remote shutdown.
RSTSP-B	Same as panel A	Yes	X	X	Remote Shutdown Transfer Switch Panel B – Same remark as RSTSP-A.
RSTSP-C	Same as panel A	Yes	X	X	Remote Shutdown Transfer Switch Panel C – Same remark as RSTSP-A.
SCC-A1, A2, A3	Supply power to safe shutdown instruments	Yes	X	X	Remote Shutdown Signal Conditioning Cabinet A – These cabinets supply power to safe shutdown instruments.
SCC-B1, B2, B3	Supply power to safe shutdown instruments	Yes	X	X	Remote Shutdown Signal Conditioning Cabinet B – These cabinets supply power to safe shutdown instruments.
SP6A-PT-1	(1) Provide indication of the OTSG A pressure. (2) Provides input to MS-V-3D,E,F / MS-V-4A automatic control. (3) Only one pressure indication per OTSG is required for shutdown.	Yes	X	X	Same remark as MS-PT-1180
SP6A-PT-2	(1) Provide indication of the OTSG A pressure. (2) Provides input to MS-V-3D,E,F / MS-V-4A automatic control. (3) Only one pressure indication per OTSG is required for shutdown.	Yes	X	X	Same remark as MS-PT-1180

Component	Function	FSSD	HSD	CSD	Comments / Discussion
SP6B-PT-1	(1) Provide indication of the OTSG B pressure. (2) Provides input to MS-V-3A,B,C / MS-V-4B automatic control. (3) Only one pressure indication per OTSG is required for shutdown.	Yes	X	X	Same remark as MS-PT-1184.
SP6B-PT-2	1) Provide indication of the OTSG B pressure. 2) Provides input to MS-V-3A,B,C / MS-V-4B automatic control. 3) Only one pressure indication per OTSG is required for shutdown.	Yes	X	X	Same remark as MS-PT-1184
SP10A-PT-1 SP10A-PT-2	Turbine Header Pressure is an input to MS-V-4A and MS-V-3D, E, F, control logic.	No (S)	-	-	
SP10B-PT-1 SP10B-PT-2	Turbine Header Pressure is an input to MS-V-4B and MS-V-3A, B, C control logic.	No (S)	-	-	
SW-P-2A	Required to provide cooling water to support ISPH Ventilation Fan A operation.	No	-	-	See remarks for system 838
SW-P-2B	Required to provide cooling water to support ISPH Ventilation Fan B operation.	No	-	-	See remarks for system 838
TG-CV-1 TG-CV-2 TG-CV-3 TG-CV-4	These valves or the Turbine Stop Valves are required to close to maintain OTSG/MS integrity (i.e. control RCS heat removal).	Yes	X	-	Turbine Control Valves. In CB-FA-3d or CB-FA-4b, the turbine will be tripped before significant fire damage occurred. Outside of the relay room or control room, a single hot short and other fire-induced failures would not prevent these valves from closing. There are two diverse means to close each valve (1) three coil servo valve and (2) disk dump valve. A loss of signal (open or short to ground) will cause the servo to drive the valve closes. A hot short on a single servo input will not affect control of the valve. Therefore, no circuit analysis is required. The valves will close when a turbine trip is required.
TG-SV-1 TG-SV-2 TG-SV-3 TG-SV-4	These valves or Turbine Control Valves are required to close to maintain OTSG/MS integrity (i.e. control RCS heat removal).	No	X	-	The turbine control valves will close when a trip is required.
VA-P-1A VA-P-1B VA-P-1C	Main Condenser Vacuum Pumps All main vacuum pump must be shutdown or VA-V-8 opened to utilize the condensate stored in the hotwell for EFW	Yes	X	X	One of these actions is required to maintain hot shutdown in areas where the fire could cause CO-V-7 or CO-V-8 to spuriously open. Otherwise, these actions are required for cold shutdown.
VA-V-8	Main Condenser Vacuum Breaker All main vacuum pump must be shutdown or VA-V-8 opened to utilize the condensate stored in the hotwell for EFW	Yes	X	X	See VA-P-1A,B,C
WDL-V-1 WDL-V-2 WDL-V-3 WDL-V-4 WDL-V-5	These valves are used divert letdown flow to the bleed tank. This creates space for additional RCS makeup while maintaining pressurizer level in the desired band. Additional RCS makeup may be desired to increase RCS boron concentration.	No	-	-	A BLEED path is not required for safe shutdown. When all rods fully insert, RCS boron concentration can be raised to the cold shutdown requirement using BWST makeup only and no credit for letdown or other mass removal from the RCS. See NOTE 4. When the FHAR was originally developed, spurious closure of MU-V-12 was a consideration. The breaker for MU-V-12 is open to prevent spurious closure. This eliminates any potential for makeup tank overfill.

NOTES:

NOTE 1: Only one motor-driven EFW pump and one OTSG are required for RCS heat removal at hot shutdown. See GPUN Memo 5520-85-0520, 10-01-85 released via DRF 038078, and the attached study by R.W. Moore, Babcock and Wilcox, “Evaluation of Effects of Reduced or Delayed EFW Flow for Appendix R Requirements – TMI.”

NOTE 2: The letdown function can be used to provide RCS chemistry control or to enhance reactor coolant system inventory and pressure control. The letdown function should be used when recovering a pressurizer steam bubble (e.g. after HPI cooling). Letdown should also be used if solid ops is required (e.g. pressurizer heaters are not available) if RCP seal cooling has been maintained. Letdown, when required to maintain RCS pressure control, may be manually restored if lost. Letdown may not be available for a fire where the intermediate cooling pumps are located or where the local operation of IC-V-2 may be challenged (see Attachment 3-5J).

NOTE 3: A evaluation of the effect of the RB environment after a loss of all RCP seal cooling has been completed which demonstrates that these components will remain operable for greater than 72 hours. [Tech Eval 352410-36]

NOTE 4: C-1101-202-E620-463, “TMI-1 Cycle 17 Shutdown margin Verification during Emergency Cooldown”. NOTE: This analysis is performed for each core reload as required by NF-AP-100-8000. This analysis demonstrates that the reactor will remain shutdown at 70°F assuming all rods fully inserted, no xenon, no injection from the boric acid mix tank (BAMT), and BWST makeup only as required to account for RCS density change during cooldown (i.e. maintain pressurizer level).

NOTE 5: TDR 900 “Reconciliation of Loss of Ventilation Systems Analyses and Tests”

NOTE 6: Two hour assumption for minimum makeup pump flow rate based on letter from Gordon Parks of Bingham-Willamette to D.H. Stevens of Gilbert/Commonwealth, dated August 25, 1986.

NOTE 7: While it is beyond the current TMI-1 licensing basis the DH-V-1 and DH-V-3 breakers are open for NRC Regulatory Guide 1.189 Revision 2 voluntary compliance.

NOTE 8: C-1101-211-E610-066, “Makeup Tank Level & Pressure Limits”.