Final Submittal

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1. As Given Simulator Scenario Operator Actions ES-D-2

Appendix D | Scenario Outline | Form ES-D-1

Facility: V. C. Summer | Scenario No.: 1 | Op-lest No.: 1

Examiners: _____ Operators: _____

Initial Conditions: IC-I61 100% Power BOL. 25 GPD Tube Leak on the "A" S/G. Emergency Feed Water Pump 'A' (XPP-21A) inoperable for maintenance. Severe Thunderstorm storms in effect. RMA 9 OOS. I&C performing STP 345.040 ENGINEERED SAFETY FEATURE ACTUATION SLAVE RELAY TEST

Turnover: Maintain 100% reactor power

Event No.	Malf. No.	Event Type*	Event Description
PRE	FWM3C	(C)	TDEFW over-speeds on start and will not reset.
PRE	TUR-020	(C)	.Failure of Turbine to **trip.**
PRE	PCS-9AB PCS-9BB	(C)	**ATWS** Reactor fails to trip
1	TUR-11	(C)BOP	**Running** EH pump trips. (Must manually start other pump)
2	TUR-12	(I) BOP	Selected P-imp fails low
3	CVC-15	(C) RO	Letdown Pressure Control Valve PCV-145 fails closed
4	N/A	(N) RO	Place excess letdown in service
5	PRS-1	(I) RO	**IT-444** fails High
6	FWM-1	(C)BOP	**A** FW pump **trip**
7	N/A	(R)RO	**Ramp** *unit* down to 91% Reactor **power** .
8	FWM1	M-All	Total Loss of Main Feed due to inadvertent FW isolation.
9	FWM3	(C)	B MDEFW trip on overcurrent. (After first verification)

(N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 1

Synopsis of Scenario.

Pre -event items are to set the simulator **up** for a total loss of feed ATWS.

Event 1 — Select the other EH **pump.** Direct maintenance to evaluate the failure of the running pump.

Event 2 — Selected P-imp fails low interaction from RO and BOP to take Rods to manual and select out failed channel. Could be diagnosed from either.

Event 3 — PCV-145 fails closed, this will cause a loss of letdown and the RO will have to deal with relief lifting, isolating letdown.

Event 4 — Establish excess letdown,

Event 5 — **PT-444** fails high, this will cause **the** spray valves to open, one PORV to open. The RO will need to close the sprays in manual and close the PORV prior to a trip parameter being met. After the valves are closed, and parameters are stabilized. The next event can be initiated.

Event *6* — "A" MFP **trips.** The BOP operator **works** with the CRS to perform the immediate actions of AOP 210.3.

Event 7 — RO and BOP coordinate to reduce load to less than 91% power at 1% per minute. When reactor power is less than 94%, **an** inadvertent FW isolation will occur, prompting the CRS to direct a reactor trip as a conservative decision.

Event 8 — The reactor and turbine does not trip? the TDEFW pump trips on overspeed. After the B MDEFW **pump is** verified running in EOP-13.0, it will trip on over current. This will put the plant in EOP-13.0 (The reactor **trip** breakers will be opened locally when S/G levels **are** less than 45% wide range). **'This** will cause the crew to go **to** Loss of heat sink / feed and bleed.

Scenario to be terminated when EFW flow is reinitated to a SG or at the discretion of the Lead Examiner.

EHC Pump Trip

Time	Operator	Actions
	BOP	Increasing amps on "A" EHC pump. Receive alarm XCP-631, **1-4.** Operator removes appropriate ARP, reviews procedure, and hands it to the CRS. "A" EHC pump trips.
	CRS/BOP	Directs/recommends starting "B" EHC pump. BOP starts "B" EHC pump and observes normal amps. Dispatches TB AO to inspect "A" EHC pump locally.
	CRS/BOP	*May refer to SOP 222 ELECTRO-HYDRAULIC CONTROL POWER SYSTEM, section III B. SWITCHOVER OF THE EHC PUMPS* 1. Start **the idle EHC pump.** 2. Verify the following: a. Starting amps decay off within 30 seconds. b. The started pump discharge pressure is greater than **1550** psig as indicated at the EHC unit by HFPM-A OUTPUT PRESSURE or HFPM-B OUTPUT PRESSURE. c. EHC header pressure is greater **than** 1550 psig as indicated by PI-5676, EHC FLUID PRESS PSHG. *3.* Place the previously running EHC pump switch in After-Stop. ***This would be** performed only after verification **that a problem existed, and** tken the CRS may direct placing A EHC **pump in pull**-to-lock due to apparent failure of motor.*
	TB AO	***Reports** "A" EHC extremely hot to the touch and has an acrid odor present.*
		End of loss of "A" EHC pump event

P-imp Fails Low

Time	Operator	Actions
	RO	*Rods step in at maximum rate (72 SPM). RO receives annunciator XCP 616, 2-5 Tave/Tref DEV HI/LO.*
	RO	*Identifies PT-446 failure and performs immediate action per AOP 401.7, TURBINE FIRST STAGE PRESSURE CHANNEL FAILURE. Places ROD CNTRL BANK SEL Switch In MAN.*
	CRS	Enters AOP 401.7, TURBINE FIRST STAGE PRESSURE CHANNEL FAILURE and verifies immediate actions completed.
	CRS/RO	Ensure TREF 1ST STG PRESS Switch is positioned to the operable channel: P447, CH IV
	CRS/RO	Adjust Control Rods until Tavg is within 1.0 °F of Tref
	CRS/RO	Check if Main Turbine load is GREATER THAN 10%
	CRS/RO	Within one hour, verify the following permissives are dim: - P13. 1ST STG PRESS. • P7. REACTOR TRIP BLOCKED.
	CRS/RO	Restore automatic rod control. Check if automatic rod control is desired. Verify Reactor power is GREATER THAN 15% (C-5 status light dim). Verify Tavg is within 1.0 °F of Tref. Place ROD CNTRL BANK SEL Switch in AUTO.
	CRS/BOP	Place STM DUMP MODE SELECT in STM PRESS.
	CRS/SE	Notify the I&C Department to place AMSAC in BYPASS
	CRS/SE	Within six hours, place the failed channel protection bistables in a tripped condition. SE identifies the correct bistables from Attachment 1 and documents on SOP 401, Attachment 1 (FB-474A, FB-484A, and FB-494A). BOP operator may verify correct bistables.
	CRS	*No further actions can be completed in AOP 401.7 until failed channel is repaired and ready to be returned to service.*
		End of PT-446 failed low event

Letdown Pressure Control Valve Fails Closed

Time	Operator	Actions
	RO	*PCV-145 fails closed. Receives XCP 613, 2-2 due to high letdown pressure and subsequent XVR 8117 lifting, as well as XCP 613, 2-4 due to high letdown pressure* *RML-1 Trouble alarm due to loss of letdown flow.*
	BOP	*Removes ARP 613, reviews, and passes procedure to CRS*
	CRS/RO	Attempts to adjust PCV-145 in manual
	CRS/RO	*Per either applicable ARP listed above, or SOP 102, the CRS will direct the operator to isolate charging and letdown.*
	CRS/RO	*The CRS will direction isolation of letdown. Letdown isolation can be accomplished by closing all letdown orifice isolation valves:* ***PVT 8149A(B)(C)****, and possibly LCV-459 and 460, as well as PVT-8152, LTDN LINE ISOL*
	CRS/RO	*The CRS will* **direct the operator** *to* **isolate charging**. *This can be accomplished by any* ***one*** *of the following:* • ***Close*** *MVG-8107* • ***Close*** *MVG 8108* • *Manual and closed on FCV 122.*
	CRS	Enters AOP 102.1, LOSS OF LETDOWN
	CRS/RO	*Attempt to place Letdown in service. PCV-145 cannot be set to 70% open, necessitating performing the alternative action, which is to* Place **Excess** Letdown in **service.** *(If any recommendations are made to use the bypass valve around PCV-145, the CRS will have been briefed to remain within the bounds of AOP 102.1).*
Critical	CRS/RO	Maintain Core Power LESS THAN 2898 MWt prior to and during Excess Letdown operation. *Discuss thermal power reduction, if necessary, and coordinate between RO and BOP to remove the turbine from the load limiter, and reduce turbine load to below 2898 MWt.*
	CRS/RO	Close all letdown isolation valves: PVT-8149A(B)(C), LCV-459 and 460.
	CRS/RO	Isolate Charging by closing either of the following: MVG-8107 or 8108.
	CRS/RO	Reduce Seal Injection flow to 7 gpm per RCP as indicated on the following: FI-130A(127A)(124A), RCP A(B)(C) INJ FLO GPM..
	CRS/RO	Ensure HCV-137, XS LTDN HX, is closed.

Letdown Pressure Control Valve Fails Closed

Time	Operator	Actions
	CRS/RO	Ensure the following are open: • MVT-8100, SEAL.WTR RTN ISOL. • MVT-8112, SEAL WTR RTN ISOL.
	CRS/RO	Ensure MVG-9583, FROM XS LTDN HX, is open.
	CRS/RO	Open the following: • PVT-8153, XS LTDN ISOL. • PVT-8154, XS LTDN ISOL.
	CRS/RO	Establish Excess Letdown flow: • Slowly throttle open HCV-137, XS LTDN HX. • Maintain temperature on TI-139, XS LETDOWN HX OUT TEMP "F, LESS THAN 165°F. *Operator may receive XCP 603 4-2 when excess letdown is established due to increasing CCW temperatures. RO will make an adjustment on HCV 137 if this alarm is received.*
	CRS/RO	Monitor the following to ensure flow between 0.2 gpm and 5.0 gpm: • 154A, RCP SL LKOFF HI RANGE. • FR-154B, RCP SL LKOFF LO RANGE.
	CRS	*IF Excess Letdown flow can NOT be established, THEN initiate plant shutdown. GO TO WP-4, POWER OPERATION (MODE 1). **N/A, as excess letdown can be established.***
	Note	*At least 6 gpm Seal Injection **flow** must be maintained to each Reactor* Coolant Pump.
	CRS	IF Normal Letdown is in service, THEN control Charging and Letdown to maintain PZR level at program level. *As neither is in service, the CRS will be directed to the alternative action.*
	CRS/RO	IF Excess Letdown *is* in service, THEN perform the following: control Seal **Injection** flow to maintain PZR level at program level. *CRS and RO discuss control of PZR level using excess letdown and RCP seal injection flow balance.*
	CRS/RO	Verify PZR pressure in the band at OR lit to 2235 psig (2220 psig to 2250 psig). *If PZR pressure is slightly* high *due to increased PZR level, it may be necessary to read and discuss alternative action* Control PZR Heaters and **Spray** as necessary to stabilize RCS pressure at 2235 psig.
	CRS	RETURN TO the Procedure and Step in effect.
		[End of PCV-145 failed closed event

RCS Pressure Control Channel Fails High

Time	Operator	Actions
	RO	*Recognizes PT-444 failing high. RO may notice spray valves opening unexpectedly, PCV 444B opening, and/or one of several alarms, including XCP 616, 2-5, PZR PCS HI at 2335 psig indicated pressure from PT-444.*
	RO	Performs immediate actions of AOP 401.5, PRESSURIZER PRESSURE CONTROL CHANNEL FAILURE. *Identifies PCV 444B open with pressure less than 2300 psig and closes PCV 444B and may close the associated block valve, MVG 8000B. Compares PZR pressure channel indications and verifies PT-444 is failed high (may have been done initially). Places the M/A stations for spray valves PCV 444C and D in manual and closes both spray valves, verifying closed indication via indicating lights. Places the pressurizer master pressure controller in manual and reduces demand, thereby increasing control group heater amps to maximum.*
	CRS	Enters AOP 401.5, PRESSURIZER PRESSURE CONTROL CHANNEL FAILURE.
	CRS	Verify **the** PZR PORVs ***are*** closed: • PCV 445A, PWR RELIEF • PCV-445B, PWR RELIEF • PCV-444B, PWR RELIEF
	RO	*Reports that PCV-444B came open, and was manually closed.*
	CRS	IF PZR pressure is LESS THAN 2300 psig, THEN perform the following: Close the AFFECTED PZR PORV(s) – PCV-444B, PWR RELIEF. *RO reports/verifies PCV-444B is closed.*
	CRS	IF any PZR PORV can NOT be closed, THEN close its Block Valve: MVG-8000B. RELIEF 444 B ISOL. *RO may have closed MVG-8000B already to isolate PCV-444B, or may be waiting the the one hour allowed by alternative action to immediate action 3, which is to close the associated block valve within one hour (to satisfy the TS action).*
	CRS/RO	Check if PI-444, CNTRL CHAN PRESS PSIG, indication is normal. *RO reports indication failed high.*
	CRS	*Directed to alternative action.* IF PT-444 is failed, THEN perform the following:
	CRS/RO	Ensure the PZR Spray Valves are closed: • PCV-444C. PZR SPRAY. • PCV-444D, PZR SPRAY. *RO reports both spray valves closed in manual.*

RCS Pressure Control Channel Fails High

Time	Operator	Actions
	CRS/RO	Control PZR PRESS MASTER CONTROL in MAN. *RO reports that the pressurizer master pressure controller is in manual and that control group heater amps are maximum.*
	CRS/RO	Operate the PZR Heaters and Spray Valves in manual to control RCS pressure between 2220 psig and 2250 psig. *RO may request to place M/A stations for spray valves PCV 444C and D back in AUTO, as their control will come directly from the pressurizer master pressure controller at this point, but this is not required.*
	CRS/RO	Within one hour: close MVG-8000B, RELIEF 444 B ISOL. *If not previously performed, RO will close block valve at this time.*
	CRS/RO	Check If PI-445. CNTRL CHAN PRESS PSIG indication is NORMAL. *RO reports normal indication.*
	CRS/RO	Ensure ROD CNTRL BANK SEL Switch is In AUTO. *RO reports that rod control is in AUTO.*
	CRS/RO	Maintain RCS pressure between 2220 psig and 2250 psig. *May discuss RCS pressure control at this time.*
	CRS/SE	Determine and correct the cause of the channel failure.
	CRS	*No further actions can be completed in AOP 401.5 until failed channel is repaired and ready to be returned to service.*
		End of PT-444 failed high event

'A' Main Feed Pump Trips

Time	Operator	Actions
	BOP	'A" MFP trips. Recognizes pump is tripped and performs mediate actions of AOP 210.3, FEEDWATER PUMP MALFUNCTION. *BOP verifies at least onefeedwater pump is wining, checks that a feedwater pump trip did occur, and checks 'heremainingfeedwuter pumps for proper response and verifies speed is increasing on both.*
	BOP/RO	*Pulls ARP for XCP 625, 2-1, FWP A/B/C TRIP, reviews procedure and/or hands procedure to CRS.*
	CRS	*Enters AOP 210.3, FEED WATERPUMP MALFUNCTION*
	CRS/BOP	Verify at least one Feedwater Pump is running. BOP *reports "B" and "C" MFP's are operating.*
	CRS/BOP	Check if a Feedwater Pump **trip** occurred. *BOP verifies and reports that "A" MFP has tripped.*
	CRS/BOP	Check the operating Feedwater Pump(s) speed control for proper response by verifying Feedwater Pump(s) speed is increasing. *BOP verifies and reports that both "B' and "C" MFP speeds are increasing and response is proper.*
	CRS	REFER TO the table below to determine the Reactor Power limit based on available Feedwater System capacity: **FEEDWATER PUMPS AVAILABLE** — **REACTOR POWER LIMIT** 2 MFW PUMPS **3** BOOSTER PUMPS — 91%
	CRS/BOP	Verify two Feedwater Pumps and three Feedwater Booster Pumps are running. *BOP verifies and reports that "B" and "C" MFP's are running, and that all four FWBP's are running.*
	CRS/BOP	CRS directs BOP to commence plant load reduction to 91% as follows: • Ramp power at directed rate (1%/min, in **100** mw increments) • **Use** dec load rate circuit 0 Take turbine off load **limiter** 0 Energize dec load rate circuit ◊ Select desired rate (1%) 0 Decrease load set by 100 mw Maintain MVARs **as** required - coordinate with dispatcher

'A' Main Feed Pump Trips

Time	Operator	Actions
	RO	*The RO **borates using normal makeup controls to maintain Tavg as** follows.* • Use control rods and/or commence boration as follows: 0 Perform a boration per SOP-106 ◊ Energize B/U htrs for mixing ◊ Return M/U system to auto per SOP-106 0 Maintain AFD within limits 0 Maintain rods above R/L
	CRS/BOP	Verify the high pressure and low pressure stop valves **close** on the AFFECTED Feedwater Pump (GRAPHIC 310 SCREEN). *BOP operator verifies high and low pressure stop valves indicate closed.*
	CRS/BOP/ TR **4 0**	Verify proper operation of the AFFECTED Feedwater Pump Turning **Gear: Check** *if* **the** Feedwater **Pump** Turbine **is** *stopped* and ensure the Feedwater Pump Turning **Gear** is engaged and running. ***Directed** operator(s) verify **that "A" MFP has stopped** and that the turning gear has engaged.*
	CRS/SE	Determine and correct the cause of the Feedwater **Pump trip.** *SE **makes calls to the appropriate mechanical and I&C maintenance** representatives.*
	BOP	ALL FRV's will be *at* 100% demand and full open. The BOP may be required to take manual control of FRV's and reduce flow to prevent overfeeding.
		End of "A" MFP trip event

Reactor Power Reduction

Time	Operator	Actions
	CRS/BOP	Continue power reduction at 1% per minute to less than 91% power as follows: • Ramp power at directed rate (1%/min, in 100 mw increments) • Use dec load rate circuit 0 Take turbine **off** load limiter 0 Energize dec load rate circuit 0 Select desired rate (1%) 0 Decrease load set **by** 100 mw Maintain MVARs as required - coordinate with dispatcher
	CRS/RO	*Use* control rods and/or commence boration **as** follows: 0 Perform a boration per SOP-**106** 0 Energize B/U htrs for mixing 0 Return M/U system to auto per SOP-106 0 Maintain AFD within limits 0 Maintain rods above R/L
	CRS	***Depending** upon **the timing, the crew may reach a reactor power less than 91% prior to** the **initiation of the next event, which necessitates going to set** load **on the turbine. If this occurs, it is expected that the BOP operator will depress** the **increase button on the turbine controlpanel until the "At Set Load" light is illuminated.***
		End of 5-10 % power reduction.

Inadvertent Peed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	CRS	*At approximately 94% Reactor power, an inadvertent FW isolation occurs. Based on OAP guidance for conservative decision making, the CRS will direct tripping the Reactor and entering EOP 1.0*
	ALL	Directs manual Reactor trip. *RO attempts to manually trip the Reactor, but is unsuccessful. The BOP operator then attempts to trip the Reactor from the backup trip switch, which is also unsuccessful.*
	CRS	Enters EOP 1.0, REACTOR TRIP/SAFETY INJECTION ACTUATION.
	CRS/RO	Verify Reactor Trip: Trip the Reactor using either Reactor Trip Switch. ***Verify*** all Reactor Trip **and ' Bypass** Breakers are open. *As both reactor trip switches will have been tried at this point and neither reactor trip breaker has opened, the CRS is directed to the alternative action: IF* the Reactor will NOT trip using both Reactor Trip Switches, OR *is* NOT subcritical, THEN GO TO EOP-13.0, RESPONSE TO ABNORMAL NUCLEAR POWER GENERATION, Step 1.
	CRS	Transitions to EOP 13.0, ABNORMAL NUCLEAR POWER GENERATION.
	All	*Attempts to trip the Reactor manually were unsuccessful in EOP 1.0, and an operator will direct the IB AO to trip the reactor locally using EOP 13.0, Attachment 1. The "A "and "B" MSIV's will not close due to I&C being in test on K-616 relay on "A" train, and the K-616 relay has failed on "B" train, thereby preventing automatic closure of A & B MSIV's.*
	RO	*The RO will attempt to trip the reactor, recognize that the reactor will not trip, and then insert control rods using the fastest manner possible.*
	BOP	*The BOP operator will attempt to trip the reactor as a backup, recognize the failure of reactor trip, and then move on to the second immediate operator action, attempting to verify turbine generator trip. Noticing the turbine has not tripped and the stop valves do not have a closed indication, he will manually depress the turbine trip switch, place both EHC pumps in pull-to-lock, and run the EHC load limiter fully counterclockwise.*
	All	*An operator will direct the TB AO to locally trip the main turbine using EOP 13.0, Attachment 2.*
	SE	*Begins monitoring EOP 12.0, CRITICAL SAFETY FUNCTIONS, using the SPDS display on the IPCS continuously per the EOP user's guide.*

Inadvertent ed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	Note	*Manual or Automatic Rod Control muy be used to perform Alternative Action Step I, whichever provides the fastest Control Rod insertion, rate.*
	ALL	Verify Reactor Trip: • Trip the Reactor using both Reactor Trip Switches. • Verify all Reactor Trip and Bypass Breakers are open. • Verify all Rod Bottom Lights are lit. • Verify Reactor Power level is decreasing.
Critical	ALL	*As the Reactor has not tripped, the CRS will move to the alternative actionfor step 1.* IF the Reactor will NOT **trip** OR is NOT subcritical, **THEN insert Control Rods.** *Ro may insert rods in manual until there is adequate Tavg/Tref deviation to permit insertion at greater than 48 SPM.* Trip the Reactor per ATTACHMENT 1, TRIPPING THE REACTC R LOCALLY.
Critical	All	*One member of operating crew directs the IB AO to perform EOP 13.0, ATTACHMENT I, TRIPPING THE REACTOR LOCALLY.*
	CRS/BOP	Verify Turbine/Generator Trip: Verify all Turbine STM STOP VLVs are closed. *BOP operator reports that all stop valves are not closed, and may report completion of actions or verify steps as read by CRS, asfollows:* Perform the following until all VLVs are closed. Turbine STM STOP OR MS Isolation **and** MS Isolation Bypass Valves are closed: 1) Trip the Turbine: • Depress Emerg Trip Sys TRIP. • Set LOAD LMT SET fully Counterclockwise. • Place EHC Pumps A and B in PULL TO LK NON-A. • Trip the Main Turbine per ATTACHMENT *2,* TRIPPING THE MAIN TURBINE LOCALLY. *2)* Close all MS Isolation and Bypass Valves: • MS Isolation, PVM-2801A(B)(C). • MS Isolation Bypass, PVM-2869A(B)(C).
	CRSIBOP	Ensure Generator Trip (after 30 second delay): Ensure the GEN BKR is open, the GEN FIELD BKR is open, **and** trip the **EXC** FED CNTRL.

Inadvertent Feed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	ALL	Ensure EFW Pumps are running: • Ensure both MD EFW Pumps are running. • Verify the TD EFW Pump is running if necessary to maintain *SG* levels. *BOP operator notes thut the TDEFW pump is not running, which prompts the* ***CRS*** *to read the alternative actions.*
	CRS/BOP	Start the TD EFW Pump: *1.* Ensure at least one of the following **is open:** • MVG-2802A, MS LOOP B TO TD EFP. **OR** • MVG-2802B, MS LOOP C TO TD EFP. 2. Open PVG-2030, STM SPLY TO TD EFP TRN A(B). *BOP operator reports that all valves are open.*
		Investigation may reveal the presence of XCP 622, 3-4, TD EFP STP VLV NOT OPEN OIL ***PRESS*** *LO, indicating the XVT02865-EF, EF PUMP TURB MAIN STEAM THROTTLE VALVE,* ***is*** *most probably closed. ABLL AO will be directed to investigate.*
Critical	CRS/RO	Initiate ***em***ergency boration o€the RCS: Ensure **at** least one Charging **Pump** is running. *RO reports that both the "A" and "B" charging pumps are running.*
	SE	***Trip of the "B" MDEFW pump is initiated.*** *It will he noted that there* ***is*** *now a redpath on heat sink by the SE, at which time the board operators will note the loss of the "B" MDEFW pump. Other than direction by muintenance and building operators to investigate, no other action* ***is*** *performed as EOP 13.0 remains the highest priority procedure.*
	CRS/RO	Verify PZR pressure is **LESS THAN** 2335 psig. *RO reports value and trend of PZR pressure.*
		Upon receipt of SI actuation, booth operator will remove the closure signals on "A" and "B" MSIV's (I&C came out of test when they heard the relay actuations in the relay room), as well as locally open the "A" and "B" RTB's. S/G WR level shouldshrink down to –10% following completion of these actions.
	CRS/RO	Verify SI ACT status light is NOT lit. *RO reports that SI ACT status light is lit, directing the CRS to the alternative action.*
	CRS/RO	Verify SI **flow** on FI-943, CHG LOOP B CLD/HOT LG FLOW GPM. *RO reports flow rate.*

Inadvertent Feed Water Isolation / **ATWS** / **Loss of** Heat **Sink**

Time	Operator	Actions
	Caution (CRS)	If **an** SI signal exists or occurs, Steps I through **8** of EOP-1.0 REACTOR TRIP/SAFETY INJECTION ACTUATION ACTIJATION, should be performed to verify proper SI, actuation, while continuing with this procedure
	CRS BOP	*Directs BOP operator to perform th te 1-8 of EOP 1.0.*
	CRS/RO	Verify Containment Ventilation Isolation Valves closed by verifying the following SAFETY INJECTION monitor lights are dim: • XCP-6103 **3-4** (POST ACCID HR EXH 6057 & **6067).** • XCP-6103 **2-1** (POST ACCID HR EXH 6056/6066).
	CRSIRO	Verify the Reactor is subcritical: a. Power Range channels indicate LESS THAN 5%. **b.** Intermediate Range channels indicate a negative startup rate. ***RO reports indications, which are a positive response for verification that the reactor is subcritical. CRS proceeds to step 15 of EOP 13.0.***
	CRS	RETURN TO the Procedure and Step in effect. *Transition brief will* ***occur, and the SE will report that a redpath exists on heat sink. The CRS will transition to EOP 15.0 RESPONSE TO LOSS OF SECONDARY HEAT SINK.***
	CRSIRO	Check if a secondary heat sink is required: a Verify RCS pressure **is** GREATER THAN any NON-FAULTED ***SG*** pressure. • Verify RCS Thot is GREATER THAN 350° F....
	CRS/RO	Verify power is available to all PZR PORV Block Valves: • MVG-8000A, RELIEF 445 A ISOL. e MVG-8000B, RELIEF 444 E ISOL. • MVG-8000C. RELIEF 445 B ISOL...
	CRS	pen the Block Valve for **any** PZR PORV that has been olated **due** to excessive seat leakage: • MVG-8000A, RELIEF 445 **A** ISOL. e MVG-8000B, RELIEF 444 B ISOL. • MVG-8000C. RELIEF 445 B ISOL. ***None have been closed due to excessive leakage, but*** *MVG 8000 B was closed due to failure of PT 444 earlier.*

Inadvertent Feed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	Caution (CRS)	*If Wide Range level in any two SGs is LESS THAN 15% [25%] OR PZR pressure is GREATER THAN 2335 psig due to loss of secondary heat sink, Steps 17 through 24 should be immediately initiated for bleed and feed cooling.*
Critical	CRS/BOP	*Proceeds to step 17 to initiate bleed and feed based on BOP identification of SG WR levels <15% in two or more SGs*
	Caution (CRS)	Steps 17 through 24 must be performed quickly to establish RCS heat removal by RCS bleed and feed, to minimize core uncovery.
Critical	CRS/RO	Ensure all RCPs are tripped.
	CRS/RO	Actuate SI using either SI ACTUATION Switch.
Critical	CRS/RO	Verify an RCS feed path: a. Ensure at least one Charging Pump is running. b. Ensure all the following are open: • MVG-8801A(B), HI HEAD TO COLD LEG INJ. • LCV-115B(D), RWST TO CHG PP SUCT. • Verify COLD/HOT LEG RECIRC monitor lights are dim on XCP-6104. • Verify SI flow on FI-943, CHG LOOP B CLD/HOT LG FLOW GPM.
	CRSIRO	Reset both SI RESET TRAIN A(B) Switches.
	CRS/RO	Reset Containment Isolation: • RESET PHASE A - TRAIN A(B) CNTMT ISOL. • RESET PHASE B - TRAIN A(B) CNTMT ISOL.
	CRSIBOP	Place both ESF LOADING SEQ A(B) RESETS to: a. NON-ESF LCKOUTS. b. AUTO-START BLOCKS.
	CRSIRO	Establish Instrument Air to the RB: • Start one Instrument Air Compressor and place the other in Standby. • Open PVA-2659, INST AIR TO RB AIR SERV. • Open PVT-2660. AIR SPLY TO RB.

Inadvertent Feed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	RO	*The RO may request that the cooling water be adjusted to the B IA compressor locally per the attached caution tag.*
Critical (At least two PORVs)	CRS/RO	Establish an RCS bleed path: • Open **all** PZR PORV Block Valves, MVG-8000A(B)(C) • Open all PZR PORVs: o PCV-445A. PWR RELIEF. o PCV-445B. PWR RELIEF. o PCV-444B. PWR RELIEF.
	Caution (CRS)	*If RB pressure increases to GREATER THAN 12 psig. RE Spray should be verified per EOP-1.0. REACTOR TRIP/SAFETY INJECTION ACTUATION, Step 8, to prevent loss of containment integrity.*
	CRS/BOP	Perform Steps 1 through *8* of EOP-1.0. REACTOR TRIP/SAFETY INJECTION ACTUATION, while continuing with this procedure. *The BOP operator had previously completed the first 8 steps of EOP 1.0 and verification that RB Spray has not actuated is all that is anticipated.*
	CRS/RO	Maintain RCS heat removal: • Maintain **SI** flow. • Maintain **at** least two PZR PORVs open.
	CRS/RO	Check if RB Spray should be stopped: • Check if any RB Spray Pumps are running. *None are at this point, which directs the CRS to the alternative action.*
	Note (CRS)	• If RCS That is stable OR decreasing, feed flow should be established slowly to only one SG until Wide Range level indication increases. • Feed flow should be established slowly to prevent excessive RCS cooldown
	SE	*SE reports that electrical maintenance has found the problem and repaired the breaker for "B" MDEFW pump.*
	CRS	Continue to try to establish **a** secondary heat sink in at least one SG: • REFER TO Step **5** for EFW flow. OR • REFER TO Steps 8 through 11 for Feed and Condensate flow. *CRS should direct BOP operator to prepare to start "B" MDEFW pump and refer to step **5** of this procedure.*

Inadvertent Feed Water Isolation / ATWS / Loss of Heat Sink

Time	Operator	Actions
	CRS/BOP	Try to establish EFW flow to at least one SG: • Check Control Room indications for the cause of EFW failure: • Verify no EFW annunciators are lit. ***Several are, and appropriate ARP's will have already been referenced.*** Verify CST level is GREATER THAN 5 ft. Ensure power is available to both MD EFW Pumps. ***Power is only available to "B" MDEFW pump. Electrical maintenance reports the breaker trip problem has been found and corrected.***
	Caution (CRS)	• ***EFW valves should NOT he opened to SGs with Wide Range level LESS THAN 15% [25%].*** • If Wide Range level in all SGs is LESS THAN 15% [25%]. EFW valves should be open to only one SG, until RCS temperatures are decreasing, to limit any failure to one SG.
	CRS/BOP	***The CRS will direct the BOP operator to throttle closed on FCV-3531(3541)(3551), MD EFW TO SG A(B)(C).***
	CRS/BOP	***The CRS will direct the BOP operator to start the "B" MDEFW pump.***
	ALL	***The CRS will direct the BOP operator to slowly open FCV 3531 and feed "A" SG at 50-100 GPM, while the RO monitors "A" loop RCS temperatures.***
		End of scenario

Facility: V. C. Summer Scenario No.: 2 Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions: IC-162 25% Power MOL, 25 GPD Tube Leak on the "A" S/G. Emergency Feed Water Pump 'B' (XPP-21B) inoperable for maintenance. Severe Thunderstorm watch in effect. RMA 9 OOS

Turnover: Ramp unit up to 50% power per GOP-4A (POWER OPERATION – MODE 1 ASCENDING) starting at stes 3.11.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R(RO)	Ramp unit toward 50% power. After desired increase initiate 2.
2	CVC-17	C(RO)	A Charging pump has sheared shaft.
3	CND-1	C(BOP)	A condenser vacuum pump trips.
4	MSS9	I(BOP)	FT 474 steamline flow transmitter fails low. (A S/G)
5	RCS3	C(RO)	A RCP pump trip (<38%)
6	PRS5	M(All)	Failure of pressure transmitter is from steam space break.
	PRS8	M(All)	Steam Space Break 50gpm to 600gpm ramped in over 3600sec.
PRE	PCS6	C(All)	Failure of Phase A containment isolation to occur.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Scenario 2

Synopsis of Scenario.

Desire is to be at **25%** power on the FRV's, and to continue to ramp unit towards 40%.

Event **1** Ramp up towards 40% power. (Reactivity for RQ)

Event *2* **A** charging pump has sheared shaft. RO should isolate letdown, rack in the C charging pump on A train, **start** the C charging pump, then reestablish letdown per AOP **102.2.**

Event 3 **A** Main Condenser Vacuum pump trips, BOP should start standby vacuum pump and open associated valve.

Event **4** FT **474,** selected steamline flow transmitter for A SG fails low, BOP should take manual control and control S/G level.

Event 5 **A** RCP trips (does not cause a reactor trip **<38%** power). RO takes action to control RCS pressure due to **loss** of a spray valve. Must be in mode 3 within one hour.

Event 6 Failure of Pressurizer protection pressure transmitter (Beginning of steam space break).

When steam space break gets large enough Crew should **SI.** Phase **A** will not actuate (can be performed manually, but valves **8149A, 2660,** and **7501** do not reposition and backup valves used for verification).

Scenario to be terminated at the entry to post **LOCA** cooldown and depressurization or at the discretion of the Lead Examiner.

Scenario 2

Power Ascension 5-10%

Time	Operator	Actions
	ALL	Per GOP Appendix A, the crew will begin power ascension at a rate specified by the CRS, not to exceed ½% per minute until 40% power is reached or examiner cues the next event.
	RO	• Use control rods or commence alt dilution as follows: 0 Perform an alt dilution per SOP-106 0 Energize BAJ htrs for mixing 0 Return M/U system to auto per SOP-106 0 Maintain AFD within limits 0 Maintain rods above R/L
	BOP	e Coordinate with RO and Use inc load rate circuit 0 Take turbine off load limiter 0 Dial load limiter fully clockwise 0 Increase load set to raise load at %%per minute Maintain MVARs as required - coordinate with dispatcher
		End of 5-10% power ascension.

Time	Operator	Actions
	RO	*A Charging pump amps decrease to minimum (~10 amps) and alarm XCP 614, 5-1 CHG LINE FLO HI/LO alarm is received. Charging flow indicates 0 GPM.* *XCP617/618/619 win 2-2 RCP SEAL INJ FLO HI/LO is recieved*
	RO/BOP ABLL AO (UNIT 6 LOWER)	*Removes ARP 614, reviews, and passes procedure to CRS. The only applicable corrective action directs the operator that, if charging flow is low and cannot be restored, go to AOP-102.2, Loss of Charging. Directs ABLL AO (UNIT 6 LOWER) to investigate locally*
	BOP	Takes turbine to set load
	CRS	Enters AOP 1022 LOSS OF CHARGING
	CRS/RO	Check if Charging Pump flow is normal. • FI-122A, CHG FLOW GPM, between 30 **gpm** and 115 gpm. • Pump **amps** between 30 amps **and** 50 amps. • PI-121, CHG PRESS PSIG, between 2650 psig and 2850 **psig.** ***Both flow and discharge pressure indicate zero, and amps indicates ~10, which directs the CRS to the alternative action.***
	ABLL AO (UNIT 6 LOWER)	*Reports that the mechanical coupling is severed and the pump is no longer attached to the motor (i.e. sheared shaft).*
	CRS/RO IB AO (UNIT 7)	*CRS directs placing the A charging pump in pull-to-lock and then directs the IB AO (UNIT 7) to rack down the A charging pump breaker, and then rack in the C charging pump breaker, A train.*

	CRS/RO	IF Charging Pump has tripped or flow is abnormal, THEN perform the following: a) Ensure the Charging Pump is secured. b) Close all Letdown Isolation Valves: 1) PVT-8149A(B)(C), LTDN ORIFICE A(B)(C) ISOL. 2) PVT-8152, LTDN LINE ISOL. 3) LCV-459, LTDN LME ISQL. 4) LCV-460, LTDN LINE ISQL. c) Close FCV-122, CKG FLOW. d) Verify CCW flow to the RCP Thermal Barriers **is** GREATER THAN 90 gpm on FI-7273A(B), THERM BARR FLOW GPM. ***RML-1 trouble alarm when Letdown flow is isolated.*** ***RO reportsflow indicates normal.*** e) Display Dedicated Display ZZRCPBRG on the IPCS to monitor KCP temperatures. ***SE and/or BOP operator may he directed to monitor RCP temperatures*** f) Contact Electrical and Mechanical Maintenance to investigate. *SE will perform appropriate contact, when directed.*
	CRS/RO	Verify Charging System valve lineup: IF Charging Pump suction is aligned to the VCT, THEN ensure both LCV 115C(E), VCT OUTLET ISOL, are open. ***Both are open.***
	CRS/RO	Ensure the following valves are open: 1) MVG-8106, CHG PP 2) MVT-8109A(B)(C), CHG PP A(B)(C). 3) MVG-8130A(B), LP **A** SUCT TO CHG PP C. 4) MVG-8131A(B), LP B SUCT TO CHG PP C. ***5)*** MVG-8132A(B), CHG PP C TO LP **A** DISCH. 6) MVG-8133A(B), CHG PP C TO LP B DISCH
	CRSIRO	Check the Charging header valve lineup as follows: 1) Ensure MVG-8107, CHG LINE ISOL, is open. 2.) Ensure MVG-8108, CHG LINE ISOL, is open. ***Both are open*** 3) Ensure FCV-122, CHG FLOW, is in MAN **and** CLOSE. *RO places FCV 122 in manual and minimum demand* 4) Ensure one of the following valves is open: PVT-8146, NORM CHG TO RCS LF B. OR FVT-8147, ALT CHG TO RCS LP **A.** ***RO reports available charging path.***
	CRS/RO	Verify VCT level is GREATER THAN 20%. *RO reports current VCT level*

Scenario 2

'A' Charging /SI Pump Sheared Shaft

Time	Operator	Actions
	CRS/ABLL AO (UNIT 6 LOWER)	Locally verify Charging Pump suction pressure is between 50 psig and 100 psig as indicated on the following (AB 388): • PI-153A, SUCTION PRESS, for Charging Pump C. *ABLL AO (UNIT 6 LOWER) reports suction pressure is 52 PSIG*
	CRS/RO	With Shift Supervisor's permission, start a Charging Pump, while monitoring RCP temperatures. REFER to SOP-102, CHEMICAL AND VOLUME CONTROL SYSTEM. *The report has been received by this* ***time that the C charging pump, A train has been racked in. The ABLL*** *AO (UNIT 6 LOWER) will verify conditions for a start, and the CRS will direct starting the C charging pump, A train.*
	CRS/RO	WHEN a Charging Pump is operating, THEN place Charging and Letdown in service. REFER TO SOP-102, CHEMICAL AND VOLUME CONTROL SYSTEM. *RO opens SOP 102* ***to section I,. RE-ESTABLISHING CHARGING AND*** *NORMAL* ***LETDOWN AFTER*** *ISOLATION AT OPERATING CONDITIONS*
	RO	Place FCV-122, CHG FLOW, in MAN and closed.
	RO	Place PCV-145, LO PRESS LTDN, in MAN and open to 70%. *RO adjusts MA station to manual and 70% demand.*
	RO	Place TCV-144, CC TO LTDN HX, in MAN and open to 100%. *RO adjusts MA station to manual and full demand.*
	RO	Place TCV-143, LTDN TO VCT OR DEMIN, in VCT. *RO places the switch to the VCT position.*
	RO	Open PVT-8152, LTDN LINE ISOL.
	RO	Open the following: a. LCV-459, LTDN LINE ISOL. b. LCV-460, LTDN LINE ISOL.
	RO	Ensure the following Charging Line Isolation Valves are open: a. MVG-8107, CHG LINE ISOL. b. MVG-8108, CHG LINE ISOL.
	RO	Slowly open FCV-122, CHG FLOW, to establish 60 gpm flow as indicated on FI-122A, CHG FLOW GPM. *RO adjusts MA station to obtain indicated 60 gpm indicated flow.*

'A' Charging /SI Pump Sheared Shaft

Time	Operator	Actions
	RO/CRS	Open Orifice Isolation Valves to obtain the desired Letdown flow rate (60 gpm to 120 gpm): a. PVT-8149A, LTDN ORIFICE A ISOL (45 gpm). b. PVT-8149B, LTDN ORIFICE B ISOL (60 gpm). c. PVT-8149C, LTDN ORIFICE C ISOL (60 gpm). *CRS directs RO to open PVT 8149A and PVT 8149B.*
	RO	Adjust FCV-122, CHG FLOW, as required to maintain TI-140, REGEN HX OUT TEMP °F, between 250°F and 350°F while maintaining Pressurizer level.
	RO	Adjust PCV-145, LO PRESS LTBN, to maintain PI-145, LO PRESS LTDN PRESS PSIG, between 300 psig and 400 psig. *RO adjusts PCV-145 to ~350 psig in preparation for placing MA station back in AUTO.*
	RO	Place PCV-145, LO PRESS LTDN, in AUTO.
	RO	Adjust TCV-144, CC TO LTDN HX, potentiometer as necessary to maintain the desired VCT temperature and place in AUTO. *RO returns MA station to AUTO.*
	RO	When Pressurizer level matches reference level, place FCV-122, CHG FLOW, in AUTO per Section III. *RO turns tu* ***SOP 102, section*** *E. TRANSFER TO AUTOMATIC CHARGING FLOW CONTROL*
	RO	Place the following in MAN: a. PZR LEVEL MASTER CONTROL. b. FCV-122, CHG FLOW.
	RO	Adjust FCV-122, CKG FLOW, in MAN to establish Pressurizer level at or near programmed level.
	RO	Establish automatic FCV-122, CHG FLOW, control as follows: Determine the correct PZR LEVEL MASTER CONTROL setpoint by dividing the current Charging flow by 1.5. ***Ifthe*** *RO* ***selects 85 gpm as a nominal valuefur*** *charging flow,* ***then the setpoint will be 57%.*** *If the RO selects 90 gpm, then the setpoint will be 60%.*
	RO	Manually adjust the PZR LEVEL MASTER CONTROL to this setpoint. *RO adjusts the MA station to the value determined in the step above.*
	RO	Place FCV-122, CHG FLOW, in AUTO.
	RO	Adjust PZR LEVEL MASTER CONTROL in MAN, as necessary, to maintain Pressurizer level at or near programmed level. *After monitoring* ***for any unexpected change in*** *FCV 122 demand/position,* ***the RO will place the*** *PZR* ***MASTER*** *CONTROL* ***in*** *AUTO.*

'A' Charging /SI Pump Sheared Shaft

Time	Operator	Actions
	RO	When Pressurizer level *is* at or near programmed level place PZR LEVEL MASTER CONTROL in AUTO.
	RO	Monitor LR-459, PZR % LEVEL & LEVEL SP, recorder to verify that Charging **flow is** maintaining actual Pressurizer level at or near the programmed setpoint. ***RO monitors for the proper operation of the PZR level control system, then returns to the final step of SOP 102, section L. RE-ESTABLISHING CHARGING AND NORMAL LETDOWN AFTER ISOLATION AT OPERATING CONDITIONS***
	RO	After the Letdown tempmatures have stabilized, place TCV-143, LTDN TO VCT OR DEMIN, in DEMIN/AUTO. *RO places TCV 143 in AUTO*
		End of A charging pump sheared shaft event.

Time	Operator	Actions
	BOP	*Receives annunciator XCP 628, 1-1 CVP A B/C TRIP. BOP operator notices that the A CVP has tripped and hands the associated ARP to the CRS for review.*
	CRS/BOP TBAO *(UNIT 5)*	*With the absence of any other alarms, the CRS will direct the TB AO (UNIT 5) to investigate for probable cause, starting at the breaker.*
	CRS/BOP	If Main Vacuum Pump **A** tripped, perform the following: a. Open **MVB-102A,** VAC PP C TO CNDSR **A.** b. Start XAC-0001C, **MAIN** CVP C. c. Place XAC-0001A, **MAIN** CVP **A,** to STOP. *BOP operator aligns C CVP to A condenser, starts the pump, and then places the switch for A CVP in stop, once directed and/or concurred with by the CRS.*
	CRS/BOP	Verify vacuum is stable on PI-3006(3016), MAIN A(B) PRESS INCHES HG. *BOP reports vacuum value and trend.*
	CRS/BOP	If necessary, **start** the following per SOP-206: a. XAC-0002A, AUX CVP **A.** b. XAC-0002B, AUX CVP B. *Vacuum will be stable and this will not be necessary.*
	CRS/BOP	Refer *to AOP-206.1,* DECREASING **MAIN** CONDENSER VACUUM. ***This** step will be unnecessary as main condenser vacuum will be normal and stable.*
	CRS/BOP/SE	Investigate the cause of the vacuum pump **trip and** correct **as** soon as possible. *The TBAO will have reported an overcurrent flag on the breaker at the IB switchgear. Electrical maintenance will be called to investigate and a tagout will be requested to be prepared for troubleshooting.*
		End of the A CVP trip event.

FT-474 Steam Flow Transmitter Fails Law

Time	Operator	Actions
	BOP/RO	*FT 474 fails low. Receive annunciator XCP 624, 4-4 SG A FWF>STF MISMATCH. BOP operator scans MCB indications and notices that CH III steamflow is pegged low. One operator will pull the ARP and pass it to the CRS.*
	CRS	*Quickly determines that an instrument failure has occurred and implements AOP 401.3, STEAM FLOW – FEED WATER FLOW PROTECTION CHANNEL FAILURE.*
	BOP	*Performs immediate operator actions of AOP 401.3, determining that the failed channel is the controlling channel, selects both SF and FF for A SG to channel IV (the operable channel), verify turbine load is less than 950 MWe, verify only one SG is affected, takes manual control of FCV 478 (if necessary), increases FW flow to A SG using channel IV indications, begins restoring SG level to 60% to 65% (if necessary), and verifies that FWP speed control is operating properly.*
	CRS/BOP	Verify the failed channel is the controlling channel.
	CRS/BOP	Select the operable flow channel: • Place FW CONTROL CHANNEL SEE Switch to the operable channel. • Place STEAM CONTROL CHANNEL SEL Switch to the operable channel. *BOP selects FW flow to 477 and Steam flow to 475 (both switches to the right for A SG)*
	CRSIBOP	Verify turbine load is LESS THAN 950 MWe
	CRSIBOP	Verify only one SG is AFFECTED. *BOP reports that A is the only affected SG.*
	CRS/BOP	Adjust the Feedwater Flow Control Valve as necessary to restore feed flow to the AFFECTED SG. *BOP is adjusting FCV 478 to provide a slightly higher feed flow than steam flow on A SG, if slow in selecting an operable channel in step 1.*
	CRS/BOP	Restore SG level to between 60% and 65%. *BOP operator reports value and trend for A SG level.*

	CRS/BOP	Check if Feedwater Pump speed control is operating properly: • Feedwater Header pressure is GREATER THAN Main Steam Header pressure. *BOP reports that feed header pressure is approximately 100 psig higher than steam header pressure.* • *Feed* flow is normal for steam flow and power level. *BOP reports normal indications for feed flow and steam flow.* • All operating *Feedwater* Pump speeds and flows are balanced. *BOP reports all speeds and flows are balanced.*
	CRS/BOP	**Verify** Narrow Range level in all SGs is normal. *It is possible that the A SG level may still be below the normal range. The CRS may or may not move to the alternative action, at his discretion. If he does, then the actions will be as follows:* Adjust the Feedwater Flow Control Valve as necessary to restore feed flow to the AFFECTED SG(s). WHEN all SG levels are restored to between 55% and 65%. THEN CONTINUE WITH **Step 7.**
	CRS/BOP	Restore the AFFECTED SG control systems to normal: • Place the Feedwater Flow Control Valve in AUTO. • Place the Feedwater Pump Speed Control System in AUTO. REFER TO SDP-210. FEEDWATER SYSTEM.
	CRS/BOP/SE	Within six hours, place the failed channel protection bistables in a tripped condition: a. Identify the associated bistables for the failed channel. REFER TO Attachment I. b. Record the following for each associated bistable on SOP-401. REACTOR PROTECTION AND CONTROL SYSTEM, Attachment I: • Instrument • Associated Bistable • Bistable Location • STPs c. Notify the I&C Department to place the identified bistables in trip. *SE will fill out the bistable trip sheet and the BOP operator will verify the sheet, as well as locate the applicable bistable status lights on the MCB. The Bop operator will work with the I&C technicians to ensure the correct bistables are tripped.*
	SE	Determine and correct the cause of the channel failure. *SE will direct I&C to investigate and develop a troubleshooting plan. No further actions can be performed in AOP 401.3 at this time.*
		End of FT 474 failed low event

Scenario 2
'A' RCP Trip

Time	Operator	Actions
	RO/CRS	*Receives* **annunciators** *XCP 617, 1-1 RCP A TRIP and XCP 615, 1-1 RCS LOOP A FLO LO. The RO will recognize that the plant is less than 38% power and therefore a reactor trip is not required. After review of the ARP's by the RO, BOP, and/or, CRS, the only appropriate actions are to reduce power and investigate the cause of the pump trip.*
	CRS/RO/BOP	*ARP for XCP 615, 1-1, corrective actions directs that the* **crew** stop **any** power increases until the cause of the alarm is determined. *If power ascension was in progress, CRS will direct BOP and RO to take the* **turbine to set load and** *stabilize plant conditions.*
	CRS/RO/BOP	*ARP for XCP 617, 1-1, supplemental actions:* If Reactor Power is less than 38%, proceed to Hot Standby per GOP 4B, Power Operation (Mode 1-Descending) and GOP 5, Reactor Shutdown From Startup to Hot Standby (Mode 2 to Mode 3), within one hour.
	CRS/RO	*SOP 101 REACTOR COOLANT SYSTEM, section IV A REMOVING A REACTOR COOLANT PUMP FROM SERVICE,* ***directs*** **place the** associated following Pressurizer Spray Valve for the affected Reactor Coolant Pump in MAN and close: PCV 444D, PZR SPRAY, for Reactor Coolant Pump **A.** *The* ***CRS will direct the K 0 to place*** *PCV 444D in manual and closed.*
	CRS/BOP	Place the following controllers in MAN as required for the affected RCS loop and maintain Narrow Range Steam Generator level between 60% and 65%: **a. PVT-478, SG A** FWF. b. **FCV-3321,** LOOP A MAIN FW BYP. *BOP will place PVT 478 in manual and eventually the valve will be fully closed.*
	CRS/SE	*Brief a power reduction and reduce power at ½% per minute to 1-3% Reactor Power, per GOP 4B. SE will make appropriate notifications and direct maintenance to investigate the cause of the A RCP trip.*

Time	Operator	Actions
	All	Commence power reduction at ½% per minute.
	CRS/BOP	CRS directs load reductionas follows • Use dec load rate circuit 0 Take turbine off load limiter 0 Energize dec load rate circuit 0 Select desired rate (1/2% **per** min) 0 Decrease load set by 100mw Maintain MVARs as required - coordinate with dispatcher
	RO	Uses control rods or commences boration as follows: 0 Perform a boration per SOP-106 0 Energize B/U htrs for mixing 0 Return M/U system to auto **per** SOP-106 0 Maintain AFD within limits Maintain rods above R/L
		End of A RCP trip event.

Time	Operator	Actions
	CRS/RO	*A break occurs on the high side of thefollowing transmitters, resulting in a PZR steam space break: PZR LVL ILT 460 (fails high) and PZR PRESS protection IPT 456 (fails low). There will be a high volume of annunciators at thispoint, but the key indicators for the crew should be an increasingpressurizer level, a decreasingpressurizer pressure, and an increasing RB pressure. Receive annunciators XCP 614 5-1 and XCP 404 &* 607 2-2.
	All	*The crew ~ * ievaluate the indications and may utilize drawing 302-602 to identify where the source of the break may be, but the CRS will ultimately make the decision respond to the indications of an RCS leak.*
	CRS	*CRS enters AOP 101.1 LOSS OF REACTOR COOLANT NOT REQUIRING SI*
	CRS/RO	Verify PZR level is at or trending to program level. Initially PZR level will decrease, directing the CRS to the alternative actions.
	CRS/RO	Check if SI is required: a. Check if any of the following criteria arc met: • PZR level is decreasing with Charging maximized and Letdown minimized. OR • PZR level is approaching 12%. OR • PZR pressure is approaching 1870 psig. OR • VCT level is approaching 5%. b. Perform the following: 1) Trip the Reactor. 2) GO TO EOP-1.0, REACTOR TRIP/SAFETY INJECTION ACTUATION WHEN EOP-1.0 Immediate Actions are complete, THEN actuate SI. **NOTE: CRS should** direct Reactor Trip **as RCS** pressure approaches **2000 psig**

Pressurizer Steam Space Break – LQCA

Time	Operator	Actiens
	Note	*We observed PZR level initially decrease, then increase at some point while minimizing letdown. Ultimately, the criteria to SI bused on PZR pressure approaching 1870 psig will be reached and the CRS will direct a Reactor trip, transition to EOP 1.0, complete immediate operator actions, then actuate SI (if not already automatically actuated). Automatic SI actuation will depend on when the crew decides to initiate a manual reactor trip.*
	CRS/RO	CRS directs a manual reactor trip.
	CRS	*Transition to EOP 1.0 REACTOR TRIP/SAFETY INJECTION ACTUATION*
	CRS/RO	Verify Reactor Trip: • Trip the Reactor using either Reactor Trip Switch. • Verify all Reactor Trip and Bypass Breakers are open. • Verify all Rod Bottom Lights are lit.
	CRS/BOP	Verify Turbine/Generator Trip: a. Verify all Turbine STM STOP VLVs are closed. b. Ensure Generator Trip (after 30 second delay): 1) Ensure the GEN BKR is open. *2)* Ensure the GEN FIELD RKR is open. *c.* Trip the EXC FLD CNTRL.
	CRS/BOP	Verify both ESF buses are energized.
	CRS/RO/BOP	Check if SI is actuated: a. Check if either either: • SI ACT status light is bright on XCP-6107 1-1. OR • Any red first-out SI annunciator is lit on XCP-626 top row. b. Actuate SI using either SI ACTUATION Switch.
	CRS/BOP	Initiate ATTACHMENT 3, SI EQUIPMENT VERIFICATION.
Critical	*Note*	*Thefailure of Phase A containment isolation may be caught by the RO as he walks down the board following the safety injection. or it should he caught us the BOP operator is performing EOP 1.0, attachment 3. The actions will be the same for either operator, when discovered:* Actuate Phase A/Containment Ventilation Isolation by placing either CS SG02A(B), TRAIN A & B, Switch to ACTUATE.
	CRS	Announce plant conditions over the page system.
	CRS/RO	Verify RB pressure h remained LESS THAN 12 psig on PR-951, RB PSIG (P-951), red pen.

Time	Operator	Actions
	CRS/RO	Check RCS temperature: With any RCP running, RCS Tavg is stable at OR trending to 557 'IF.
	CRS/RO	Check PZR PORVs and Spray Valves: a. PZR PORVs are closed. b. PZR Spray Valves are closed. c. Verify power is available to at least one PZR PORV Block Valve: • MVG-8000A, RELIEF **445** A ISOL. • MVG-8000B, RELIEF **444** B ISOL. • MVG-8000C, RELIEF **445** B ISOL. d. Verify at least one PZR PORV Block Valve is open.
Critical	CRS/RO	Check if RCPs should be stopped: a. Check if either of the following criteria is met: • Annunciator **XCF-612 4-2** is lit (PHASE B ISOL). OK • RCS pressure is LESS THAN I400 psig AND SI flow is indicated on **FI-943,** CHG LOOP B CLD/HOT LG FLOW GPM. If any of the above criteria are met, then stop all RCPs.
	CRS/BOP	Verify no SG is FAULTED: • No SG pressure is decreasing in **an** uncontrolled manner. • No SG is completely depressurized.
	CRS/SE	Verify Secondary radiation levels indicate SG tubes are NOT RIJPTURED: • RM-G19A(B)(C), STMLN HI RNG GAMMA. • RM-A9, CNDSR EXHAUST **GAS** ATMOS MONITOR. • RM-L3, STEAM GENERATOR BLOWDOWN LIQUID MONITOR. • RM-L10, SG BLOWDOWN CW DISCHARGE LIQUID MONITOR.

Pressurizer Steam Space Break – LQCA

Time	Operator	Actions
	CRS/SE/RO	Check if the RCS is INTACT: a. RE3 radiation levels are normal on: • RM-G7, CNTMT HI RNG GAMMA. • RM-G18, CNTMT HI KNG GAMMA. b. RB **Sump** levels are normal. ***c.*** RB pressure is LESS THAN 1.5 psig. d. The following annunciators are NOT lit: • XCP-606 2-2 (RBCU 1A/2A DRN FLO **HI).** • XCP-607 **2-2** (RBCU 1B/2B DRN FLO HI). GO TO EOP-2.0, LOSS OF REACTOR OR SECONDARY COOLANT, Step 1.
	CRS	***Transition brief – transition to EOP 2.0***
Critical	CRS/RO	Check if RCPs should be stopped: a. Check if either of the following criteria is met: • Annunciator XCP-612 4-2 is lit (PHASE B ISOL). OR • RCS pressure is LESS THAN 1400 psig and **SI flaw** is indicated on FI-943. CHG LOOP B CLD/HOT LG FLOW GPM. b. Stop ALL RCPs *While **the criteria for securing** RCP's may **not be met** at **the time this step is read, this is a continuous** action step **and the criteria for being less** than 1400 psig **with SI flow indicated on** FI **943 will be** met early **in** EOP 2.0.*
	CRS/BOP	**Verify** no SG is FAULTED: • NO SG pressure is decreasing in an uncontrolled manner. • NO SG is completely depressurized.
	CRS/BOP	Check INTACT SG levels: a. **Verify** Narrow Range level in INTACT SGs is GREATER THAN 30% [50%]. b. Control EFW flow to maintain Narrow Range level in each INTACT SG between 40% [50%] and 60%.
	CRS/RO	Reset both SI RESET TRAIN A(B) Switches.
	CRS/RO	Reset Containment Isolation: • RESET PHASE **A** - TRAIN A(B) CNTMT ISOL. • RESET PHASE B - TRAIN A(B) CNTMT ISOL.

Pressurizer Steam Space Break – LOCA

Time	Operator	Actions
	CRS/SE	Check if Secondary radiation levels are normal: a. Check radiation levels normal on: • RM-G19A(B)IC), STMLN HI RNG GAMMA. e RM-A9, CNDSR EXHAUST **GAS** ATMOS MONITOR. e RM-L3, STEAM GENERATOR BLOWDOWN LIQUID MONITOR. e RM-L10, SG BLOWDOWN CW DISCHARGE LIQUID MONITOR. b. Place SVX-9398A(B)(C). SG A(B)(C) SMPL ISOL, in AUTO. c. Notify Chemistry to sample all SG secondary sides and screen samples for abnormal activity using *a* frisker.
	CRS/RO	Check PZR PORVs **and** Block Valves: a. Verify power is available to the PZR PQRV Block Valves: • MVG 8000A, RELIEF 445 A-ISOL. e MVG 8000B, RELIEF 444 B ISOL. e MVG-8000C, RELIEF 445 B ISOL. b. Verify all PZR PORVs are closed c. Verify at least one PZR P B /alve is open.
	CRS/BOP	Place both ESF LOADING SEQ A(B) RESETS to: a. NON-ESF LCKOUTS. b. AUTO-START BLOCKS.
	CRS/RO	Establish Instrument Air to the RB: **a.** Start one Instrument Air Compressor and place the ether in Standby. b. Open PVA-2659, INST AIR TO RB AIR SERV. c. Open PVT-2660, AIR SPLY TO RE.

Time	Operator	Actions
	CRS/RO/BOP	Check if SI flow should be reduced: **a.** RCS subcooling on TI-499A(B), A(B) TEMP OF is GREATER THAN 30°F. ***Subcooling should be < 30°F.***
	CRS/RO	Check if RB Spray should be stopped: • Check if any RB Spray Pumps are running. *None **are running, directing** the crew past this step*
	CRS/RO	Check if RHR pumps should be stopped: **a.** Check if any RHR Pump is running in the ***Si*** Mode. b. Check RCS pressure: I) RCS pressure is GREATER THAN 250 psig 2) RCS pressure is stable or increasing. c. Stop any RHR Pump which is running in the **SI** Mode **and** place in Standby. *The CRS will direct the RO to place both RHR pumps in standby.*
	CRS/RO	Check if RCS pressure is stable or decreasing. *RO reports RCS pressure is continuing to decrease.*
	CRS/BOP	Check if pressure in all SGs Is stable or increasing. ***BOP should** report **SG pressures as stable.***
	CRS/CB AO	Check If DGs should be stopped: **a.** Verify both ESF buses are energized by offsite power. b. Stop any unloaded DG. REFER TO SOP-306. EMERGENCY DIESEL GENERATOR. ***The CRS** will **direct** the CB operator to secure both DG's.*
	CRS/RO/SE	**Verify** equipment is available for Cold Leg Recirculation. a. **Verify** power is available for at least one RHR Pump: 1) PUMP **A.** 2) PUMP **B.** b. Open both MVB-9503A(B) CC TO RHR HX A(B). c. Shift the CCW Train to fast speed in the Active Loop. REFER TO SOP- 118. COMPONENT COOLING **WATER.** d. Consult with TSC personnel to determine if equipment required for Cold Leg Recirculation is available.

Pressurizer Steam Space Break – LOCA

Time	Operator	Actions
	CRS/BOP	Check the AB for evidence of ECCS leakage: **a.** Verify AB radiation levels are normal on: • RM-A3. MAIN PLANT VENT EXH ATMOS MONITOR: PARTICULATE, IODINE, GAS. • RM-A13. PLANT VENT HI RANGE. • RM-A11 AB VENT GAS ATMOS MONITOR. • Local **area** monitors. **b.** Verify **annunciator** XCP-631 6-1 ***is*** NOT lit **(AB** SMP LVL HI). c. Verify annunciators XCP-606 3-4 and XCP-607 3-4 ***are*** NOT **lit** (LD TRBL AB SMP FL DRN LVL HI).
	CRS/RO/SE	Obtain necessary Chemistry samples: a. Ensure & RCS sample valves are in AUTO: • SVX-9364B and SVX-9365B, RCS LP B SMPL ISOL. • SVX-9364C and SVX-9365C, RCS LP C SMPL TSOL. b. Notify Chemistry **to** sample the following: • RCS: • All SGs for isotopic activity.
	CRS/BOP	Shut down and stabilize the Secondary Plant. REFER TO AOP-214.1 TURBINE TRIP.
	CRS/RO	Check if RCS cooldown and depressurization **is** required a. RCS **pressure is** GREATER THAN *250* psig. b. GO TO EOP-2.1. POST-LOCA COOLOOWN AND DEPRESSURIZATION, Step 1.
		End of scenario