

Facility: Indian Point 2 Scenario No.: 1

Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions:

Reset simulator to IC-115 Load Simulator Schedule-Scenario1

The Plant is at 30% power. 23 EDG is OOS due to a malfunctioning governor.

Turnover:

Return plant to 100% power at 200 MW/hr.

21 EDG, 22 EDG, 138 KV offsite power supply and 13.8 KV offsite power supply are protected

Tech Spec 3.8.1.B surveillance requirement last performed 3 hours ago

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R (ATC) N (CRS) N (BOP)	Power Escalation
2	XMT-SGN008A	I(ATC) I(BOP) TS(CRS)	23 SG Controlling Steam Flow Transmitter Fails High
3	MAL-EPS008L	C (BOP) C (CRS) TS (CRS)	MCC-28 will trip on overcurrent.
4	MAL-EPS001	C (ALL)	Loss of offsite power due to Loss of Station Aux Transformer. The running charging pump (21) will trip.
5	MAL SWD003A	M(ALL)	Complete loss of off site power resulting in a Reactor Trip
6	MAL-DSG007A	M(ALL)	21 EDG will trip and team will enter ECA-0.0.
7	MAL-CVC002	C(ALL)	300 GPM Seal LOCA. Crew will take actions for Safety Injection.
8	N/A	C(BOP)	22 EDG will be repaired and started. Team must start a service water pump to cool the EDG before it overheats and trips.
9	N/A	C(ATC) C(CRS)	Prior to starting a charging pump, RCP Seal Injection must be isolated.

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

Session Outline:

The evaluation begins with the plant at 30% power steady state operation. 23 EDG is out of service due to a malfunctioning governor. Post maintenance testing will be performed this shift. After completion of testing, the diesel will be declared operable. The team is currently raising power.

After taking the watch, 23 SG Steam Flow Transmitter fails high. The team will take actions in accordance with 2-AOP-INST-1, Instrument and Controller Failures.

After failed channel is removed from service, MCC-28 will trip on overcurrent. The team will need to restart Control Rod Drive (CRD) Cooling Fans on MCC-28A.

Following restart on the CRD cooling fans, a loss of offsite power will occur due to a widespread blackout. The running charging pump (21) will trip and EDG 22 will fail to start.

At lead evaluator discretion, a loss of grid will occur resulting in a unit trip. The team will perform actions of E-0, Reactor Trip or Safety Injection. Only Bus 5A will be energized. Because both motor driven AFW Pumps are de-energized, the team will take manual action to align AFW flow from the turbine driven AFW pump.

Soon after AFW flow is established, 21 EDG will trip. The team will recognize a loss of all AC and enter EOP ECA-0.0, Loss of All AC Power. After equipment is placed in pullout per ECA-0.0, 22 EDG will be repaired and started. However, 22 Service Water Pump will not auto start. The team will manually start the Service Water pump to provide cooling to the EDG before the diesel overheats and trips. MOV 222 will be failed open. The RCP seals will overheat causing a seal LOCA. The team will proceed through ECA-0.0 and transition to ECA-0.2, Loss of All AC Recovery with SI Required, and then to E-1, Loss of Reactor or Secondary Coolant. The scenario will be terminated in ECA-0.2, or at the lead evaluator's discretion.

Procedure flow path: AOP-INST-1, 2-ARP-SLF window 4-5, 2-AOP-138 KV-1, ECA-0.0, ECA-0.2

Scenario Critical Task and Malfunction Analyses

Critical Tasks:

CT-1

Establish greater than 400 gpm AFW flow to the SGs before transition out of E-0 or tripping the RCPs in the FR-H.1.

Actions to complete task :

- Increase speed on 22 AFW Pump and establish >760 gpm feed to all SGs

CT-2

Manually start the ESW pump such that the EDG does not fail because of damage caused by engine overheating.

Actions to complete task :

- Team will ensure 22 ESW pump is running for 22 EDG

CT-3

Isolate RCP Seal Injection before starting a Charging Pump.

Actions to complete task :

- Team will isolate RCP Seal Injection

Credited Events:

1. Power escalation. ATC will add positive reactivity via dilution and/or rods. BOP will increase MTG load. CRS will coordinate activities.
2. FT-439B fails high. The ATC should diagnose the event with help from the BOP and swap to the unaffected channel. The CRS will implement the AOP and have the BOP remove the affected channel from service. This malfunction also requires evaluation of Tech Specs by the CRS.
3. MCC-28 will trip on overcurrent. The team will diagnose the loss of MCC-28. BOP will restart tripped CRD fans in accordance with ARP. The CRS will coordinate and supervise activities. This malfunction also requires evaluation of Tech Specs by the CRS.
4. Loss of offsite power occurs due to the loss of the Station Aux Transformer. ATC will start 22 Charging pump. BOP will energize loads on 21 EDG.
5. A complete loss of power will occur. The unit will trip and the team will perform the immediate actions of E-0. BOP will align 22 AFWP to supply >760 gpm to the S/Gs.
6. 21 EDG will trip and the team will enter ECA-0.0. BOP will place equipment in Pullout. CRS will coordinate and supervise activities.
7. MOV 222 will be failed open. A 300 GPM Seal LOCA will occur. The team will take Safety Injection actions and actions to isolate the leak.
8. 22 EDG will be repaired and the team will be able to start and load the EDG. BOP should realize there is no ESW pump running and start an ESW pump to prevent the EDG from overheating and being damaged. BOP will start equipment on the running EDG. CRS will coordinate and supervise activities.
9. ATC will be requested to start a charging pump. RCP seal injection must be isolated prior to starting a charging pump.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
IC Reset	115	RESET SIMULATOR TO 30% POWER IC
SES Setup Schedule	LOA-DSG035 to OUT LOA-DSG057 to OFF MAL-DSG003B MOC-SWS006 to AUT_CLS MOC-SWS007 to AUT_CLS XMT-SGN008A to 1178.69995 on event 2 MAL-EPS008L on event 3 MAL-EPS001 on event 4 MAL-SWD002A on event 5 MAL-SWD002B on event 5 MAL-SWD003A on event 5 MAL-CVC002A after 780 to 75.00000 on event 5 MAL-CVC002B after 780 to 75.00000 on event 5 MAL-CVC002C after 780 to 75.00000 on event 5 MAL-CVC002D after 780 to 75.00000 on event 5 RLY-DSG026 to DE- ENERGIZE on event 6 RLY-DSG020 to DE- ENERGIZE on event 6 LOA-DSG062 after 15 to RESET on event 6 MAL-DSG007A in 60 on event 30 Event 30 ft1200 > 100 -desc ft1200 MOV-CVC002 to Open	Removes 23 EDG from service Loads 22 EDG starting failure Loads 2A and 3A service water pump start failures Sets trigger 2 to fail FT-439B Sets trigger 3 to fail MCC 28 on a fault Sets trigger 4 for loss of the station aux transformer Sets trigger 5 for loss of grid/Seal LOCA Sets trigger 6 to restart 22 EDG Sets trigger to trip 21 EDG once AFW flow is established Fails MOV-222 in the open position

SES Setup Schedule	<p>Load schedule and verify malfunctions and overrides have been entered</p>	<p>Removes 23 EDG from service Loads 22 EDG starting failure Loads 2A and 3A service water pump start failures Sets trigger 2 to fail FT-439B Sets trigger 3 to fail MCC 28 on a fault Sets trigger 4 for loss of the station aux transformer Sets trigger 5 for loss of grid/Seal LOCA Sets trigger 6 to restart 22 EDG Sets trigger to trip 21 EDG once AFW flow is established</p>
Floor Setup	<p>Perform setup checklist</p> <p>Ensure 21 Charging Pump is In Service</p> <p>Ensure 2 CRD fans are powered from MCC-28</p>	<p>Watch team walks the panels and assumes the watch. Place #23 EDG output breaker control switch in Pullout and apply a Danger tag. Place protected equipment placards on 21 and 22 EDGs. Update the protected equipment computer to show 21 and 22 EDGs and 13.8/138KV power supplies as protected equipment. Risk is yellow. Ensure 21 Charging Pump is In Service Ensure 2 CRD fans are powered from MCC-28</p>
Event 1	Respond as requested by Crew	Crew performs power ascension
Event 2	Actuate Trigger 2 when directed	MAL-SGN008A, FT-439B Main Steam flow transmitter fails high
Role Play	Acknowledge requests for I&C to troubleshoot	I&C will develop a troubleshooting plan
Role Play	If called about tripping bistables	Inform team that bistables are to be tripped.
Event 3	Actuate Trigger 3 At lead evaluator direction	MAL-EPS008L, Fault on MCC-28

Role Play	When NPO contacted	NPO will report that investigation with FIN reveals that the breaker appears to have a mechanical issue that caused it to open. No flags were up on the breaker. Alternate Path-If team does not use 28A, and team requests changing out the MCC breaker, report that time compression is being used and that a spare breaker has been inserted in the cubicle. Remove the malfunction and then mechanically close the breaker from the Rack in/ Rack out LOA.
Event 4	Actuate Trigger 4 At lead evaluator direction	MAL-EPS001, Loss of Station Aux Transformer
Role Play	When ConEd contacted	ConEd reports that they are having problems in the Buchanan Switchyard and are investigating
Event 5	Actuate Trigger 5 At lead evaluator direction	MAL-SWD003A, Main Generator trip 345KV EASTVIEW LINE FAULT MAL-SWD002A, MAL-SWD002B (96952 and 96951 138 KV LINE FAULT MAL-CVC002A thru D, Seal LOCA, at 75% after 13 minute delay (300 gpm)
Event 6	60 seconds after AFW established	MAL-DSG007A, 21 EDG Trips. Loss of All AC Power – ECA-0.0.
Role Play	MOV 222 is mechanically bound and is stuck OPEN	MOV 222 can not be shut.
Role Play	If Unit 3 is contacted then provided the following information: Unit 3 has tripped and is stable on their EDGs.	
Role Play	If dispatched to App R DG	After 1 minute. report that there is a lot of oil all around the diesel and it cannot be run.

Role Play	If Unit 3 is asked to start their App R DG to supply Unit 2 with power, comply with request. After approximately 10 minutes inform them that the output breaker will not close.	
After equipment in pullout in ECA-0.0 step 6 Restore 22 EDG:	<p>To Start 22 EDG Delete air start malfunction on Director (MAL-DSG003B), Actuate trigger 6 to start the EDG</p> <p>After it starts, call again to ensure that they know it has been started.</p>	<p>Restore 22 EDG. Deletes failure, resets and starts 22EDG. AFTER all four of the following conditions are met, NPO call CCR and let them know that you are ready to start 22 EDG:</p> <ul style="list-style-type: none"> • Equipment placed in pullout • NPO dispatched to start EDGs • All 480V buses have been de-energized for >15 minutes <p>CCR notified that 22 EDG is ready to start and CCR gave permission to start 22 EDG</p>
Role Play	Perform requested NPO actions except any that restore power other than 22 EDG as directed above.	

Event Description: Power Escalation

Time	Position	Applicant's Actions or Behavior
<p>Note:</p> <p>The reactivity plan for the power ascension should be developed by the team in the briefing room prior to taking the watch. The plan could call for dilution and/or rod withdrawal</p>		
	CRS	Assigns roles for power ascension
	ATC	Reviews reactivity plan
	ATC	If rods are withdrawn: <ul style="list-style-type: none"> • Places/verifies rods are in Manual • Withdraws rods • Observes: <ul style="list-style-type: none"> ○ Proper rod motion ○ Tavg ○ Power
	BOP	Peer checks rod withdrawal
	ATC	If dilution is performed: <ul style="list-style-type: none"> • Places RCS Makeup control to Stop • Place RCS Makeup Mode selector to Dilute • Adjusts integrator to desired dilution amount • Places RCS Makeup control to Start • Observes: <ul style="list-style-type: none"> ○ Proper makeup response ○ Tavg ○ Power
	BOP	Peer check dilution
Lead Evaluator		When the following has been demonstrated/observed: <ul style="list-style-type: none"> • Sufficient load ascension. • Sufficient normal plant operations by the BOP. Then instruct Booth to insert Event 2.

Event Description: 23 SG Controlling Steam Flow Transmitter Fails High

Time	Position	Applicant's Actions or Behavior
	BOP/ATC	Diagnose failed instrument: High Steam Flow Channel Trip Alarm High Steam Flow indicated for 23 SG 23 SG High Steam Flow Mismatch Trip
	BOP	Refers to ARPs for alarms
	ATC	Places Channel A in service for 23 SG Steam Flow (may switch to the A Channel for Feed Flow as well) NOTE: Team may place 33 Main Feed Regulating Valve in manual to eliminate windup in the controller and then return it to automatic, EN-OP-115.
	CRS	Directs team to perform immediate operator actions of 2-AOP-INST-1
	ATC	Checks all instruments listed in 2-AOP-INST-1
	CRS	Implements 2-AOP-INST-1 <ul style="list-style-type: none"> • Verifies no other instrument failures • Ensures actions have been taken to stabilize the plant • Refers to Tech Spec Tables 3.3.1-1 and 3.3.2-1 <ul style="list-style-type: none"> ○ 72 hour AOT to trip bistables • Directs tripping of bistables (may ask SM for direction)
Lead Evaluator		If the CRS asks the SM if bistables are to be tripped, a cue to trip bistables will be given.
	BOP	Trips the following bistable: In Rack A-11 Loop 3B SF > FWF and Loop 3B High SF SI
Lead Evaluator		When bistables have been tripped, direct the Booth Instructor to insert trigger for Event 3

Event Description: MCC-28 Trip on overcurrent.

Time	Position	Examinee's Actions or Behavior
	BOP/ATC	Diagnose loss of MCC-28
	BOP	Diagnose loss of power to two CRD Fans and review ARP-SLF Window 4-5, Common Control Rod Cooling Fan Tripped. <ul style="list-style-type: none"> • Verify fans are available for restart • Restart tripped fans on MCC-28A
	CRS	Direct implementation of ARP-SHF Window 3-8, MCC-28 Auto Trip. Direct implementation of ARP-SLF Window 4-5, Common control Rod cooling fan tripped.
	BOP	Restart CRD Fans
Lead Evaluator		NPO will report that investigation with FIN reveals that the breaker appears to have a mechanical issue that caused it to open. No flags were up on the breaker. Alternate Path- if team requests changing out the MCC breaker report that time compression is being used and that a spare breaker has been inserted in the cubicle. Remove the malfunction and then mechanically close the breaker from the Rack in/ Rack out LOA.
	CRS	Review TRM for loss of power to VC Sump Pump <ul style="list-style-type: none"> • TRM 3.4D Condition B- Start operable sump once per 24 hours and restore failed pump within 7 days.
Lead Evaluator		Proceed to next event following crew brief, or at the discretion of the Lead Evaluator.

Event Description: Loss of offsite power due to Loss of Station Aux Transformer.

Time	Position	Examinee's Actions or Behavior
	BOP/CRS	Diagnose loss of offsite Power
	ATC	Diagnose loss of 21 Charging Pump
	ATC	Start 22 Charging Pump
	BOP	Verify CCW pumps running
	BOP	Verify SW pumps running
	BOP	<p>Energize bus 5A from 21 EDG</p> <p>Energize loads on bus 5A from 21 EDG</p> <p>Setup to restore power to busses via 13.8 KV using Attachment 1 and place the following 6.9 KV breakers to trip pullout:</p> <ul style="list-style-type: none"> ___ BUS 1-5 TIE BRKR UT1-ST5 ___ BUS 2-5 TIE BRKR UT2-ST5 ___ BUS 3-6 TIE BRKR UT3-ST6 ___ BUS 4-6 TIE BRKR UT4-ST6 ___ 6900V BUS 5 NORMAL FEED BRKR ST5 ___ STA SERVICE XFMR 5 SUPPLY BRKR SS5 ___ 6900V BUS 6 NORMAL FEED BRKR ST6 ___ STA SERVICE XFMR 6 SUPPLY BRKR SS6 <p>Ensure Green Flag on control switches for:</p> <ul style="list-style-type: none"> ___ 22 CWP ___ 25 CWP
Lead Evaluator		Proceed to next event following crew brief, or at the discretion of the Lead Evaluator.

Event Description: Complete loss of off site power resulting in a Reactor Trip

Time	Position	Examinee's Actions or Behavior
	CRS	When Unit trips, direct team to perform immediate actions of E-0 <ul style="list-style-type: none"> • Verifies immediate actions using the procedure.
	ATC	Verifies Reactor Trip: <ul style="list-style-type: none"> • Reactor trip breakers open • Nuclear flux decreasing • Rod bottom lights lit • IRPIs < 12.5 inches Verify Turbine is tripped
	ATC	Verifies Turbine Trip by observing stop valves closed
	BOP	Check status of 480V buses Observe ONLY bus 5A is energized
	ATC	Check SI status Determine SI is not required
	BOP	Check AFW status Manually aligns 22 AFWP to supply >760 gpm to the S/Gs

Critical Task

Establish at least 400 gpm AFW flow to the S/Gs before transition out of E-0 or tripping RCPs in FR-H.1

Soon after AFW flow is established, 21 EDG will trip

Event Description: 21 EDG will trip and team will enter ECA-0.0.

Time	Position	Examinee's Actions or Behavior
	CRS	Transitions to ECA-0.0, Loss of All AC Power and directs crew actions during implementation of ECA-0.0
	ATC	Verify Reactor trip <ul style="list-style-type: none"> • Reactor trip breakers open • Nuclear flux decreasing • Rod bottom lights lit • IRPIs < 12.5 inches Verify Turbine is tripped
	ATC	Verifies Turbine Trip by observing stop valves closed
	ATC	Check if RCS is isolated <ul style="list-style-type: none"> ○ Isolates letdown ○ Close LCV-459 ○ Close 200A, B, and C
	ATC	Verifies AFW flow > 400 GPM
	CRS/BOP	Try to restore power <ul style="list-style-type: none"> • Manually actuate Safety Injection
	ALL	Open all Control Room Cabinets
Lead Evaluator		There is no power is available from the Buchanan Switchyard. 138KV and 13.8KV are NOT available. IF asked, the team can attempt starting the Appendix R DG to restore 13.8KV supply. NPO will report major oil system failure and DG is not available. If asked, Unit 3 has tripped and is stable on the EDGs and meets Emergency Plan NUE classification if only IP3 were affected. Con Ed reports widespread blackout across CT, Westchester, NYC and Long Island

Event Description: 21 EDG will trip and team will enter ECA-0.0.

	BOP	<p>Place equipment to Pullout</p> <ul style="list-style-type: none"> • Containment Spray Pumps • SI Pumps • FCUs • Motor Drive ABFPs • Turning Gear Oil pump • Bearing Oil pump • Turbine Auxiliary Oil pump • CCW Pumps • RHR Pumps <p>Reset Safety Injection when directed by the CRS</p>
	CRS	<p>Direct RO/BOP to reset Safety Injection</p> <p>Dispatch Personnel to Locally Close Valves to Isolate RCP Seals and Place Valve Switches in CLOSED position</p> <ul style="list-style-type: none"> • MOV-222, Seal Water Return Isolation(Valve is Bound OPEN) • RCP Seal Injection valves 250A, B, C, and D • FCV-789, CCW return From RCP Thermal Barrier
<p>Critical Task</p> <p>Isolate RCP Seal Injection before starting a Charging Pump</p>		
	CRS	<p>Isolate the CST</p> <p>Check status of SGs – MSIVs, Main FW regulating and bypass valves and blowdown isolation valves – all Closed</p> <p>Check if any SG is faulted – No SGs are faulted</p> <p>Check if all SG tubes are intact – Yes all SG tubes are intact</p> <p>Check Intact SG levels – control with AFW flow</p> <p>Check DC bus loads – has call made to Technical Support Center</p> <p>Check CST level > 2 ft – Yes</p>
Lead Evaluator		<p>Proceed to next event or allow the depressurization of the SGs at the discretion of the Lead Evaluator.</p>

Event Description: 21 EDG will trip and team will enter ECA-0.0.

	CRS/ATC	Initiate depressurization of Steam Generators. ___ At least one SG above 10% (27% for adverse containment) Narrow Range (if not, maintain max AFW flow, preferentially 22 or 23 SG, until level is obtained. Continue in procedure until level is obtained) ___ Manually dump steam to maintain cool down rate < 100°F/hr ___ Check RCS Cold Leg Temperatures > 325°F ___ Check SG pressures < 300 psig (cool down stop criteria) ___ Maintain SG pressures at 300 psig
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Event Description: 22 EDG will be repaired and started. 300 GPM Seal LOCA

Lead Evaluator		<p>AFTER all of the following conditions are met, NPO call CCR and let them know that he is ready to start 22 EDG:</p> <ul style="list-style-type: none"> ○ NPO has been dispatched to isolate RCP seal injection per ECA-0.0 step 8 ○ All 480V buses have been de-energized for >15 minutes (use time from RX trip on PICS) ○ CCR has been notified by NPO that 22 EDG is ready to start and CCR has provided permission to NPO to start 22 EDG <p>THEN clear the air start failure, reset 22 EDG, and start it:</p> <ul style="list-style-type: none"> ○ Delete air start malfunction: DMF MAL-DSG003B ○ Initiate trigger 6
	CRS	Provide permission to NPO to start 22 EDG
	BOP	<p>Diagnose 22 EDG is running and bus 2A/3A energized</p> <ul style="list-style-type: none"> ○ Observe no SW pump running ○ Manually start 22 ESW Pump
	CRS	Ensure SW Pump running for 22 EDG
Critical Task		
Manually start the ESW pump such that the EDG does not fail because of damage caused by engine overheating		
	CRS	<p>Continue recovery actions with ECA-0.0 step 24</p> <p>Stabilize SG Pressures</p> <p>Refers to step 18b to reset SI</p> <p>Directs actions to load equipment onto 2A/3A</p>
	BOP	<p>Reset SI (if not previously reset)</p> <p>Verify EDG SW valves open</p> <p>Verify equipment loaded onto bus 2A/3A</p>
	CRS	Transition to ECA-0.2, Loss of All AC Power Recovery with SI Required
	CRS/BOP	If not previously reset, then reset SI signal
	CRS	<p>Check RCP Thermal Barrier CCW Isolation status</p> <p>Check RWST level > 9.24 FT</p>

U2 NRC 2012 Scenario I: Power Escalation from 30%, FT-439B fails high, MCC-28 trips, Loss of offsite power, Loss of all EDG to ECA-0.0.

Event Description: 22 EDG will be repaired and started. 300 GPM Seal LOCA

	CRS/BOP	Manually align valves to establish SI injection mode: <ul style="list-style-type: none">• Verify MOV-1810 Open (RWST to SI Pump Suction)• Open RHR HX CCW outlet valves<ul style="list-style-type: none">○ MOV-822A○ MOV-822B• Open RHR HX outlet valves<ul style="list-style-type: none">○ MOV-746○ MOV-747
	CRS/BOP	Start: <ul style="list-style-type: none">• One CCW Pump• One RHR Pump• One SI Pump
Lead Evaluator		After review of the scenario set for the exam, this scenario may be terminated at this point provided a valid exam with the required attributes is given to all candidates.

Post Scenario Event Classification

Event Classification - Site Area Emergency Alert

EAL 6.1.4 following determination of the inability to power required core cooling systems with alternate power sources for greater than 15 minutes and loss of all AC for greater than 15 minutes

Turnover Information

Date/Time:	Today/Now
Condition:	Power Ops
% Power:	30%
Xenon:	Equilibrium
RCS Boron:	1313 ppm
PZR Press Control:	Channel 1
PZR Level Control:	Channel 2
RCS Total Leakage:	0.1 gpm
RCS Unidentified Leakage:	0.01 gpm
Condenser Air leakage	6 SCFM
RCS Gas activity	1.78E-2 $\mu\text{Ci/cc}$
Risk Assessment:	Yellow

Plant Equipment Status:

1. 23 EDG is out of service due to a malfunctioning governor. Maintenance is complete and post maintenance testing will be performed this shift.
2. TS 3.8.1.B surveillance requirement last performed 3 hours ago.
3. 21 and 22 EDGs are protected equipment. 138KV and 13.8KV Offsite Power Supplies are protected.

Instructions:

Return power to 100% at 200 MW/hr.

Facility: Indian Point 2 Scenario No.: 3

Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions:

Reset simulator to IC-117 Load Simulator Schedule Scenario 3

Turnover:

The Plant is at 90% power. 21 EDG is OOS for major PM.
 Return plant to 100% power.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R (ATC) N (CRS) N (BOP)	Power Escalation
2	XMT-SGN037A	I (ALL) TS (CRS)	PT-419C (21 SG C Channel Pressure) fails high causing 21 ADV to fail open requiring manual closure.
3	MAL-RCS002A	C (ALL) TS (CRS)	35 gpm RCS leak.
4	MOC CCW003A MOC CCW001/2	C(CRS) C (BOP) TS (CRS)	23 CCW Pump trips and 21 and 22 CCW Pump fail to auto start
5	MAL-RCS001A	M (ALL)	Large Break RCS LOCA.
6	MOC-RHR003/4	C (CRS) C (BOP)	RHR pumps will not auto start and need to be started manually.
7	RLY-PPL085/090	C (BOP)	Failure of Containment Phase A requiring manual initiation.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

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Session Outline:

The evaluation begins with the plant at 90% power steady state operation. The team is instructed to raise power to return to full load. The following equipment is out of service:

- 21 EDG has been out of service for 12 hours for PM. Maintenance is in progress. It is not expected back on this shift.

After starting the power ascension, a SG pressure channel (PT-419C) fails high. The team will take actions in accordance with 2-AOP-INST-1, Instrument/Controller Failures.

Prior to completion of the Subsequent Actions of 2-AOP-INST-1, a 35 gpm RCS leak will occur. The crew will diagnose RCS leakage, quantify the leak rate and take actions per 2-AOP-LEAK-1.

23 CCW Pump will trip. 21 and 22 CCW Pumps will fail to auto start requiring the BOP to manually start 21 or 22 CCW Pump before RCP trip is required. The first pump they start will have a shaft shear. They will be able to start the last pump successfully.

Large Break LOCA will occur. The team will perform actions of E-0, Reactor Trip or Safety Injection. Both RHR Pumps will fail to Auto start and must be started manually. Containment Isolation Phase A will fail to auto actuate requiring manual actuation by the operator. Fan Cooler Units 23 and 25 will trip due to bearing failures and will remain out of service for the remainder of the scenario. The team will subsequently transition to E-1, Loss of Reactor or Secondary Coolant.

When RWST level decreases to 9.24 feet, the team will transition to ES-1.3, Transfer to Cold Leg Recirculation. The team will take the appropriate action to place a train of recirculation in service. The scenario is terminated when recirculation is established to one train and SI pumps are secured.

Procedure flow path: 2-AOP-INST-1, 2-AOP-LEAK-1, 2-AOP-CCW-1, 2-E-0, 2-E-1, 2-ES-1.3

Scenario Critical Task and Malfunction Analyses

Critical Tasks:

CT-1

Manually start at least one low-head ECCS pump before completion of E-0 Attachment 1.

Actions to complete task :

21 and 22 RHR Pumps will be started. The team may notice that the pumps did not start and start them due to an automatic system not working properly. E-0 main body has a prompt to check RHR Pump status, and Attachment 1 checks RHR Pump Status.

CT-2

Close containment isolation valves such that at least one valve is closed on each critical penetration before the end of the scenario.

Actions to complete task :

Automatic Phase A will not work and manual use of pushbuttons is successful;

CT-3

Transfer to cold leg recirc and establish minimum ECCS requirements of ES-1.3 prior to core uncover based on CET temperature exceeding 700°F.

Actions to complete task :

Team will have to establish cold leg recirc per ES-1.3. Failure of the team to adequately progress through ES-1.3 could lead to having to secure all injection into the RCS (when RWST level reaches 3 ft.) prior to establishing internal recirc.

Credited Events:

1. Power escalation. ATC will add positive reactivity via dilution and/or rods. BOP will increase MTG load. CRS will coordinate activities.
2. PT-419C fails high. The ATC should diagnose the event with help from the BOP. The ATC will place 21 SG ADV in manual and closed. The CRS will implement the AOP and have the BOP trip bistables. This malfunction also requires evaluation of Tech Specs by the CRS.
3. RCS leak and LOCA. Initially the leak rate will be 35 gpm. There are no specific actions required by the team, so no actions are credited, however, time will be allowed for them to calculate leak rate. The CRS will have time to evaluate Tech Specs for the leak.
4. 23 CCW Pump will trip. 21 and 22 CCW Pumps will fail to auto start requiring the BOP to manually start 21 or 22 CCW Pump before RCP trip is required. The first pump they start will have a shaft shear. They will be able to start the last pump successfully. The CRS will coordinate and supervise activities.
5. When the leak rate is increased to a LOCA, this will be a major malfunction.
6. RHR pumps do not auto-start. This will require manual action to prevent challenging core cooling. Credit is given to the BOP since this addressed by E-0 Attachment 1, however, the CRS may direct the ATC to perform this action.
7. Phase A will not actuate automatically. This will require manual action by the BOP to isolate containment.

Simulator Setup and Instructor Directions

Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
IC Reset	Reset Simulator to IC-117	Reset Simulator to 90% power IC.
Schedule Setup	Run schedule for NRC Scenario 3.	

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
	Loads LOA-DSG055 to OFF Loads LOA-DSG032 to OUT Loads MOC-RHR003 to AUT_CLS Loads MOC-RHR004 to AUT_CLS Loads MOC-CCW001 to AUT_CLS Loads MOC-CCW002 to AUT_CLS Loads RLY-PPL085 to STUCK_CONTACTS Loads RLY-PPL090 to STUCK_CONTACTS Loads XMT-SGN037A to 1400.00000 on event 2 Loads MOT-CCW003A to WINDING_SHORT on event 4 Loads MAL-RCS002A to 0.00650 on event 3 Loads MAL-RCS001A on event 5 Loads MOT-CNM010A after 30 to WINDING_SHORT on event 30 Loads MOT-CNM012B after 22 to 100.00000 on event 30 Loads RLY-PPL085 to N/A on event 20 Loads RLY-PPL090 to N/A on event 21 Create Event 30 jbkrt==0 -desc RTA Open Create Event 20 xdoi047f==1 -desc Phase A Train A Push Button Create Event 21 xdoi048f==1 -desc Phase A Train B Push Button Insert malfunction MOT-CCW001A to SHAFT_BREAK on event 11 Insert malfunction MOT-CCW002A to SHAFT_BREAK on event 12	Removes 21 EDG from Service Auto Start Failure of 21RHR Pump Auto Start Failure of 22RHR Pump Auto Start Failure of 21 CCW Pump Auto Start Failure of 22 CCW Pump Phase A failure to auto actuate PT-419C failure 23 CCW Pump Over Current Trip 35 GPM RCS Leak Large Break LOCA 23 Fan Cooler Unit Failure 25 Fan Cooler Unit Failure Removes Relay failures for Phase A when Manual Pushbuttons depressed Creates Event 30 for Reactor Trip Creates Event to allow Manual Phase A actuation Shaft Breaks on first CCW Pump Started after 23 Trips.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
Floor Setup	Perform setup checklist.	Hang protected equipment signs for 22 and 23 EDGs. Place 21 EDG 52/EG1 to pullout and apply danger tag. Update the protected equipment PC.
Event 1	No Booth actions other than responding to requests and communications from the crew.	Crew performs power ascension.
Event 2	Actuate Trigger 2 (there is no trigger 1) At lead evaluator direction	21 SG Pressure Channel C Fails High XMT-SGN037A FIXED OUTPUT failed high with no ramp or delay.
Role Play	Acknowledge requests for I&C to troubleshoot. When CRS asks SM if B/S should be tripped:	I&C will develop a troubleshooting plan. Provide cue that SM requests bistables be placed in trip.
Event 3	Actuate Trigger 3 At lead evaluator direction	35 gpm RCS Leak MAL-RCS002A failed to 0.003 no ramp or delay
Event 4	Actuate Trigger 4 At lead evaluator direction.	23 CCW Pump trips MOT-CCW003A to short the windings on the CCW Pump. Actuate Trigger 11 or 12 to perform a shaft shear on the first CCW pump the team starts.
Event 5	Actuate Trigger 5 At lead evaluator direction.	LBLOCA 21 CL MAL-RCS001A to TRUE with no ramp or delay

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
Note:		<p>When SI is actuated, the following SI equipment will not auto-start (manual available): 21 RHR Pump 22 RHR Pump.</p> <p>The following will fail and not be able to be started either in Auto or Manual: 23 FCU 25 FCU.</p>
Role Play	If asked to investigate 23 and 25 FCU failures:	Overcurrent trip actuated on both breakers. No obvious problem (no visual damage and no smell of burning or over heat condition).
Role Play	At CCR Request:	Perform various LOAs per NPO Task List.

Op-Test No.: 1 Scenario No.: 3 Event No.: 1Page 1 of 1

Event Description: Power Escalation

Time	Position	Applicant's Actions or Behavior
	CRS	Supervise the actions of the team during power escalation <ul style="list-style-type: none"> • Refers to POP-2.1 Attachment 2, Reactor Power Ascension Checklist and Attachment 1, Operation At Power. • Refers to Reactivity Summary Sheet • Develops and implements a reactivity plan (should be done prior to team taking watch) • Directs the ATC to make reactivity additions • Directs the BOP to make turbine load changes
	ATC	Commences dilution using 2-SOP-3.2, Reactor Coolant System Boron, and/or withdraws Control Rods to raise Tavg to support load increase. Observes: Tavg, NIs
	BOP	Peers Checks dilution and/or rod withdrawal.
	BOP	Initiate generator load increase at rate directed by CRS <ul style="list-style-type: none"> • Monitor Tave – Tref deviation • Coordinate load increase with ATC reactivity addition rate. • Maintain Feed Water Regulating Valve controllers manual setpoint nulled during power reduction.
	ATC	Peers Checks MTG load increase

Op-Test No.: 1 Scenario No.: 3 Event No.: 2Page 1 of 1

Event Description: PT-419C (21 SG C Channel Pressure) fails high causing 21 ADV to fail open requiring manual closure.

Time	Position	Applicant's Actions or Behavior
	BOP	Observes Steam Line Delta-P 21 CHNL Trip 155 PSID alarm.
	ATC	Observes PI-419C is pegged high and increased steam flow on 21 SG
	ATC	Diagnoses PT-419C has failed high
	ATC	Places 21 SG ADV in manual and closes valve
	CRS	Instructs team to perform immediate operator actions of 2-AOP-INST-1
	ATC	Checks all instrumentation associated with instrument failures covered by 2-AOP-INST-1. No additional actions are necessary. Announces immediate actions complete.
	CRS	Instructs team that they are entering 2-AOP-INST-1
	CRS/ATC	Re-checks all instrumentation associated with instrument failures covered by 2-AOP-INST-1. Verifies that no additional actions are necessary.
	CRS	Evaluate TS 3.3.2. <ul style="list-style-type: none"> • Function 1e and g. • Function 4e. • Determine Condition A requires review of table 3.3.2-1 and associate actions. • From table 3.3.2-1 determine Condition D requires bistables placed in trip within 72 hours.
	CRS	Consults with SM to determine if bistables are to be tripped. <i>When called the Booth will inform team that bistables will be tripped. The CRS may just elect to trip bistables without consulting SM. This is allowed per 2-AOP-INST-1 step 4.39.</i>
	BOP	Trips bistables in Rack B-9: <ul style="list-style-type: none"> • Loop 1C, Low Pressure SI • Loop 1C, P1<P4-A • Loop 1C, P4<P1-A
	Lead Evaluator	When bistables are tripped, have Booth initiate Event 3

Op-Test No.: 1 Scenario No.: 3 Event No.: 3Page 1 of 1

Event Description: 35 gpm RCS leak.

Time	Position	Applicant's Actions or Behavior
	CREW	Diagnose RCS Leakage: <ul style="list-style-type: none"> • VCT level decrease • PZR level decrease • Containment humidity increase • Containment Sump level increase
	CRS	Enters 2-AOP-LEAK-1
Lead Evaluator		Booth operator acting as SM or OM will ask CRS what implications leak rate has on continued operation. This will prompt determination of leak rate and evaluation of T.S.
	ATC or BOP	Team should quantify leak rate using: <ul style="list-style-type: none"> • Seal injection flows • Seal return flows • VCT level trend • PZR level trend
	CRS	Determine required shutdown due to leak rate. T.S. 3.4.13 requires leakage to be reduced within 4 hours. Be in Mode 3 in 6 hours after 4 hours exceeded.
	CREW	Team may: <ul style="list-style-type: none"> • Adjust charging pump speed • start a second charging pump • Reduce letdown to 45 gpm
Lead Evaluator		Team will continue with actions to diagnose leak isolation. At Lead Evaluator discretion have Booth initiate Event 4 while primary leak is in progress.

Op-Test No.: 1 Scenario No.: 3 Event No.: 4Page 1 of 1

Event Description: Trip of 23 CCW pump.

Time	Position	Applicant's Actions or Behavior
	BOP	Diagnose that 23 CCW pump has tripped:
	BOP	Attempt start of 21 or 22 CCW pump based on failure of automatic action (Auto Start of standby CCW pump on low pressure) to occur First pump started will have a sheared shaft.
	BOP	Diagnose started pump is not providing flow based on failure of alarms to clear BOP will coordinate to start the remaining CCW Pump.
	CRS	May Enter 2-AOP-CCW-1
	CRS/BOP	If prior actions have not been taken based on Auto-Start Failure Pump starts described above will be directed at Step 1 of the procedure.
	CRS	CRS will make the TS call based on having two CCW Pumps out of service.
Lead Evaluator		When CCW is restored initiate Event 5

Op-Test No.: 1 Scenario No.: 3 Event No.: 5Page 1 of 1

Event Description: Large Break RCS LOCA.

Time	Position	Applicant's Actions or Behavior
	CRS	Direct team to perform immediate operator actions of E-0
	ATC	Verifies Reactor Trip: <ul style="list-style-type: none"> • Reactor trip breakers open • Nuclear flux decreasing • Rod bottom lights lit • IRPIs < 12.5 inches
	ATC	Verifies Turbine Trip by observing stop valves closed
	BOP	Verifies Power to 480V Busses - all powered from offsite power
	ATC	Verifies SI has actuated in both trains
	CRS	Enters E-0 and performs read-through of steps 1-4
	CRS	Recognizes foldout criteria are met for tripping RCPs
	ATC	Trips RCPs
	CRS	Directs BOP to perform E-0 Attachment 1
<p>Note:</p> <p><i>Actions will be continued on Event 6 and 7 D-2s</i></p>		

Op-Test No.: 1 Scenario No.: 3 Event No.: 6Page 1 of 1

Event Description: RHR pumps will not auto start and need to be started manually.

Time	Position	Applicant's Actions or Behavior
Note:		
<i>Depending on how the crew responds, Events 6 and 7 may be addressed in either order. Also, since the BOP is performing Attachment 1 in parallel, the actions may be addressed at different points in E-0.</i>		
	CRS/ATC	Verify AFW Pumps and Flow
Critical Task 1		
Manually start at least one low-head ECCS pump before completion of E-0 Attachment 1		
	CRS/ATC	Checks that RCS Press is < 1750 psig
	CRS/ATC	Checks that High Head SI flow is indicated
	CRS/ATC	Checks that RCS Press is < 350 psig
	CRS/ATC	Checks that RHR flow is indicated - it is not
	BOP	Starts 21 and 22 RHR Pumps
	CRS/ATC	Directs local closure of service water valves: FCV-1111/1112 SWN-4,5,6,7
	CRS	When service water valves are reported closed, directs start of one non-Essential Service Water Pump.
	CRS/ATC	Continue verification steps in E-0 May reduce AFW flow at RCS Temperature verification step
	CRS	Will transition to E-1 based on numerous indications of RCS leakage in containment

Op-Test No.: 1 Scenario No.: 3 Event No.: 7Page 1 of 1

Event Description: Failure of Containment Phase A requiring manual initiation.

Time	Position	Applicant's Actions or Behavior
	BOP	Will note that adverse containment conditions exist.
	BOP	Will start one Charging Pump and adjust to maximum speed.
	BOP	Will open LCV-112B and close LCV-112C
	BOP	Place RCS makeup control to STOP
	BOP	Opens 345 KV Switch F7-9
	BOP	Checks all 480V busses energized by offsite power
	BOP	Dispatches NPOs to reset: <ul style="list-style-type: none"> • Lighting • MCC-24A, 27A, 29A
	BOP	Stops all condensate pumps
	BOP	Verifies: <ul style="list-style-type: none"> • FW isolation • MSIV closure • Service Water alignment • SI Pumps alignment • RHR Pump alignment • Containment Fan Cooler status - note 23 and 25 have tripped and will remain out of service • AFW flow • Containment Ventilation isolation
Critical Task 2		
Close containment isolation valves such that at least one valve is closed on each critical penetration before the end of the scenario.		
	BOP	Notes Phase A valves not closed
	BOP	Presses both Phase A actuation pushbuttons

Time	Position	Applicant's Actions or Behavior
	BOP	Checks containment spray system
	BOP	Verifies CCR AC in incident mode
	CRS	Announces entry into E-1
	CRS/ATC	Verifies: <ul style="list-style-type: none"> • Checks PORV/Block status • RCPs are stopped • SGs not faulted • SGs not ruptured
	ATC/BOP	Resets SI: <ul style="list-style-type: none"> • Close MFRV/Bypass FRVs • Place SI Defeat Keys in switches • Reset both trains SI
	BOP	Reset Phase A: <ul style="list-style-type: none"> • Put switches in Open for valves 1410, 1413, SOV-3518, 3519 • Place CNTMT Rad Mon WCPS valves to Open • Verify both airlock solenoid switches are in Incident • Place remaining SN panel Phase A switches to Close • Press both Phase A reset buttons
	BOP	Reset Phase B: (If Containment Pressure <17 psig) Press both Containment Spray Reset buttons Press both Phase B Reset buttons
	BOP	Open PCV-1228 to establish Instrument Air to Containment
	ATC	Secure Charging Pump if flow is oscillating
Note:		
<i>Around this point, RWST Level will reach 9.24 ft and the Crew will transition to ES-1.3</i>		
	BOP/ATC	Announce that both RWST Low Low 9.24 Ft. Alarms are up

	CRS	Announces entry in to ES-1.3
	CRS/ATC	Verify RWST alarms are up and VC Sump Level is increasing
	CRS/BOP	Reset SI if not already done
	CRS/BOP	Dispatch NPO to CCW HXs
	ATC	Stops Charging Pump and Secures PZR Heaters
	ATC	Reset Containment Spray
	ATC	Place Recirc Switches 1 and 3 to On Verifies: 22 SI Pump stopped 21 Containment Spray Pump stopped Both RHR Pumps stopped
	CRS	Verifies that Service Water Valves are closed (order sent out in E-0)
	ATC	Place Recirc Switch 2 to On Verifies: <ul style="list-style-type: none"> • One NESW Pump running • CCW Pump running • Stops 23 CCW Pump • Function Complete Light Lit
	CRS/BOP	Check 822A/B 746/747 Open Close 746
Critical Task 3		
Transfer to cold leg recirc and establish minimum ECCS requirements of ES-1.3 prior to core uncover based on CET temperature exceeding 700°F		
	ATC	Place Recirc Switch 4 to On Verify: <ul style="list-style-type: none"> • 21 Recirc Pump Running • MOV-1802A/B are open • Function Complete Light Lit
Lead Evaluator		The next steps verify adequate recirculation flow. Scenario can be terminated when flow is established.

Post Scenario Event Classification

Event Classification - Alert

EAL 3.1.2 Primary system leakage exceeding the capacity (> 75 gpm) of a single charging pump.

Candidate should understand that EAL 4.1.3 SAE was challenged without automatic Phase A actuation

Turnover Information

Date/Time:	Today/Now
Condition:	Power Ops
% Power:	90%
Xenon:	Equilibrium
RCS Boron:	1265 ppm
Rods	CB D - 203
PZR Press Control:	Channel 1
PZR Level Control:	Channel 2
RCS Total Leakage:	0.1 gpm
RCS Unidentified Leakage:	0.01 gpm
Condenser Air leakage	6 SCFM
RCS Gas activity	1.78E-2 $\mu\text{Ci/cc}$
Risk Assessment:	Green

Plant Equipment Status:

Plant is at 90% power. Power was reduced a week ago for work on 22 MBFP. The work is complete and power is to be returned to 100%. 21 EDG has been out for 12 hours due to a major PM. It is expected back in 24 hours.

Instructions:

Return power to 100% at 100 MW/hr.

4

Facility: Indian Point 2 Scenario No.: 4

Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions:

Reset simulator to IC-118. Load Simulator Schedule – Scenario 4
 The Plant is in a 100% normal full power lineup. 21 AFW Pump is out of service

Turnover:

21 AFW Pump of out of service for scheduled maintenance and is expected back within 4 hours.
 22 and 23 AFW Pumps are protected equipment
 Maintain 100% Power

Event No.	Malf. No.	Event Type*	Event Description
1	XMT CVC019A	I (ALL)	VCT Level Transmitter LT-112 fails low
2	MAL RCS014D	TS (CRS)	6 gpm SG Tube Leak 24 SG
3	NA	R (ATC) N (CRS) N (BOP)	Rapid Load Reduction/Shutdown
4	MAL RCS014D	M (ALL)	Steam Generator Tube Rupture
5	BKR- DSG004	C (ATC)	23 EDG output Breaker fails as is
6	MAL SIS001	C (BOP)	Safety Injection Pump 21 Fails to Auto Start
7	AOV RCS003A SWI RCS006B SWI RCS006C	C (CRS) C (BOP)	PORV 456 loss of control power when attempted to open
8	AOV CVC008A	C (CRS) C (BOP)	Auxiliary Spray Valve 212 will open but will failed closed resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control
9	NA	C (BOP) C (ATC)	Power is restored to bus 6A

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

Session Outline:

The evaluation begins with the plant at 100% power steady state operation.

21 AFW Pump is out of service for scheduled maintenance and is expected back within 4 hours.

Shortly after the crew takes the shift, VCT level transmitter 112 will fail low. The crew will take actions in accordance with 2-AOP-CVCS-1 to restore a normal charging lineup. VCT level will be maintained by maintaining VCT pressure above the pre-failed value.

A 6 gpm Steam Generator Tube leak will occur in 24 SG. The team will take actions in accordance with 2-AOP-SG-1 and determine that a shutdown must commence per TS 3.4.13. After the magnitude of the leak is determined, the crew will initiate a power reduction using either 2-AOP-RLR-1 or 2-AOP-RSD-1. (The crew may determine that the leakrate will not be adequately reduced at 50% power and perform 2-AOP-RSD-1 to shutdown the unit.)

During the power reduction the tube leak will increase to a Steam Generator Tube Rupture requiring a Reactor Trip and Safety Injection. When the Main Generator output breakers open, the Station Auxiliary Transformer will fault resulting in a loss of offsite power. When Safety Injection is actuated, 23 EDG output breaker will fail to close causing a loss of bus 6A. With 6A lost and 21 AFW pump out of service, 22 Auxiliary Boiler Feed Pump will have to be manually aligned to supply water to the SGs. 21 Safety Injection Pump will fail to auto start and must be manually started.

The team will transition to E-3. Pressurizer Spray will not be available due to loss of RCPs. PORV 456 control power will fail when the valve is placed to open. Auxiliary Spray Valve AOV-212 will open but then shortly failed closed when the crew attempts to align Aux Spray. The crew will transition to ECA-3.3. Once transition made to ECA-3.3, power to bus 6A will be restored. The team will energize loads on bus 6A and return to E-3. The scenario is terminated when SI is terminated.

Procedure Flow Path: 2-AOP-CVCS-1, 2-AOP-SG-1, 2-AOP-RSD-1, E-0, E-3, ECA-3.3, E-3

Scenario Critical Task and Event Analyses

Critical Tasks:

CT-1

Establish greater than 400 gpm AFW flow to the SGs before transition out of E-0 or tripping the RCPs in the FR-H.1.

Actions to complete task :

- Increase speed on 22 AFW Pump and establish >400 gpm feed to all SGs

CT-2

Isolate Feedwater flow to and steam flow from the ruptured SG before transition to ECA-3.1 occurs.

Actions to complete task :

Isolate feedflow and steam flow to 24 SG

CT-3

Establish/Maintain RCS temperature to ensure transition out of E-3 does not occur due to either of the following:

- RCS temperature too high to maintain required subcooling
- RCS temperature too low resulting in severe challenge to the subcriticality or integrity CSF (due to the fault of the team).

Actions to complete task :

In E-3, cooldown must be controlled

Credited Events:

1. VCT level instrument failure low. The ATC and BOP both have control board indications that will be used to diagnose failure. The BOP will acknowledge alarms and take action to restore Charging Pump suction to the VCT. The ATC will have to monitor for reactivity effects when the Charging Pump is taking suction from RWST. Additionally, the ATC will secure makeup at the proper time. The CRS will coordinate and supervise activities.
2. 24 SG Tube Leak. The BOP and ATC will have to diagnose event. The BOP will take actions to isolate leakage. A load reduction will occur which will be a reactivity manipulation for the ATC and normal plant operation for the BOP and CRS. This malfunction also requires evaluation of Tech Specs by the CRS.
3. Rapid Load Reduction. CRS will direct the activities of a rapid load reduction. The ATC will control rods and boron while the BOP will lower MTG load.
4. 24 SG Tube Rupture. This is a major malfunction for all operators. Complicating the event is a loss of the Station Aux Transformer.
5. Failure of 23 EDG output breaker to close. With 6A deenergized and 21 AFW pump out of service, 22 Auxiliary Boiler Feed Pump will have to be manually aligned to supply water to the SGs.
6. 21 Safety Injection Pump will fail to auto start and must be manually started.
7. PORV 456 loss of control power when attempted to open. ATC will attempt to open PORV 456, but control power will fail
8. Auxiliary Spray Valve 212 will open and then fail closed resulting in a transition to ECA-3.3 SGTR with Loss of Pressure Control. Crew will perform actions of ECA-3.3 up to and including the securing of SI.
9. Power will be restored to bus 6A prior to step 4 of ECA-3.3. CRS will direct the ATC and BOP to energized loads lost on bus 6A, transition to E-3 and secure SI.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
IC Reset	118	Reset Simulator to 100% power IC
SES Setup Batch File	Run setup schedule and verify malfunctions and over-rides have been entered.	
	Loads LOA-EPS008 to OUT Loads AOV-CVC008A to CLOSE after 12 on event 28 Loads MOC-SIS001 to AUT_CLS Loads XMT-CVC019A to 0 on event 1 Loads MAL-RCS014D to 0.1200 on event 2 Loads MAL-RCS014D from 0.25000 to 8.00000 on event 4 Loads MAL-EPS001 on event 30 Loads BKR-DSG004 to ASIS on event 30 Loads AOV-RCS003A to CLOSE on event 29 Loads SWI-RCS006B to Off on event 29 Loads SWI-RCS006C to Off on event 29 Create Event 30 ji_p==1 -desc ji_p Create Event 29 xcoi327o==1 -desc xcoi327o Create Event 28 xcoi223o==1 -desc xcoi223o Loads AOV-SGB015A to open to fail PCV-1217	Removes 21 AFW Pump from service Closes AOV-212 after it cycles open Auto Start Failure of 21 SI Pump VCT Level Transmitter 112 Failure low 24 SG Tube Leak 24 SG Tube Rupture Loss of Station Aux Transformer (Off Site Power) on Generator Trip 23 EDG Output Breaker Fails to close Failure of PCV-456 (PORV) to open De-energizes Green Light to simulate blown fuse De-energizes Red Light to simulate blown fuse Creates Event 30 Creates Event 29 Creates Event 28 Failure of Blowdown Isolation Valve to close
Floor Setup	Perform setup checklist. Update the Protected Equipment PC. <i>Risk is Yellow</i>	21 AFW to TPO with 22 and 23 protected.
Event 1	Actuate Trigger 1 button at lead evaluator direction	VCT Level Transmitter LT-112 Fails low
Role Play	If NPO sent to investigate VCT level instrumentation:	NPO reports no obvious problems.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
Role Play	If I&C asked to investigate VCT level instrumentation:	Inform the crew that a troubleshooting plan will be developed.
Event 2	Actuate Trigger 2 button at lead evaluator direction.	6 gpm Steam Generator Tube Leak on 24 SG
Role Play	If NPO sent to N16 panel:	Acknowledge the local alarm and report reading on 24 main steam line. Team will start a shutdown based on SGTL
Event 3	No Booth Operator Action	Rapid Shutdown due to SGTL
Event 4	Actuate Trigger 4 button at lead evaluator direction. No Booth Operator Action; event loaded at setup	Steam Generator Tube Rupture Station Aux Transformer Fault – Loss of Offsite Power
Event 5	No Booth Operator Action; event loaded at setup	23 EDG output breaker will fail to close.
Event 6	No Booth Operator Action; event loaded at setup	21 Safety Injection Pump fails to auto start
Event 7	No Booth Operator Action; event loaded at setup	PORV 456 Loss of control power when attempted to open
Event 8	Once AOV-212 is open (wait 3 seconds after valve is open)	Auxiliary Spray Valve AOV-212 will open but failed closed resulting in a transition to ECA-3.3
Event 9	Booth Operator ensures 23 EDG is running and closes 23 EDG output breaker. (After ECA-3.3 is entered and prior to Step 4 of ECA-3.3) Remove malfunction from BKR-DSG004	Bus 6A will energize.

Event Description: VCT level instrument fails low causing automatic makeup and charging pump suction to swap to the RWST.

Time	Position	Applicant's Actions or Behavior
	CRS BOP	Diagnose VCT Level Instrument failing low by the following: <ul style="list-style-type: none"> • Automatic Makeup to VCT initiating • VCT Level Low Alarm (FB-1) • Charging Pump Suction swaps to RWST (LCV-112B opens LCV-112C closes)
	CRS	Enters 2-AOP-CVCS-1
	BOP	Place and hold LCV-112C in Open
	BOP	When LCV-112C indicates Full Open, place LCV-112B in Close
	BOP	When LCV-112B indicates Full Closed, place LCV-112C in Auto
	ATC	Place Makeup Control in Stop
	ATC	Place Makeup Mode Selector Switch in Manual
	CRS	Determine if RCS Temperature was affected by RWST makeup. <i>No action should be needed if Crew response was timely</i>
	ATC	Makeup or divert from VCT as necessary to maintain VCT Pressure 2-5 psi above pre-event value.
	CRS	Complete AOP actions: <ul style="list-style-type: none"> • Have Chemistry determine RCS Boron concentration • Have NPO monitor running Charging Pump • Make notifications
	Lead Evaluator	Request Booth Operator initiate Event 2

Event Description: 6 gpm tube leak on 24 SG

Time	Position	Applicant's Actions or Behavior
	CRS ATC	Diagnose SG Tube Leakage by the following Alarms: <ul style="list-style-type: none"> • Steam Line N-16 Monitor • Air Ejector Exhaust R-45 • Steam Gen Blowdown Hi RAD/Trouble R-49
	BOP	Dispatch NPO to N-16 Monitor <i>Report back will be that 24 SG leakage is approximately 8600 gpd.</i>
	CRS	Enter 2-AOP-SG-1
	ATC	Determines that PZR Level is not affected
	CRS	Determine that leakage is greater than 75 gpd (report from N-16 panel and R-45 will confirm)
	CRS	Perform AOP actions: <ul style="list-style-type: none"> • Make notifications • Direct operator to fill out leakrate attachment • Have Chemistry obtain samples

Event Description: Rapid Load Reduction/Shutdown

	CRS	Initiate Shutdown to achieve <50% in one hour and Mode 3 in additional 2 hours using: 2-POP-2.1, 2-AOP-RSD-1, or 2-AOP-RLR-1 <ul style="list-style-type: none">• Perform notifications• Hold briefing for load reduction
	ATC	Perform Boration for shutdown
	BOP	Reduce Turbine Load using Governor
	BOP	Perform Actions per 2-AOP-SG-1: <i>Actions performed depend on crew pace and when Event 4 is initiated.</i> <ul style="list-style-type: none">• Adjust 24 SG ADV to 1030 psig• Attempt to close 24 SG Blowdown valves<ul style="list-style-type: none">○ Valve 1217 will not close, can be failed closed in field○ 1217A will isolate Blowdown line
Lead Evaluator		When sufficient load reduction has been observed, request Booth Operator to proceed to Event 4.

Event Description: SG Tube Leak will turn into a rupture. This will lead to team performing a manual reactor trip and SI.

Time	Position	Applicant's Actions or Behavior
	ATC	Diagnose that SG Leakage has increased: <ul style="list-style-type: none"> • Decreasing PZR level • RCS Low Pressure Alarm • Charging Pump speed increase in automatic • VCT lowering level • VCT Level Low Low Alarm May start additional Charging Pump and/or Place 45 gpm orifice in service.
	CRS	Directs ATC to trip Reactor Directs BOP to Initiate SI
	ATC	Trip Reactor from Flight Panel
	BOP	Initiates Safety Injection
	CRS	Directs Operators to perform immediate operator actions of E-0.
	ATC	Verifies Reactor Trip: <ul style="list-style-type: none"> • Checks trip breakers open • Checks flux decreasing • Checks rod bottom lights lit (will have lost power) • Checks IRPIs <12.5 inches (will have lost power)
	ATC	Verifies Turbine Trip by observing all Turbine Stop Valves closed.
	BOP	Verifies Power to 480V Busses: <ul style="list-style-type: none"> • Depending on the timing of this step the Station Aux Transformer and bus 6A may be deenergized.

Event Description: SG Tube Leak will turn into a rupture. This will lead to team performing a manual reactor trip and SI.

Time	Position	Applicant's Actions or Behavior
	ATC	Checks SI Status: <ul style="list-style-type: none">• SI Annunciators are lit• SI Pumps are running• Both Trains of SI are actuated (only one train will be running due to faults)
	CRS	Directs BOP to perform Attachment 1 of E-0
	BOP	Performs Attachment 1 in parallel with the CRS/ATC progressing through E-0: <ul style="list-style-type: none">• Start a charging pump and align suction to RWST by opening LCV-112B and closing LCV-112C.• Dispatch NPO to reset lighting and MCCs 24A, 27A, and 29A.• Stop condensate pumps.

Event Description: 23 EDG output breaker will fail to close causing a loss of power to bus 6A. 22 Aux Boiler Feed Pump will have to be started and aligned to feed SGs.

Time	Position	Applicant's Actions or Behavior
	ATC	Reports that no AFW pumps are running.
<p>Critical Task</p> <p>Establish greater than 400 gpm AFW flow to the SGs before transition out of E-0 or tripping the RCPs in the FR-H.1.</p>		
	ATC	<p>Establish greater than 400 gpm AFW flow:</p> <ul style="list-style-type: none"> • Increase speed on 22 AFW Pump which is idling. • Adjust 22 AFW Pump Aux Feed Reg Valves to establish greater than 400 gpm total AFW Flow. 24 SG should be fed if level is less than 10% narrow range level.

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS/BOP	Verify SI System Flow: <ul style="list-style-type: none"> • 21 SI pump Failed to Auto Start and must be manually started (May not be started until Attachment 1 is performed)
	CRS/ATC	Checks RCS Pressure Checks SI Flow indicated if RCS Pressure is below 1720 psig Verifies RHR flow not established/required, RCS Pressure is greater than 320 psig Places RHR pump to TPO
	CRS/ATC	Check RCP Seal Cooling: <ul style="list-style-type: none"> • Notes no CCW flow • RCPs should be de-energized due to loss of offsite power. • Direct Service Water Valves FCV-1111, FCV-1112, SWN-6, SWN-7, SWN-4, SWN-5 be closed locally • When valves are closed start 24 or 25 SWP
	CRS/ATC	Check RCS Temperature: AFW Flow may be throttled back to just above 400 gpm at this point to maintain RCS Temperature.

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS/ATC	Will check that Spray, Aux Spray, and PORVs are all closed.
	CRS/ATC	Check if RCPs should be stopped: RCPs are already secured
	CRS/ATC	Check for Faulted SG
	CRS/ATC	Check for Ruptured SG: <ul style="list-style-type: none"> • 24 SG Level will be increasing in an uncontrolled manner • Air Ejector, Steam Line and Blowdown Radiation Monitors will be abnormal. Team may identify 24 SG is ruptured at this point.
	CRS	Transition to E-3 Steam Generator Tube Rupture
	CRS/ATC	Check if RCPs should be stopped: RCPs are already secured
	CRS	Identifies 24 SG as ruptured
Critical Task		
Isolate Feedwater flow to and steam flow from the ruptured SG before transition to ECA-3.1 occurs.		
<i>Isolating AFW Flow to 24 SG may have occurred in E-0 when level reached 10% as a Prudent Operator Action.</i>		
<i>If AFW is secured immediately after 10% level is reached, the team may have to re-initiate feeding to maintain level >10%</i>		
	CRS/ATC	Adjust 24 SG ADV to 1030 psig (74% on dial) and check that it is closed if pressure is below 1030 psig. ADV should have been adjusted in AOP-SG-1.
	CRS/ATC	Verify Blowdown Valves closed for 24 SG. This should have been done in AOP-SG-1
	CRS/ATC	Direct closure of steam traps upstream of 24 MSIV.
	CRS/ATC	Direct check that MS-55D (MSIV bypass) is closed.

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS/ATC	Close 24 MSIV
	CRS/BOP	Stop feed flow to 24 SG when Narrow Range Level greater than 10%
	CRS/ATC	Check 24 SG Pressure greater than 440 psig. If properly isolated, pressure will be approximately 1030 psig.
	CRS/ATC	Determine Core Exit Thermal Couple target temperature for cooldown: If 24 SG < 1050 psig and > 1025 psig, then target is 510°F. If 24 SG < 1025 psig and > 1000 psig, then target is 507°F.
Critical Task		
<p>Establish/Maintain RCS temperature to ensure transition out of E-3 does not occur due to either of the following:</p> <ul style="list-style-type: none"> • RCS temperature too high to maintain required subcooling (This could be caused by team allowing CET temperature to come back up above target value) • RCS temperature too low resulting in severe challenge to the subcriticality or integrity CSP (Procedure specifies maintain temperature below target value without giving a specified band, however operators are trained to keep temperature close to target. Overcooling which leads to integrity challenge constitutes failure) 		
	CRS/ATC	<p>Commence Cooldown to target CET temperature:</p> <p><i>Note: SG Atmospheric Dump Valves (ADVs) will be used for cool down.</i></p> <ul style="list-style-type: none"> • Initiate Cooldown using 21, 22 and 23 ADVs • Do not exceed 0.5E6 lbs/hr on each of 21, 22, 23 SG <p><i>Team will continue in procedure while CETs are lowering</i></p> <p>When CET temperatures are less than target:</p> <ul style="list-style-type: none"> • Stop cooldown by closing ADVs • Maintain CET temperature below target temperture
	CRS/ATC	Check SG Levels and maintain AFW flow
	CRS/ATC	<p>Check PORVs and Block Valves. One block valve, MOV-535, has no power.</p> <p>Block Valve MOV-536 is opened.</p>

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS/ATC	Reset SI: <ul style="list-style-type: none"> • Place non-running CCW Pumps in Trip Pullout • Close MFRV and Bypass FRVs • Place SI Defeat Key Switches in Defeat • Press SI Reset Pushbuttons
	CRS/BOP	Reset Phase A: <ul style="list-style-type: none"> • Place switches in open for IVSW valves 1410, 1413, SOV-3518, SOV-3519 • Place Containment Rad Monitor WCPS Valve Switch to open • Place personnel and equipment hatch switches in incident • Place all remaining Phase A Valve switches to close • Depress Phase A reset pushbuttons
	CRS/BOP	Establish Instrument Air to Containment by opening PCV-1228
	CRS/BOP	Secure remaining in service RHR Pump
	CRS/ATC	Start the remaining Charging Pump and establish maximum charging flow
	CRS/ATC	After cooldown stopped, check 24 SG Pressure stable or increasing. It will be stable
	CRS/ATC	Check that adequate RCS subcooling exists. Subcooling will be greater than the required 43 degrees
	CRS/ATC	Attempts to Depressurize RCS <ul style="list-style-type: none"> • Normal spray not available (No RCPs running) • Attempts to open PORV 456. Control power fails when switch placed to open. (The block valve for PORV 455C is de-energized in the closed position) • Attempts to place Aux Spray in service. <ul style="list-style-type: none"> ○ AOV-212 initially opens and then fails shut 3 seconds later

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS	Transition to ECA-3.3
After step 1 in ECA-3.3 is started, booth operator calls the control room to say that there does not appear to be anything wrong with 23 EDG output breaker and the NPO would like to close the breaker. The breaker should be closed during step 1.		
	CRS/BOP	Check status of 480V Busses. Will start one Electrical Tunnel Exhaust Fan and direct restoring some auxiliary loads locally.
	CRS/ATC	Check 24 SG Level <73%:
	CRS/ATC	Check 24 RCP not in service (normal spray not available)
	CRS/ATC/ BOP	Try to establish pressure control: <ul style="list-style-type: none"> • 23 EDG will be able to power bus 6A to enable use of PORV 455C and transition back to E-3, Step 18
	CRS	Transition to E-3, step 18
	CRS/ATC	Depressurize RCS by opening Block Valve MOV-536 (if not opened in ECA-3.3) and PORV 455C Stopping criteria to close the PORV: <ul style="list-style-type: none"> • Both the following <ul style="list-style-type: none"> ○ RCS Pressure less than 24 SG pressure, AND ○ PRZR Level greater than 14% OR • PRZR Level greater than 71% OR • RCS Subcooling less than the value in the table
	CRS/ATC	Check RCS pressure is increasing after PORV is closed.

Event Description: Safety Injection Pump 21 Fails to Auto Start. PORV 456 loss of control power when attempted to open. Auxiliary Spray Valve 212 will fail closed after opening resulting in a transition to ECA-3.3 SGTR With Loss of Pressure Control. Power will be restored to bus 6A allowing them to use a PORV and return to E-3.

Time	Position	Applicant's Actions or Behavior
	CRS/ATC	Terminate SI: Check Subcooling - will be above required value from table Check Heat Sink - will have greater than 400 gpm available flow Check RCS pressure is stable or increasing PZR level greater than 14% Stop SI Pumps and place in auto
Lead Evaluator		Terminate Scenario

Post Scenario Event Classification

Event Classification - ALERT

EAL - 3.1.2 Primary system leakage exceeding the capacity (>75 gpm) of a single charging pump.

Turnover Information

Date/Time:	Today/Now
Condition:	Power Ops
% Power:	100%
Xenon:	Equilibrium
RCS Boron:	1234 ppm
PZR Press Control:	Channel 1
PZR Level Control:	Channel 2
RCS Total Leakage:	0.1 gpm
RCS Unidentified Leakage:	0.01 gpm
Condenser Air leakage	6 SCFM
RCS Gas activity	1.78E-2 $\mu\text{Ci/cc}$
Risk Assessment:	Yellow

Plant Equipment Status:

1. 21 AFW Pump of out of service for scheduled maintenance and is expected back within 4 hours.
2. 22 and 23 AFW Pumps are protected equipment.

Instructions:

Maintain 100% power

Facility: Indian Point 2 Scenario No.: 2

Op-Test No.: 1

Examiners: _____ Operators: _____

Initial Conditions:
 The Plant is in a 100% normal full power lineup.

Turnover:
 21 Charging Pump and 21 CCW pump are out of service.

Event No.	Malf. No.	Event Type*	Event Description
1	XMT RCS043A	I (ALL) TS (CRS)	RCS Loop 23 T-Hot fails high
2	CVH- CFW009B	R (ATC) N (CRS) N (BOP)	24 MFRV will slowly drift closed due to a broken air line prompting a Rapid Load Shutdown
3	MAL CRF002AV	C (ATC) C (CRS) TS (CRS)	Control Rod P-6 "ratchets in" during rod motion.
4	MOT CVC004A	C (ATC) C (BOP) C (CRS) TS (CRS)	Loss of Letdown due to LCV-459 failing shut. Excess Letdown will be placed in service.
5	MAL SGN004A	M (ALL)	Steam Break down stream of 21 MSIV & Check Valve in Aux Boiler Feed Pump Building.
6	PLP RHR033 PLP RHR022 RLY PPL487 RLY PPL488 MOV RHR011	M (ALL)	LOCA outside Containment in Primary Auxiliary Building (PAB) Safety Injection fails to Auto Actuate requiring Manual Actuation. RHR valve 746 will fail to auto open requiring Manual Action

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

Session Outline:

The evaluation begins with the plant at 100% power steady state operation.

21 Charging Pump and 21 CCW pump are out of service.

Shortly after the crew assumes the watch 23 Loop T-hot instrument fails high. The team will take actions in accordance with 2-AOP-INST-1, Instrument and Controller Failures.

24 SG feed regulating valve will start to drift shut. After investigation the Shift Manager will call the control room and report that 24 SG Feed Regulating Valve air line has been damaged by a maintenance crew. The shift manager will direct the team to begin a rapid shutdown in accordance with 2-AOP-RSD-1.

After adequate power reduction has taken place, Control Rod P-6 will ratchet into the core due to a movable gripper failure, requiring the load reduction to be stopped and the condition evaluated per 2-AOP-ROD-1.

After the load reduction is resumed, LCV-459 will fail shut. The crew will respond using 2-AOP-CVCS-1 and isolate letdown. Excess letdown will be place in service.

Subsequently a Main Steam Rupture will occur downstream of 21 MSIV and check valve. The team may use 2-AOP-UC-1 to trip the reactor and close the MSIVs. 23 MSIV will fail to close and will close 60 seconds after the reactor trip.

Simultaneously with the reactor trip, a rupture will occur on the RHR discharge header outside of containment. Automatic SI will fail to actuate when demanded, requiring manual actuation.

The team will progress through E-0 and may determine that RCP trip criteria is met. (This depends on the magnitude of the cooldown during the steam break.) The BOP will manually open MOV-746 while performing E-0 Attachment 1. The team will continue in E-0 until a transition to ECA-1.2 is directed. In ECA-1.2, the source of the LOCA outside containment will be identified and isolated. The scenario is terminated when the team has determined a transition to E-1 is required.

Procedural flow path: 2- AOP-INST-1, 2-AOP-FW-1, 2-AOP-RSD-1, 2-AOP-ROD-1, 2-AOP-CVCS-1, 2-AOP-UC-1, 2-E-0, 2-ECA-1.2, 2-E-1.

Scenario Critical Task and Event Analyses

Critical Tasks:

CT-1

Manually actuate at least one train of SIS-actuated safeguards before any of the following:

- Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRP.
- Completion of step 5.a of ES-0.1.

Actions to complete task:

Automatic actuation of SI will not occur. Team must manually actuate SI via pushbuttons.

CT-2

When RCP trip criteria are met, trip all RCPs prior to completion of the first step in the EOP network that directs tripping RCPs.

Actions to complete task:

BOP/ATC will secure RCPs once the RCP trip criteria is met

CT-3

Isolate the LOCA outside of containment before transition out of ECA-1.2.

Actions to complete task:

BOP/ATC will Close RHR pump cold leg injection valves 746 and 747

Credited Events:

1. RCS Loop 23 T-Hot fails high. The ATC should diagnose the event with help from the BOP. ATC should take Charging pump control and Rod control to manual control and perform the immediate actions of AOP-INST-1. CRS will implement the AOP. BOP will remove the affected channel from service.
2. Team will perform the actions of 2-AOP-FW-1. Team will commence Rapid Shutdown. CRS will supervise activities of the crew. ATC will develop a reactivity plan for the shutdown and perform the shutdown. BOP will perform peer checks and load reductions.
3. Control Rod P-6 "ratchets in" during rod motion. CRS will evaluate Tech Specs. ATC will verify or place rod control in manual.
4. LCV-459 will fail shut. BOP will close 200A, B, C. Crew will place excess letdown in service.
5. Steam Break down stream of 21 MSIV & Check Valve in Aux Boiler Feed Pump Building. CRS will direct actions of AOP-UC-1. ATC will manually trip the reactor and verified it is tripped. BOP will close all MSIVs except 23 MSIV will fail to close. 23 MSIV will close Approximately 60 seconds after the reactor trips.
6. LOCA outside containment in the PAB. ATC will manually initiate SI when the auto actuation fails. BOP will be operating equipment on the panel in accordance with Attachment 1 including opening RHR 746 which will fail to auto open. ATC will secure RCPs when sub-cooling lowers and reset SI. CRS will diagnose LOCA outside containment and transition to ECA-1.2. CRS will coordinate and supervise activities. BOP will isolate the LOCA by closing RHR pump cold leg injection valves 746 and 747.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
IC Reset	118	Reset Simulator to 100% power IC.
SES Setup Schedule File	Load schedule and verify malfunctions and over-rides have been entered	
	LOA-EPS010 to OUT LOA-EPS010 to OUT MAL-CRF002AV to MOVING RLY-PPL487 to STUCK_CONTACTS RLY-PPL488 to STUCK_CONTACTS MOV-RHR011 to AUT_OPN MAL-SGN004A to 20.00000 Event 30 jbkrrta==0 -desc jbkrrta PLP-RHR033 to 100.00000 PLP-RHR022 to 100.00000 FLX-RHR008 to 100.00000 XMT-RMS031A XMT-RMS018A BST-RMS009A XMT-RMS046B XMT-RMS047B XMT-RMS045B ANN-SB2-1-9 SWI-SGN003A to RESET=1 SWI-SGN003A after 60 AOV-CVC030A XMT-RCS043A to 640.00000 CVH-CFW009B to 65.00000	Racks out 21 Charging Pump 480V breaker. Racks out 21 CCW Pump 480V breaker. Loads movable gripper malfunction on control rod P-6 on trigger 3. Loads failure of Auto SI master relays SIA-1&2. Loads auto open failure MOV-746. Loads steam line break on trigger 5. Sets conditional trigger 30 which auto actuates when reactor trip occurs. Loads malfunctions to cause RHR piping LOCA outside containment on trigger 30. Loads Alarms for proper indication of LOCA outside VC Loads failure of 23 MSIV Remote Closure Loads closure of 23 MSIV 60 seconds after Rx Trip Loads Failure of LCV-459 Closed Loads Failure of 23 Loop Hot Leg RTD Loads Failure of 24 Loop Feed Reg Valve

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
Floor Setup	<p>Perform setup checklist.</p> <p>Place pump control switch for 21 Charging Pump in TPO and apply danger tag.</p> <p>Place pump control switch for 21 CCW Pump in TPO and apply danger tag.</p>	<p>Watch team walks the panels and informs Lead Evaluator when ready to take the watch.</p> <p>Place Protected equipment placards on the other Charging and CCW pumps.</p> <p>Update the Protected Equipment LCD screen.</p>
Event 1	Actuate Trigger 1 At lead evaluator direction	XMT-RCS043A RCS Loop 23 hot leg temperature fails high
Role Play	Acknowledge requests for I&C to troubleshoot	I&C will develop a troubleshooting plan
Event 2	Actuate Trigger 2: As SM tell team to commence rapid shutdown. (1 Hr S/D trip at 250MW)	Team will enter 2-AOP-FW-1 or 2- AOP-INST-1 due to 24 MFRV drifting closed. Team begins load reduction using AOP-RSD-1 on prompting from SM
Event 3	<i>Following rod motion actuate Trigger 3</i>	Rod P-6 ratchets in during rod motion IMF MAL-CRF002AV
Role Play	<p>Acknowledge requests for I&C to troubleshoot</p> <p>Acknowledge requests for Reactor Engineer assistance.</p>	<p>I&C will develop a troubleshooting plan Using "time compression" report back that I&C troubleshooting has discovered an open circuit on the movable gripper circuit for rod P-6.</p> <p>Reactor Engineer will report to CCR. Using "time compression" report back that RE has determined CCR should allow rod P-6 to ratchet the rest of the way into the core rather than attempting to retrieve it.</p>
Event 4	Actuate Trigger 4 At lead evaluator direction:	AOV-CVC030A LCV-459 will fail shut. Team will enter 2-AOP-CVCS-1 and respond to loss of letdown. Normal letdown will not be available and the team will place excess letdown in service.

Simulator Setup and Instructor Directions		
Setup/Event	INSTRUCTOR ACTIONS	EXPECTED RESPONSE/INSTRUCTOR CUES
Event 5	Actuate Trigger 5 At lead Evaluator direction	Steam Line Rupture Downstream of MSIVs. RCS Leak Outside of VC. Failure of automatic actuation of Safety Injection. Manual initiation required.
Role Play	When RO/CRS are checking SI flow in E-0 step 8. Nuclear NPO calls CCR to report:	"A large leak of steam is billowing up from the mezzanine area. I cannot get close due to steam"
Role Play	When NPOs dispatched:	Perform field actions as requested.

Op-Test No.: 1 Scenario No.: 2 Event No.: 1

Page 1 of 2

Event Description: Loop 23 Hot leg temperature fails high

Time	Position	Applicant's Actions or Behavior
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	BOP/ATC	<p>Diagnose failed instrument:</p> <p>High T-AVE 568F</p> <p>T AVE Deviation</p> <p>OVERPOWER Delta-T Channel Trip or Rod Stop</p> <p>OVERTEMP Delta-T Channel Trip or Rod Stop</p> <p>Delta-T Deviation</p> <p>T AVE T REF Deviation 5F</p> <p>T AVE Loop 3 reading higher than normal</p> <p>Rod Step Speed indicating 72</p>
	BOP	Refers to ARPs for alarms
	ATC	Place Rod control and Charging Pumps to manual
	CRS	Directs team to perform immediate operator actions of 2-AOP-INST-1
	ATC	Checks all instruments listed in 2-AOP-INST-1
	CRS	<p>Implements 2-AOP-INST-1</p> <ul style="list-style-type: none"> • Verifies no other instrument failures • Ensures actions have been taken to stabilize the plant • Refers to Tech Spec Table 3.3.1-1 <ul style="list-style-type: none"> ○ 72 hour AOT to trip bistables • Refers to Tech Spec Table 3.3.2-1 <ul style="list-style-type: none"> ○ 72 hour AOT to trip bistables • Directs tripping of bistables (may ask SM for direction)
Lead Evaluator		If the CRS asks the SM if bistables are to be tripped, a cue to trip bistables will be given.
	BOP	<p>Trips the following bistables:</p> <p>In Rack D-10 Switch T/412B to DEFEAT LOOP 3</p> <p>In Rack B-8 Switch T/411B to DEFEAT LOOP 3</p> <p>In Rack B-3 trip Loop 3 Overtemp trip, Overpwr Trip and Lo TAVG.</p>
	CRS/ATC	Return Rod control and Charging Pumps to AUTO

Lead Evaluator

Initiate Trigger 2. After team investigates inform them that a Rapid Shutdown is required due to 24 SG Feed Regulating Valve air line has been damaged by maintenance. Perform plant Shutdown in 2 hours.

Event Description: 24 MFRV drifts shut/Perform Rapid Shutdown

Time	Position	Examinee's Actions or Behavior
	ALL	Team enters 2-AOP-FW-1 or 2-AOP-INST-1 due to 24 MFRV failing closed.
	ATC	Takes manual control of 24 MFRV and attempts to open. The valve will continue to slowly close.
	ATC	Perform Immediate Operator Actions of 2-AOP-FW-1 checks both Main Boiler Feed Pumps running
	CRS	Determines a Valve Malfunction has occurred and transitions to correct section of procedure.
	ATC	Opens 24 FW bypass. Main Feed Reg Valve will stop closing and adequate feed flow is available using the low flow bypass and Feed Reg Valve.
	CRS ATC	Develop shutdown plan and reactivity plan.
	CRS	Supervise activities of the Team during rapid shutdown. <ul style="list-style-type: none"> ○ Performs a Team brief on shutdown plant. ○ Directs the RO to perform the reactivity plan. ○ Directs load reduction.
	ATC	Develops reactivity plan. <ul style="list-style-type: none"> ○ Borates the reactor. ○ Monitors critical parameters during load reduction.
	BOP	Performs actions as directed by the CRS during load reduction. <ul style="list-style-type: none"> ○ Peer checks reactivity manipulations (when personnel available). ○ Performs load reduction when directed by CRS.
	ATC CRS	When rod motion occurs, diagnoses rod P-6 is misaligned. (After event 3 actuated) <ul style="list-style-type: none"> ○ Discuss stopping the shutdown. ○ Stabilize the plant per AOP-RSD-1 Attachment 1.
	Lead Evaluator	Proceed to next event when the team diagnoses a misaligned control rod.

Event Description: Control Rod P-6 "ratchets in" during rod motion

Time	Position	Examinee's Actions or Behavior
Lead Evaluator		Rod P-6 has a failed moving gripper. <i>Alarm SF 2-7 Control Rod or Power Distribution Trouble.</i> <i>Alarm FC 2-4 NIS Power Range Channel Deviation 3%.</i> <i>Control Rod P-6 IRPI indicates lower than the rest of Control Bank D.</i> <i>PICS alarms for Rod to Bank deviation and Rod to Rod deviation.</i>
	CRS ATC	Diagnose Rod P-6 misaligned (dropped if rod motion not stopped).
	CRS	Implement AOP-ROD-1. Supervise the actions of the Team during AOP-ROD-1.
	CRS ATC	Perform AOP-ROD-1 actions: <ul style="list-style-type: none"> ○ Check if entry into the AOP was due to continuous unwarranted rod motion. ○ Go to section for Misaligned Rod. ○ Determine that the malfunction is clearly a misaligned rod. ○ Verify Rod Control is in manual and operate rods in manual as directed by CRS. ○ Direct I&C to investigate.
	CRS	Evaluate the following TS: <ul style="list-style-type: none"> 3.1.4 (Rod Group Alignment Limits). 3.2.3 (Axial Flux Difference (AFD)). 3.2.4 (Quadrant Power Tilt Ratio (QPTR)). (Cue from Reactor Engineer to allow rod to ratchet in during shutdown)
	ALL	Continue with AOP-RSD-1 Shutdown.
Lead Evaluator		At the discretion of the Lead Evaluator, direct the Booth Instructor to actuate trigger 4.

Event Description: LCV-459 fails shut

Time	Position	Examinee's Actions or Behavior
	ATC	Diagnose LCV-459 failing shut
	BOP	Perform ARPs for associated alarms <ul style="list-style-type: none"> ○ FBF 4-5 Low Charging flow ○ SFF 3-5 RCP Thermal Barrier Low Delta-P 0
	CRS	Direct actions of AOP-CVCS-1, "Loss of Charging or Letdown"
	CRS ATC BOP	Perform AOP-CVCS-1 actions as directed by CRS <ul style="list-style-type: none"> ○ Close 200A, B, C and LCV-459 ○ Verify a charging pump is running ○ Verify seal injection flow exists ○ When HCV-142 is fully closed then close 204A and 204B
	BOP	<ul style="list-style-type: none"> ○ Place excess letdown in service per Attachment 1 until Lead Evaluator desires to move to next event. ○ Open 796, 793/796 and 791/798 ○ Close HCV-123 ○ Place 215 in DIVERT ○ Open 213 ○ Slowly open HCV-123 ○ Slowly close HCV-123 when VCT level change observed ○ Place 215 in NORMAL ○ Open 222 ○ Slowly open HCV-123 to desired flow
	CRS	Monitor PRZR Level. If $\geq 65.1\%$, then evaluate ITS 3.4.9. Evaluate TRO 3.1.B.1.c) Boration Systems requirements.
	Lead Evaluator	Proceed to the next event at the discretion of the lead evaluator, direct the Booth Instructor to actuate trigger 5

Op-Test No.: 1 Scenario No.: 2 Event No.: 5

Page 1 of 1

Event Description: Steam Break down stream of 21 MSIV and Check Valve in the AUX Boiler Feed Pump Building

Time	Position	Examinee's Actions or Behavior
	CRS ATC	Diagnose Steam Leak.
	CRS ATC	Implement AOP-UC-1 Direct operators to perform the following: <ul style="list-style-type: none">○ Manually trip the reactor.○ Verify the reactor is tripped.
	BOP	○ Close MSIVs.
	CRS	○ Go to E-0.
Lead Evaluator		When the reactor trip breakers open the LOCA commences on the RHR piping in the PAB piping penetration. SI will fail to actuate. The team will perform E-0 and successfully isolate the leak in ECA-1.2

Event Description: LOCA outside containment in the PAB. SI fails to Auto actuate and RHR valve 746 will fail to auto open

Time	Position	Examinee's Actions or Behavior
	CRS	When Unit trips, direct team to perform immediate actions of E-0 <ul style="list-style-type: none"> • Verifies immediate actions using the procedure.
	ATC	Verifies Reactor Trip: <ul style="list-style-type: none"> • Reactor trip breakers open • Nuclear flux decreasing • Rod bottom lights lit • IRPIs < 12.5 inches Verify Turbine is tripped
	ATC	Verifies Turbine Trip by observing stop valves closed
	BOP	Check status of 480V buses
	ATC	Check SI status
Critical Task		<p>Manually actuate at least one train of SIS-actuated safeguards before any of the following:</p> <ul style="list-style-type: none"> ○ Transition to any E-1 series, E-2 series, or E-3 series procedure or transition to any FRP ○ Completion of step 5.a of ES-0.1
	BOP	<p>Perform E-0 immediate actions.</p> <p>Perform E-0 Attachment 1.</p> <ul style="list-style-type: none"> ○ Start a charging pump. ○ Dispatch NPO to reset lighting and MCCs 24A, 27A, 29A. ○ Stop Condensate Pumps. ○ Check automatic actions. ○ OPEN MOV-746 and 747.

Event Description: LOCA outside containment in the PAB. SI fails to Auto actuate and RHR valve 746 will fail to auto open

Time	Position	Examinee's Actions or Behavior
	BOP	Perform actions directed by CRS. <ul style="list-style-type: none"> ○ Dispatch NPO to align service water valves. ○ Start 25 SWP. ○ When RCS sub-cooling lowers, check RCP trip criteria and stop all RCPs. ○ SI Defeat switches to DEFEAT ○ Reset SI. ○ Diagnose abnormal PAB radiation due to LOCA outside containment.
Critical Task		When RCP trip criteria are met, trip all RCPs prior to completion of the first step in the EOP network that directs tripping RCPs.
	CRS	Evaluate plant conditions and diagnose LOCA outside containment.
	CRS	Transition to ECA-1.2 and supervise the actions of the Team to identify and isolate the leak.
	CRS ATC	Perform ECA-1.2 actions. <ul style="list-style-type: none"> ○ Verify SI reset.
	BOP	<ul style="list-style-type: none"> ○ Reset Phase A and B ○ Close RHR pump cold leg injection valves 746 and 747. ○ Observe rising RCS pressure.
	ATC	Diagnose LOCA outside containment has been isolated.
Critical Task		Isolate the LOCA outside of containment before transition out of ECA-1.2. (Team will close 746 and 747)
	CRS	Transition to E-1.
Lead Evaluator		Terminate scenario following transition to E-1, or at the discretion of the Lead Evaluator.

Post Scenario Event Classification

Event Classification - Site Area Emergency Alert

EAL 4.1.3 Inability to isolate any primary system discharging outside containment AND Radiological release to the environment exists as a result.

Turnover Information

Date/Time:	Today/Now
Condition:	Power Ops
% Power:	100%
Xenon:	Equilibrium
RCS Boron:	1234 ppm
PZR Press Control:	Channel 1
PZR Level Control:	Channel 2
RCS Total Leakage:	0.1 gpm
RCS Unidentified Leakage:	0.01 gpm
Condenser Air leakage	6 SCFM
RCS Gas activity	1.78E-2 $\mu\text{Ci/cc}$
Risk Assessment:	Yellow

Plant Equipment Status:

1. 21 Charging pump is out of service for troubleshooting. Scoop tube positioner erratic operation. 22 and 23 Charging pumps are protected.
2. 21 CCW pump is out of service to replace pump packing. 22 and 23 CCW Pumps are protected.

Instructions:

Maintain current 100% Steady State operations.

Facility: Indian Point Unit 2Task No: 0840220422Task Title: **Align 23 Charging Pump to 12FD3**K/A Reference: 000068AA1.06
RO-4.1 SRO-4.2Job Performance Measure
No: _____In Plant - 1

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	_____	Simulator	_____
		Plant	X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The CCR has been evacuated due to a fire and 2-AOP-SSD-1, Control Room Inaccessibility Safe Shutdown Control, has been implemented.
- Radio communications have been established and operators are standing by in the PAB.
- Sub-Station 12FD3 is energized.
- 480V Switchgear Room is accessible
- Instrument Air is available
- An NPO is standing by in the PAB

Task Standard: 23 Charging Pump is aligned to 12FD3 and running.

Required Materials: None

General References: 2-AOP-SSD-1, Control Room Inaccessibility Safe Shutdown

Initiating Cue: You are the BOP assisting the Conventional NPO and the SM has directed you to perform the required actions to Align 23 Charging Pump to its safe shutdown power supply per 2-AOP-SSD-1, Attachment 8 and Start 23 Charging Pump. **Simulate all actions**

Time Critical Task: No

Validation Time: 20 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure

Standard: Obtain 2-AOP-SSD-1

Comment: Cue: hand candidate Attachment 8 of 2-AOP-SSD-1.

During a control room evacuation the procedure is obtained from the App R locker in the CCR Foyer.

2. Performance Step: Is 480V Switchgear Room Accessible

Standard: Given in Initial Conditions that 480V Switchgear Room is accessible.

Comment:

3. Performance Step: If At Any Time 21 Charging Pump available to start from the 480V Switchgear Room and the SM desires THEN Go To Step 8.20.

Standard:

Comment: *CUE: The SM desires 23 Charging Pump placed in service on Alternate Safe Shutdown feed.*

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4. Performance Step: **Open breaker on bus 6A using trip button and Remove DC Control Power Fuse Block**

Standard: **Locate Breaker for 23 Charging Pump and depress TRIP button located on front of breaker. Simulate Opening the breaker door and describe removal of control power fuse block and re-install in OFF position.**

Comment: *CUE: Breaker is open and control power fuses pulled and reinstalled in OFF position.*

Fuse block is located in the upper right side of the cubicle. The fuse block is removed and rotated 180° then reinstalled in the OFF position.

5. Performance Step: Observe NOTES before step 8.4

Standard: Reviews the NOTES

Comment:

6. Performance Step: Is 12FD3 Sub-Station energized

Standard: Given in Initial Conditions 12FD3 is energized

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 7. Performance Step: Place "LOCAL-REMOTE Control Switch Device 69" for substation 12FD3 in LOCAL.

Standard: Locate Switch and simulate rotating switch to LOCAL

Comment: *CUE: The switch is in LOCAL.*

The switch is located in a control panel/box directly above CHARGING PUMP 23 Breaker Control Switch

8. Performance Step: Is Substation 12FD3 Breaker 1M Open

Standard: Determines Breaker is OPEN

Comment: The designator for the breaker switch 1M indicates that it is the MIDDLE switch (Top, Middle, Bottom)

9. Performance Step: Place Transfer Switch EDC4 to EMERGENCY FEED position

Standard: Contact NPO to place Transfer Switch EDC4 to Emergency Feed position

Comment: *CUE: NPO acknowledges. The switch is in EMERGENCY FEED.*

Performance Information

(Denote critical steps with a check mark ✓)

10. Performance Step: Is Instrument Air Available

Standard: Given in Initial Conditions Instrument Air is Available

Comment:

11. Performance Step: Open 288, RWST Manual Inlet Stop

Standard: Contact the NPO to Open 288

Comment: *CUE: NPO acknowledges and reports 288 is OPEN*

12. Performance Step: Close 297, Boric Acid Blender Outlet Stop

Standard: Contact the NPO to close 297

Comment: *CUE: NPO acknowledges and reports 297 is CLOSED*

✓ 13. Performance Step: **Unlock and place Substation 12FD3 Breaker 1M in the vertical position**

Standard: Unlock open cabinet door. Unlock breaker and rotate handle to vertical position.

Comment: *CUE: Breaker is in the vertical position*

Performance Information

(Denote critical steps with a check mark ✓)

✓ 14. **Performance Step: Close Substation 12FD3 Breaker 1M by operating the CLOSE/TRIP switch.**

Standard: **Locate switch in small cabinet on the side of 12FD3 and rotate to close position.**

Comment: *CUE: You hear the breaker close.*

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The CCR has been evacuated due to a fire and 2-AOP-SSD-1, Control Room Inaccessibility Safe Shutdown Control, has been implemented.
- Radio communications have been established and operators are standing by in the PAB.
- Sub-Station 12FD3 is energized.
- 480V Switchgear Room is accessible
- Instrument Air is available
- An NPO is standing by in the PAB

Initiating Cue:

You are the BOP assisting the Conventional NPO and the SM has directed you to perform the required actions to Align 23 Charging Pump to its safe shutdown power supply per 2-AOP-SSD-1, Attachment 8 and Start 23 Charging Pump. **Simulate all actions.**

Performance Information

(Denote critical steps with a check mark √)

1. Performance Step: Obtain Correct Procedure

Standard: Obtain 2-AOP-SSD-1

Comment: Cue: hand candidate Attachment 14 of 2-AOP-SSD-1.

During a control room evacuation the procedure is obtained from the App R locker in the CCR Foyer.

√ 2. Performance Step: **Close 734A SI/RHR Supply Header Stop**

Standard: **Locate valve and simulate rotating clockwise to close**

Comment: ***CUE: The Valve is CLOSED***

√ 3. Performance Step: **Close 734B SI/RHR Normal Outlet Stop**

Standard: **Locate valve and simulate rotating clockwise to close**

Comment: ***CUE: The Valve is CLOSED***

Performance Information

(Denote critical steps with a check mark ✓)

✓ **4. Performance Step:** Connect a hose between PW-115, PW to CCW Supply Telltale Drain Stop and MW-746 City Water Header Outlet Stop

Standard: Locate hose and valves and simulate connecting hose between the 2 valves.

Comment: *CUE: Hose is connected. NOTE: Hoses are located in App "R" cabinet near SI Pumps.*

SI PUMP ROOM – 59' Elevation						
Component	Step	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
Ladder *	4.2.1	N/A	1 Ladder	Ladder	YES / NO	
White Hose			3 Hoses	Hoses	YES / NO	
Spanner Wrench			1 Wrench	Wrench	YES / NO	
Flat Screwdriver			1 Screwdriver	Screwdriver	YES / NO	
Adj. Wrench			2 Wrenches	Wrenches	YES / NO	
¾" Comb. Wrench			1 Wrench	Wrench	YES / NO	
¾" Box Wrench			1 Wrench	Wrench	YES / NO	
5/8" Box Wrench			1 Wrench	Wrench	YES / NO	

* Ladder SHALL be chained and locked.

Above is the inventory list for equipment located in Appendix R cabinet in the SI Pump Room

✓ **5. Performance Step:** Connect a hose at 734F SI/RHR Pumps Emergency Cooling Outlet Stop and direct to a drain

Standard: Locate hose and valve. Connect hose and direct to a drain

Comment: *CUE: Hose is connected*

√ 6. Performance Step: **OPEN 734F SI/RHR Pumps Emergency Cooling Outlet Stop**

Standard: **Locate valve and simulate rotating counterclockwise to OPEN valve**

Comment: ***CUE: Valve is OPEN***

√ 7. Performance Step: **OPEN 734E SI/RHR Pumps Emergency Cooling Outlet Stop**

Standard: **Locate Valve and simulate rotating counterclockwise to OPEN valve**

Comment: ***CUE: Valve is OPEN***

8. Performance Step: **Is PW-114 PW and CCW Supply Isolation closed?**

Standard: **Locate valve and check valve closed**

Comment: ***CUE: The valve is closed.***

√ 9. Performance Step: **Open PW-115 PW to CCW Supply Telltale Drain Stop**

Standard: **Locate valve and simulate rotating counterclockwise to OPEN valve**

Comment: ***CUE Valve is OPEN***

√ 10. Performance Step: OPEN MW 746 City Water Header Outlet Stop

Standard: Locate Valve and simulate rotating counterclockwise to OPEN valve

Comment: *CUE Valve is OPEN*

√ 11. Performance Step: OPEN 733C SI/RHR Pump Primary Water Emergency Supply Stop

Standard: Locate Valve and simulate rotating counterclockwise to OPEN valve

Comment: *CUE Valve is OPEN. You hear water flowing.*

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The CCR has been evacuated due to a fire and 2-AOP-SSD-1, Control Room Inaccessibility Safe Shutdown Control has been implemented.
- CCW cooling is not available to the SI and RHR Pumps

Initiating Cue:

You are the ATC assisting the Nuclear NPO and the SM has directed you to establish backup cooling to the SI and RHR Pumps in accordance with 2-AOP-SSD-1 Attachment 14 steps 14.4 – 14.13.

Facility: Indian PointTask No: 0070010124Task Title: **Reduce Level in PRT**K/A Reference: 068000A402
RO – 3.2 SRO – 3.1Job Performance Measure
No: _____In Plant - 3

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	_____	Simulator	_____
		Plant	X

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- PRT level is 80%
- PRT Temperature is 125°F
- RCDT Pumps are NOT available

Task Standard: PRT Level restored to between 67 and 77%.

Required Materials: None

General References: 2-SOP-1.6 Pressurizer Relief Tank Operations

Initiating Cue: You are the Nuc Side NPO and the CRS has directed you to lower the PRT level to between 67 and 77% in accordance with 2-SOP-1.6 Pressurizer Relief Tank Operations

Time Critical Task: No

Validation Time: 15 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure

Standard: Obtains 2-SOP-1.6, Pressurizer Relief Tank Operations

Comment: *CUE: PRT Level is 80%*

2. Performance Step: Observe Caution prior to step 4.5.2.1

Standard: Reviews Caution
Observes VC Sump Level

Comment:

3. Performance Step: MONITOR VC Sump level AND RCDT level while draining the PRT to the VC Sump

Standard: Contact the CR for VC Sump Level and Observe RCDT Level indications

Comment: *CUE: CCR states VC Sump Level is 41 feet*

4. Performance Step: Observe NOTE prior to step 4.5.2.2

Standard: Review Note.

Comment: RCDT Pumps inoperable is given in Initial Conditions.

Performance Information

(Denote critical steps with a check mark ✓)

✓ **5. Performance Step: OPEN 523, PRT Outlet Valve (WDP).**

Standard: **Rotate Switch on Waste Disposal Panel to OPEN**

Comment: *CUE: RCDT level is not changing*

✓ **6. Performance Step: OPEN 1609, RCDT Drain to VC Sump**

Standard: **Rotate Switch on Waste Disposal Panel to OPEN**

Comment: *CUE: CCR states VC Sump Level is rising but it is within band*

7. Performance Step: **Observe PRT level lowering**

Standard:

Comment: *CUE: The PRT level is 74%*

✓ **8. Performance Step: CLOSE 1609, RCDT Drain to VC Sump**

Standard: **Rotate Switch on Waste Disposal Panel to CLOSE**

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ **9. Performance Step:** **CLOSE 523, PRT Outlet Valve**

Standard: **Rotate Switch on Waste Disposal Panel to
CLOSE/RCDT Auto Level Defeat**

Comment:

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- PRT level is 80%
- PRT Temperature is 125°F
- RCDT Pumps are NOT available

Initiating Cue:

You are the Nuc Side NPO and the CRS has directed you to lower the PRT level to between 67 and 77% in accordance with 2-SOP-1.6 Pressurizer Relief Tank Operations

Facility: Indian Point Unit 2Task No: 0040170101Task Title: **Align CVCS Makeup after Chemistry Sample**K/A Reference: 004000A4.07Job Performance Measure No: Sim 1

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u> X </u>	Actual Performance	<u> </u>
Classroom	<u> </u>	Simulator	<u> X </u>
		Plant	<u> </u>

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The plant is operating near End of Life.
- A power reduction was required.
- Following the power reduction the watch Chemist reports that current RCS Boron concentration is 430 ppm
- 21 and 22 BAST boron concentrations are 12 w/o

Task Standard: Proper boric acid flow rate is determined for 90 gpm makeup; the controllers are properly set for current boron concentration and 90 gpm makeup capability.

Required Materials: None

General References: Graphs Book (CVCS section) CVCS-1A
 2-SOP-3.2, RCS Boron Concentration Control

Initiating Cue: You are the ATC and the CRS has directed you to adjust makeup controls for a 90 gpm blend to match the current chemistry sample boron concentration and perform a manual makeup of approximately 200 gallons.

Time Critical Task: NO

Validation Time: 15 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure and Review Precautions and Limitation

Standard: Obtains 2-SOP-3.2 Reactor Coolant System Boron Concentration Control

Comment: Procedure Section Manual Makeup Section 4.2

2. Performance Step: IF makeup is NOT aligned for automatic makeup OR it is desired to adjust blend THEN REFER TO section 4.1 and PERFORM steps 4.1.1 through 4.1.8

Standard: Refers to section 4.1

Comment: Procedure Section Automatic Makeup Section 4.1

3. Performance Step: Determine RCS Boron Concentration

Standard: Current Boron Concentration is 430 ppm Given in Initial Conditions

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

4. Performance Step: Verify both Boric Acid Transfer Pump speed selector switches are in SLOW

Standard: Observes pump speed switches selected to SLOW

Comment:

5. Performance Step: Verify in-service Boric Acid Transfer Pump in AUTO

Standard: Observes pump switches selected to AUTO

Comment:

6 Performance Step: Verify on Primary Water (PW) pumps is running

Standard: Observes 21 PW pump running

Comment:

7. Performance Step: Verify FIC-110 Boric Acid Flow Control in AUTO

Standard: Observes controller selected to AUTO

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 8. **Performance Step:** Adjust FIC-110, Boric Acid Flow Control, auto setpoint to match blender output Boron concentration to that existing in Reactor Coolant. (refer to CVCS section in Graphs Book)

Standard: Using Graph CVCS-1C/D determine the automatic setpoint for FIC is 1.825 ± 0.025 gallons per minute flow. Adjust potentiometer to $18.2 \pm$ one division on dial

Comment: The automatic controller for Boric Acid flow is a 0 to 10 gpm controller. A setting of 18.2 on the controller will yield approximately 1.82 gpm boric acid flow

9. **Performance Step:** IF required blended makeup boron concentration is greater than 1700 ppm THEN perform the following, as appropriate:

Standard: Desired boron concentration is < 1700 ppm. This step is NOT APPLICABLE

Comment:

Performance Information

(Denote critical steps with a check mark √)

10. Performance Step: IF desired to maximize boron flow, THEN close the appropriate B ATP recirculation valve.

Standard: Maximizing boron flow is NOT desired. This step is NOT APPLCABLE

Comment:

11. Performance Step: IF manual blended makeup is being used to borate or dilute, THEN PLACE FIC-110, Boric Acid Flow Control AND/OR FIC-111, Demin Water Flow Control to position as determined by CRS.

Standard: Boration or Dilution is NOT desired. This step is NOT APPLCABLE

Comment:

√ 12. Performance Step: Place RCS Makeup Control switch to Stop

Standard: Rotate RCS Makeup Mode Selector switch to Stop

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 13. Performance Step: Place RCS Makeup Mode Selector switch to MANUAL

Standard: Rotate RCS Makeup Mode Selector switch to Stop

Comment:

✓ 14. Performance Step: Place RCS Makeup Control Switch to START

Standard: Rotate Makeup Control Switch to START

Comment:

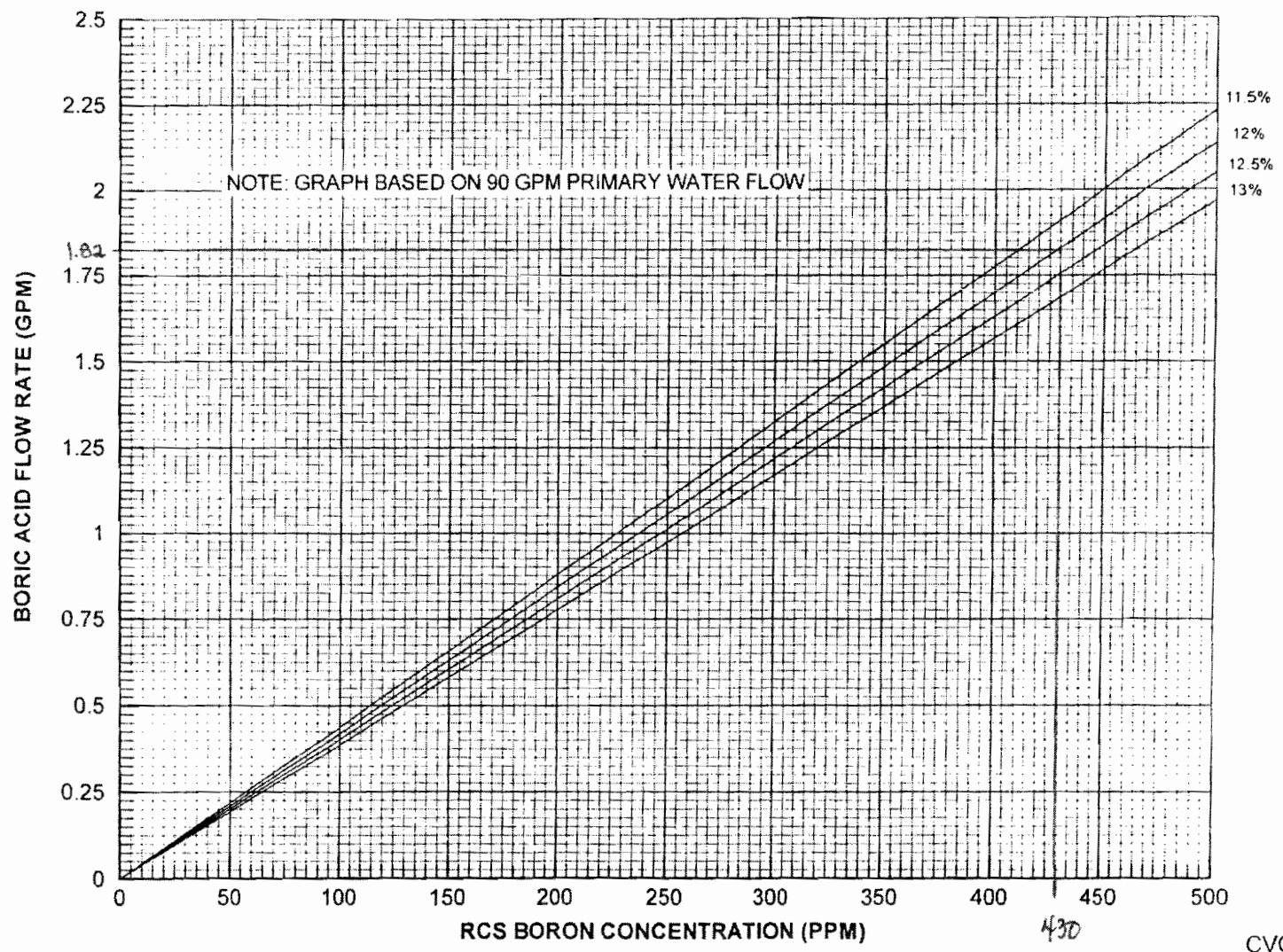
15. Performance Step: Verify Boric Acid and Primary Water flow rates are correct

Standard: Adjust potentiometers as necessary to achieve proper flow rates

Comment:

Terminating Cue: When adequate makeup flow has been observed, the evaluator can CUE: JPM Complete

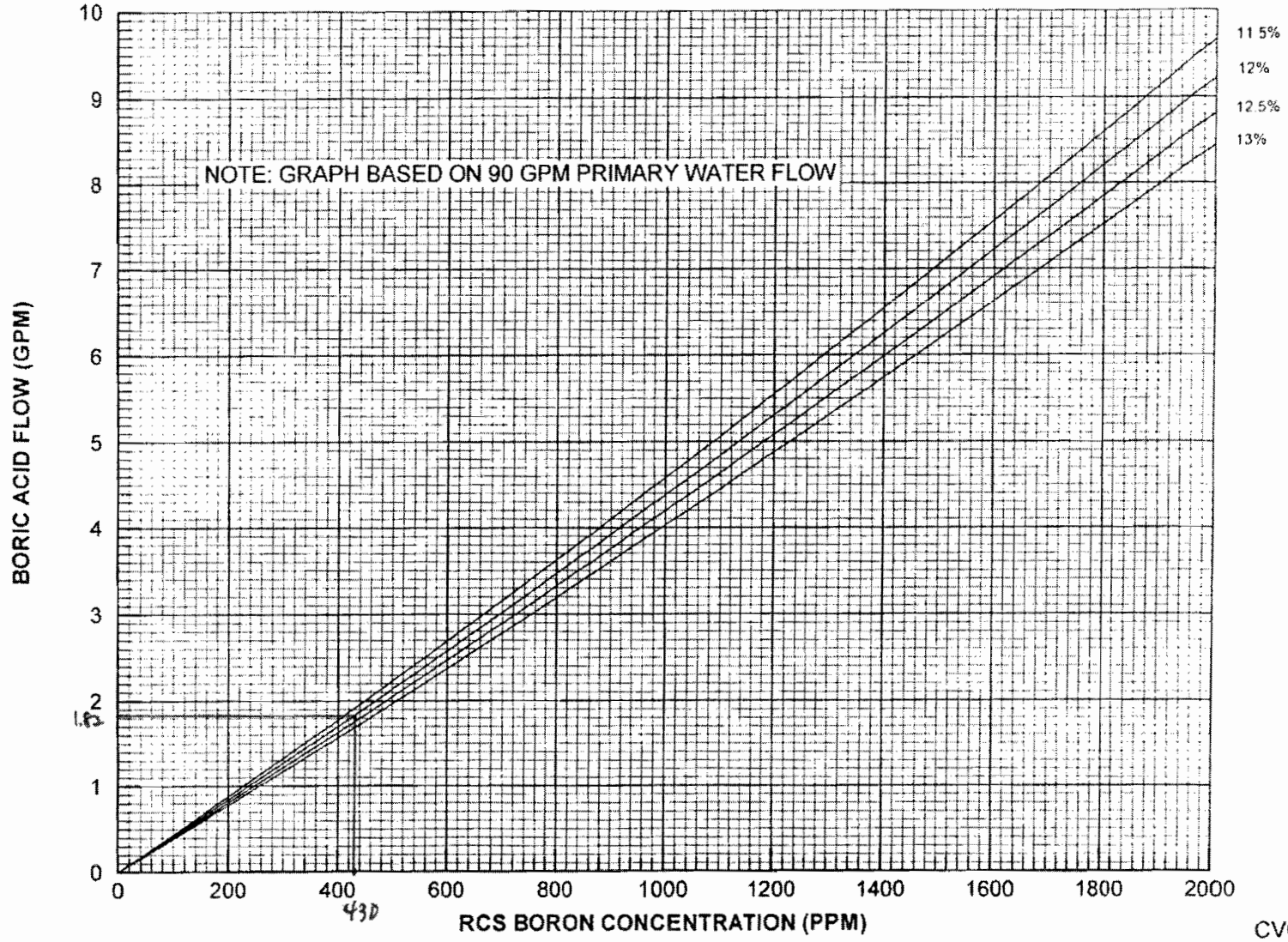
INDIAN POINT STATION UNIT NO. 2 REACTOR COOLANT SYSTEM BLENDED MAKEUP



430

CVCS-1
Rev. 0

INDIAN POINT STATION
UNIT NO. 2
REACTOR COOLANT SYSTEM BLENDED MAKEUP



CVCS-1
Rev. 0

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

This JPM can be performed from any plant condition.

Ensure the Automatic setpoint for controller FCV-110 is set for < 10 (1 gpm).

Initial Conditions:

- The plant is operating near End of Life.
- A power reduction was required.
- Following the power reduction the watch Chemist reports that current RCS Boron concentration is 430 ppm
- 21 and 22 BAST boron concentrations are 12 w/o

Initiating Cue:

You are the ATC and the CRS has directed you to adjust makeup controls for a 90 gpm blend to match the current chemistry sample boron concentration and perform a manual makeup of approximately 200 gallons.

Facility: Indian Point Unit 2 Task No: 0000420501Task Title: **Transfer to Hot Leg Recirculation**K/A Reference: 000011EA1.13 Job Performance Measure No: SIM-2

Examinee: _____ NRC Examiner: _____

Facility Evaluator: _____ Date: _____

Method of testing:

Simulated Performance	X	Actual Performance
Classroom	Simulator	Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- A Large Break LOCA occurred approximately 6.5 hours ago.
- The operating crew properly aligned Cold Leg Recirculation per 2-ES-1.3 Transfer to Cold Leg Recirculation using 21 and 22 Recirculation Pumps.
- FSB Ventilation has been previously shutdown

Task Standard: The Safety Injection System is aligned for Hot Leg Recirculation .

Required Materials: None

General References: 2-ES-1.4, Transfer to Hot Leg Recirculation

Initiating Cue: You are the BOP and the CRS has directed you to align the Safety Injection System for Hot Leg Recirculation.

Time Critical Task: No

Validation Time: 20 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure
Standard: Obtains 2-ES-1.4 Transfer to Hot Leg Recirculation
Comment:

2. Performance Step: Check Low Head Recirculation Flow Indicated
Standard: Observes Flow indicated on FI 946 A-D on Panel SBF-2
Comment:

3. Performance Step: Check if FSB Ventilation previously shutdown
Standard: Given in Initial Conditions FSB Ventilation is Shutdown
Comment:

✓ 4. Performance Step: Close Cold Leg Injection Valve
Standard: Locate and rotate switch to close for either MOV 856A or 856E on Panel SBF-2
Comment:

Performance Information

(Denote critical steps with a check mark √)

√ 5. Performance Step: Open Hot Leg Injection Valve to Loop 23

Standard: Locate and rotate switch for MOV-856B on Panel SBF-2

Comment:

√ 6. Performance Step: Close Cold Leg Injection Valve

Standard: Locate and rotate switch to close for either MOV 856C or 856D on Panel SBF-2

Comment:

√ 7. Performance Step: Open Hot Leg Injection Valve to Loop 21

Standard: Locate and rotate switch for MOV-856F on Panel SBF-2

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step: Check Recirculation System Alignment

Standard: Locate indications for MOV 746 and 747 on Panel SBF-1 or SGF and observe one closed

Observe Safety Injection Recirc Switch 6 is OFF on Panel SBF-1

Comment:

✓ 9. Performance Step: **Check System Alignment for Starting SI Pumps**

Standard: Locates and Observes 21 and 22 Recirculation Pump Running on SBF-1

Place 21 OR 22 Recirculation Pump in trip pullout

Locates and Observes SI Pump Miniflow valves MOV-842 and 843 closed on SBF-1

Locate and rotate switch for MOV-888A & 888B to OPEN on SBF-1

Locate and place toggle switch for SI Pump Low Suction Pressure Alarm to ON on SBF-1

Locate and Observe Recirculation Switch 7 in ON on SBF-1

Place Recirculation Switch 7 to OFF on SBF-1

Comment: Only the steps for placing recirc pump in trip pullout opening MOV-888A/B and recirculation switch 7 are critical for this step.

Performance Information

(Denote critical steps with a check mark ✓)

10. Performance Step: Check SI Suction Pressure > 75 psig

Standard: Locate and observe SI Pump Suction Pressure Indicator PI-947 > 75 psig on Panel SBF-2

Comment: Candidate may also observe SI Pump Suction Low Pressure Alarm CLEAR on Panel SBF-1

11. Performance Step: Observe Caution before Step 10

Standard: Caution is Not Applicable for this condition.

Comment:

12. Performance Step: Start 23 SI Pump

Standard: Attempt start 23 Safety Injection Pump. The Pump will trip on overcurrent when start is attempted.

Comment: Alternate Path actions are listed in the next step.

Performance Information

(Denote critical steps with a check mark √)

√ 13. Performance Step: Alternate Path Actions for failure of 23 SIP to start**Standard:**

Place 21 Containment Spray Pump in Pullout (Not Critical)

Place 22 SI Pump in PULLOUT On Panel SBF-2
NOTE: There are 2 breaker switches for 22 SI Pump that must be placed in PULLOUT.

Place Recirc Switch 1 to OFF on Panel SBF-1

Open 22 SI Pump Suction Valves 887A and 887B on Panel SBF-2

Verify MOV-851B Open AND 851A closed on Panel SBF-2

Rotate control switch for 851A to close

Start 22 SI Pump on Panel SBF-2

Comment:**√ 14. Performance Step: Verify 746 and 747 CLOSED****Standard:**

Locate indications for MOV 746 and 747 on Panel SBF-1 or SGF and observe one valve closed. Rotate switch for Opened valve to CLOSE on Panel SGF-1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

15. Performance Step: Check SI Pump Suction Pressure Greater than 75 psig

Standard: Locate and observe SI Pump Suction Pressure Indicator PI-947 > 75 psig on Panel SBF-2

Comment: Candidate may also observe SI Pump Suction Low Pressure Alarm CLEAR on Panel SBF-1

16. Performance Step: Observe Caution before Step 13

Standard: Caution is Not Applicable for this condition.

Comment:

✓ 17. Performance Step: Start 21 SI Pump

Standard: Locate and Observe Bus 5A is Energized by OFF SITE POWER

Locate and rotate switch for 21 Safety Injection Pump to START on Panel SBF-2.

Comment:

Performance Information

(Denote critical steps with a check mark √)

18. Performance Step: Verify Adequate Recirculation Flow

Standard: Observe Core Exit Thermocouples Stable or
Decreasing on QSPDS

Comment:

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initialize Simulator to any 100% Power IC

Insert Malfunction MAL-RCS001A Rupture 21 Loop Cold Leg

Perform Actions of E-0, E-1 and ES-1.3 when conditions require.

Insert Malfunction MOT-SIS004A Overcurrent Trip 22 SIP after transfer to cold leg recirc complete.

Initial Conditions:

- A Large Break LOCA occurred approximately 6.5 hours ago.
- The operating crew properly aligned Cold Leg Recirculation per 2-ES-1.3 Transfer to Cold Leg Recirculation using 21 and 22 Recirculation Pumps.
- FSB Ventilation has been previously shutdown

Initiating Cue:

You are the BOP and the CRS has directed you to align the Safety Injection System for Hot Leg Recirculation.

Facility: Indian Point Unit 2Task No: 0000150501Task Title: **Depressurize RCS during Natural Circ to Block Low Pressure SI**K/A Reference: WE09EA1.1Job Performance Measure No: Sim-3

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u>X</u>	Actual Performance	_____
Classroom	_____	Simulator	<u>X</u>
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- A Unit Trip occurred coincident with a loss of off site power.
- All 480 V buses are energized from the Emergency Diesel Generators.
- All actions of E-0, Reactor Trip or Safety Injection and ES-0.1, Reactor Trip Response have been completed.
- The RCS has been borated to the Cold Shutdown Boron Concentration.
- An RCS Cooldown has been established at approximately 24°F/hr.
- RCS Temperature is approximately 540°F.
- The Shift Manager has determined that a Natural Circulation Cooldown will be performed.
- A spare operator is controlling cooldown rate.

Task Standard: RCS Pressure is stable at approximately 1890 psig.
Low Pressure SI is blocked

Required Materials:

General References: 2-ES-0.2, Natural Circulation Cooldown
2-SOP-1.4, Pressurizer Pressure Control

Initiating Cue: You are the ATC and the CRS has directed you to
Depressurize the RCS and Block Low Pressure SI.

Time Critical Task: No

Validation Time: 20 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain a copy of ES-0.2

Standard: Obtains copy of ES-0.2 and reviews actions up to step 7

Comment:

2. Performance Step: Depressurize RCS to 1890 psig (Step 8 of ES-0.2)

Standard: The sub steps to accomplish this are listed below steps 3-5.

Comment: Charging flow cannot be established (Seal injection is in service) which will prevent establishing < 320°F differential temperature between aux spray and the PRZR.

3. Performance Step: Check Letdown in service

Standard: Observes Letdown flow is 0 gpm on Panel FBF
Go To 2-SOP-3.1, Charging, Seal Water, and
Letdown Control, section 4.12 to Establish or Restore
Letdown Flow

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

4. Performance Step: Verify a charging pump is in service

Standard: Observes 21 Charging Pump is in service on Panel FBF

Comment:

5. Performance Step: Verify HCV-142, Charging Line Flow Controller is Throttled Open as directed by the CRS (default of 50%)

Standard: Rotate potentiometer to 50% on Panel SFF
Candidate should observe that Charging flow does not change. Candidate may also check Seal Injection flow did not change.

These are indications that HCV-142 is failed shut.

Candidate MAY return to 2-ES-0.2 because letdown cannot be placed in service without charging flow and GO TO step 9.

Comment: If candidate asks the CRS for desired position of HCV-142, CUE:
Set HCV-142 to 50%.

Performance Information

(Denote critical steps with a check mark ✓)

6. Performance Step: Verify 204B, Loop 21 Cold Leg Normal (now alternate) Charging Stop, is open to establish charging flow.

Standard: Observes 204B is Open on Panel SFF

Comment:

7. Performance Step: Verify Letdown Orifice Stops Closed

Standard: Observes 200A, 200B, 200C are Closed on Panel FBF

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step:	Verify Valves are aligned in preparation for establishing letdown
Standard:	Observes Letdown Flow Control Valves 200 ABC Switch in Remote on Panel SNF Observes 201 and 202 Letdown Isolation Valves Open on Panel SNF OR SFF
Comment:	

9. Performance Step:	Refer to the following table and control charging flow based on orifices to be used.
Standard:	Attempt to rotate HCV-142 potentiometer (Panel SFF) or Charging Pump Speed (Panel FBF) to raise charging flow. Candidate will not be able to establish charging flow. If candidate has not previously returned to ES-0.2 due to inability to establish charging flow, he/she should transition back now.
Comment:	If asked CUE 75 gpm letdown is desired.

Performance Information

(Denote critical steps with a check mark ✓)

✓ 10. Performance Step: Use One PORV (to depressurize to 1890 psig)

Standard: Open One PORV Motor Operated Block Valve
Open One PORV
Observe PRZR Pressure decreasing

Comment: Alternate Path Actions

✓ 11. Performance Step: Block Low Pressure SI

Standard: Observe LO PRESS PERMISSIVE TO BLOCK S.I.
light illuminated
**Rotate BOTH SAFETY INJECTION BLOCK 1940
PSIG Switches to Block position**
Observe CH. A and CH. B light illuminated

Comment:

12. Performance Step: Maintain Following RCS Conditions

Standard: RCS Pressure 1890
PRZR Level 37% to 71%
Cooldown Rate < 25°F/hr
RCS Temp and Press within limits of Figure 1 ES02-1

Comment:

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Reset the simulator to any 100% power IC.

Insert Malfunctions:

MAL-EPS001

MAL-EPS-002

CHV-CVC006B to 0

Perform actions of E-0 and ES-0.1

Initial Conditions:

- A Unit Trip occurred coincident with a loss of off site power.
- All 480 V buses are energized from the Emergency Diesel Generators.
- All actions of E-0, Reactor Trip or Safety Injection and ES-0.1, Reactor Trip Response have been completed.
- The RCS has been borated to the Cold Shutdown Boron Concentration.
- An RCS Cooldown has been established at approximately 24°F/hr.
- RCS Temperature is approximately 540°F.
- The Shift Manager has determined that a Natural Circulation Cooldown will be performed.
- A spare operator is controlling cooldown rate.

Initiating Cue:

You are the ATC and the CRS has directed you to Depressurize the RCS and Block Low Pressure SI.

Facility: Indian Point Unit 2Task No: 0810070401Task Title: **Energize a 480V Bus from Appendix R/SBO Diesel Generator**K/A Reference: 000055A106
RO- 4.1 SRO-4.5Job Performance Measure No: Sim-4

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u>X</u>	Actual Performance	
Classroom	_____	Simulator	<u>X</u>
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- A Loss of All AC Power concurrent with SI has occurred
- The crew is responding in accordance with ECA-0.0
- The Appendix R Diesel Generator has been started and power is available up to 52GT26

Task Standard: Bus 3A is re-energized.

Required Materials: None.

General References: 2-SOP-27.6 Attachment 4

Initiating Cue: You are the BOP and the CRS has directed you to restore power to bus 3A using the Appendix R/SBO Diesel Generator in accordance with 2-SOP-27.6 Attachment 4.

Time Critical Task: No

Validation Time: 25 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain current copy of 2-SOP-27.6, Unit 2 Appendix R Diesel Generator Operation Attachment 4

Standard: Obtains current copy of the procedure

Comment:

✓ 2. Performance Step: **Verify the following breakers are OPEN**

Standard: **Place the switches for 52GT25 and 52GT26 in Pullout (Panel SHF)**

Comment:

3. Performance Step: Observe Caution before step 1.2

Standard: Candidate reviews Caution

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4 Performance Step: Verify the following breakers are OPEN

Standard: Rotates the switches for the following breakers to Pullout (Panel SHF)

- ST6
- SS6
- UT3
- UT3-ST6
- UT4-ST6
- 3AT6A
- 2AT3A

Comment:

5. Performance Step: SET the flags to Green for all 6.9KV Bus 6 and 3 load Breakers

Standard: Place the following 6900 kV load breakers in OFF and return to auto

- 23 RCP (Panel SAF)
- 21 Heater Drain Tank Pump (Panel SCF)
- 22 Circulating Water Pump (Panel SJF)
- 26 Circulating Water Pump (Panel SJF)
- River Water Normal Feed (SHF)

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ **6. Performance Step: IF Energizing 480V Bus 3A THEN verify the following breakers are OPEN**

Standard: Place the switches for the following breakers in Pullout (Panel SHF)

- **52SS3**
- **52/3A**
- **52EG-2B (Labeled EG-2B)**

Comment:

✓ **7. Performance Step: Place all 480V Bus 3A Loads in PULLOUT**

Standard: Places the switches for the following components in PULLOUT

- **22 Service Water Pump (Panel SJF)**
- **25 Service Water Pump(Panel SJF)**
- **21 PZR BU Heaters (Panel FBF) NOT Critical (Switch to OFF not Pull Out)**
- **21 AFW Pump (Panel SCF)**
- **24 Fan Cooler Unit(Panel SBF2)**
- **22 SI Pump (Panel SBF2)**
- **21 RHR Pump (Panel SGF)**
- **22 Charging Pump (Panel FBF) NOT Critical**
- **22 Lighting Transformer (Contact NPO) NOT Critical**

Comment: CUE: Acknowledge direction to check breaker position

Non-Critical elements above are components that will NOT automatically re-start when the bus is re-energized.

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step: Direct the NPO to Remove Control fuses for 52/3A

Standard: Contact the NPO and direct fuses be removed

Comment: CUE: NPO acknowledges and reports "Fuses have been removed"

Booth Operator insert LOA EOP099 Remove Fuses

9. Performance Step: Direct the NPO to close 52/3A in the 480 Volt Room

Standard: Contact the NPO and direct closure of the breaker

Comment: CUE: NPO acknowledges and reports "Breaker is closed"

Booth Operator insert LOA EPS004 to mechanically close breaker

✓ 10. Performance Step: Place the CCR switch for 52/3A in CLOSE (red flag) position

Standard: Rotates switch for 52/3A to close (panel SHF)

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 11. **Performance Step: When the Appendix R Diesel Operator has power up to 52GT26 and is ready to load the diesel THEN Close 52GT26**

Standard: Power to 52GT26 was given in the Initial Conditions
Rotates switch for 52GT26 to close (panel SHF)

Comment:

✓ 12. **Performance Step: PLACE 6900V Bus 3 Synchroscope switch in BUS 3 - BUS 6**

Standard: Rotates switch to the Bus 3 – Bus 6 position
(Panels SHF)

Comment:

✓ 13. **Performance Step: CLOSE Bus 3 6 Tie Breaker 52UT3-ST6**

Standard: Rotates switch for 52UT3-ST6 to close positions
(Panel SHF)

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

14. Performance Step: PLACE 6900V Bus 3 Synchroscope switch in OFF

Standard: Rotates switch to OFF

Comment:

✓ 15. Performance Step: **CLOSE 52SS3, Sta Service Trans 3 Supply Breaker**

Standard: Rotate switch for 52SS3 to CLOSE position

Comment:

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Reset Simulator to IC for this JPM

Initial Conditions:

- A Loss of All AC Power concurrent with SI has occurred
- The crew is responding in accordance with ECA-0.0
- The Appendix R Diesel Generator has been started and power is available up to 52GT26

Initiating Cue:

You are the BOP and the CRS has directed you to restore power to bus 3A using the Appendix R/SBO Diesel Generator in accordance with 2-SOP-27.6 Attachment 4.

Facility: Indian Point Unit 2Task No: 0350010401Task Title: **Respond to 22 SG "B" Level Channel failure High**K/A Reference: 059000A4.08Job Performance Measure No: Sim-5

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u>X</u>	Actual Performance	_____
Classroom	_____	Simulator	<u>X</u>
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- Reactor at indicated power.
- Steady State, equilibrium Xenon.
- No equipment out of service.

Task Standard: Plant stabilized, failed channel removed from service.

Required Materials:

General References: 2-AOP-INST-1, Instrument or Controller Failures

Initiating Cue: You are the ATC.

Time Critical Task: No

Validation Time: 25 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

✓ 1. Performance Step: **Operator takes Immediate Actions from memory (steps 3.1-3.3)**

Note: Immediate actions of 2-AOP-INST-1

Standard:

1. Checks all parameters listed and determines that 22 S/G Level Channel (427B) is failed high.
2. Verify 22 S/G level control is affected
- 3. Place 22 FW Reg Valve in MANUAL.**
- 4. Take manual actions as necessary to control parameters and stabilize the plant.**
5. Assures all control systems listed in step 3.1 are checked.

Comment: Note: Placing 22 Feedwater Reg Valve in Manual and stabilizing plant are critical

2. Performance Step: Has an instrument failure occurred?

Standard: Operator determines that 22 SG Level 427B has failed high

Comment: The purpose of this step is to distinguish between an instrument failure and a controller failure

3. Performance Step: Go To the applicable step for the indicated failure

Standard: Candidate determines Step 4.22 is correct

Comment: This step is normally "peer checked" the candidate may request a peer check. If so, CUE: "I agree" with whatever step the candidate selects.

Performance Information

(Denote critical steps with a check mark ✓)

4. Performance Step: Has Channel "B" failed

Standard: Candidate determines that Channel "B" has failed.

Comment:

✓ 5. Performance Step: **Manually control affected SG Feed Regulating Valve as necessary to maintain SG level**

Standard: Make periodic adjustments on 22 SG Feed Reg Valve to maintain SG level.

Comment:

6. Performance Step: Refer to the following Tech Specs for required actions

Standard: Candidate should verbalize Tech Spec reference.

Comment: *CUE: The STA will refer to Tech Specs.*

7. Performance Step: Review NOTES prior to step 4.25

Standard: Candidate reviews NOTES prior to step

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step: If At Any Time (IAAT) SM/CRS determines and bistables listed on Attachment 1 should be tripped, THEN trip bistables as directed by SM/CRS

Standard:

Comment: *CUE: The SM has determined that all necessary bistables will be tripped.*

✓ 9. Performance Step: Trip Bistables

Standard: Place bistable trip switches for 427B in tripped (UP) position in Protection Rack B-2

- LC-427E Loop 2B High Level
- LC-427F Loop 2B Low Level
- LC-427A-2 Loop 2B AMSAC Low Level

Comment: The candidate should verify that no other bistables are tripped for 22 SG to ensure that tripping the bistables will not cause a reactor trip. The bistable status panel is on Panel SOF. The candidate should verify that the bistable status lights are lit on Panel SOF after the bistables are tripped.

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

This JPM can be run from any 100% power IC

Insert Malfunction XMT-SGN018A 100%, 0 delay, 0 ramp.

Initial Conditions:

- Reactor at indicated power.
- Steady State, equilibrium Xenon.
- No equipment out of service.

Initiating Cue:

You are the ATC.

Facility: Indian Point Unit 2Task No: 0000460501Task Title: **Isolate a Faulted SG with CST Level < 2 feet.**K/A Reference: 000040A110
RO-4.1 SRO-4.1Job Performance Measure No: Sim-6

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	_____	Simulator	X
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- An airliner crashed a short time ago that resulted in a Safety Injection
- All required actions of E-0 have been completed with a transition to E-2, Faulted Steam Generator Isolation

Task Standard: 21 SG isolated in accordance with E-2 with AFW aligned to city water.

Required Materials: None

General References: 2-E-2

Initiating Cue: You are the BOP and the CRS has directed you to Identify and Isolate the Faulted Steam Generator in accordance with E-2, Faulted Steam Generator starting at step 1 up to checking Secondary Radiation.

Time Critical Task: No

Validation Time: 15 minutes

Performance Information

(Denote critical steps with a check mark √)

1. Performance Step: Obtain current copy of 2-E-2

Standard: Obtains current copy of procedure

Comment:

2. Performance Step: Review Cautions prior to Step 1

Standard: Candidate reviews cautions

Comment:

3. Performance Step: Check MSIVs Closed

Standard: Observes MSIVs closed on Panel SBF-1

Comment:

4. Performance Step: Check if any SG Secondary Pressure Boundary is Intact

Standard: Observes 22, 23, and 24 SG Pressures are Stable on Panel FBF

Comment:

Performance Information

(Denote critical steps with a check mark √)

5. Performance Step: Review caution prior to step 3

Standard: Candidate reviews caution

Comment:

√ 6. Performance Step: Identify Faulted SG

Standard: Observes 21 SG Pressure Decreasing in uncontrolled manner or completely depressurized on Panel FBF

Comment:

7 Performance Step: Review caution prior to step 4

Standard: Candidate reviews caution

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step: Isolate Main Feed Line

Standard: Verify 22 SG Main & Low Flow Feed Reg Valves
Closed On Panel FBF and SNF
OR
Motor Operated Isolation Valves BFD 5-1 and BFD 90-
1 on Panel SCF

Comment:

✓ 9. Performance Step: Isolate AFW Flow

Standard: Take controller switch to manual and Close 21 SG
AFW Regulating Valve on Panel SCF

Comment:

10. Performance Step: Verify SG Blowdown Valves Closed

Standard: Check both B/D Valves for 21 SG Closed on Panel
SCF

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

11. Performance Step: Direct the NPO to locally isolate 21 SG Upstream Traps and verify MSIV bypass closed

Standard: Contact NPO and direct closure of upstream traps and verification MSIV bypass is closed for 21 SG

Comment: CUE: Acknowledge as NPO

12. Performance Step: Check CST Level Greater than 2 feet.

Standard: Observes CST level is less than 2 feet on Panel SCF

Comment:

13. Performance Step: Open City Water Header Isolation Valve

Standard: Locates and rotates switch for FCV-1205A to OPEN on Panel SCF

Comment:

√ 14. Performance Step: Open AFW pump Suction valves

Standard: Locates and rotates switches for 1187, 1188, 1189 to OPEN on Panel SCF

Comment: Valve 1188 is NOT critical. 22 AFW pump is not supplying water to the SGs and thus is NOT NECESSARY. Candidate may or may not open the valve.

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Reset Simulator to IC snapshot for this JPM

Verify CST level is < 2 feet

To Drain the CST insert FLX-CMU001 to 100%. This will take approximately 1 hour to drain the CST.

Initial Conditions:

- An airliner crashed a short time ago that resulted in a Safety Injection
- All required actions of E-0 have been completed with a transition to E-2, Faulted Steam Generator Isolation

Initiating Cue:

You are the BOP and the CRS has directed you to Identify and Isolate the Faulted Steam Generator in accordance with E-2, Faulted Steam Generator up to checking Secondary Radiation

Validation Time: 15 Minutes

Performance Information

(Denote critical steps with a check mark √)

1. Performance Step: Obtain correct procedure

Standard: Obtains 2-FR-C.1

Comment: *CUE: Hand candidate 2-FR-C.1*

2. Performance Step: Check if RCPs Should be Started

Standard: Sub Steps Below Steps 3 - 4

Comment:

3. Performance Step: Check Core Exit Thermocouples GREATER THAN 1200°F

Standard: Observes CETs > 1200°F

Comment:

Performance Information

(Denote critical steps with a check mark √)

4. Performance Step: Check if an idle RCS cooling loop is available

Standard: Observe Narrow Range SG Level GREATER THAN 27%
RCP in associated loop available and not running

Comment:

√ 5. Performance Step: **Place RCP BEARING LIFT PERMISSIVE BYPASS key switch in bypass located on the rear of SA Panel**

Standard: **Enter the Supervisory Panel and locate the key switches (near the floor) and place selected RCP switch in bypass**

Comment:

√ 6. Performance Step: **Start one RCP**

Standard: **Rotate RCP Switch to Start Position**

Comment: ***CUE: If requested direct candidate to start 24 RCP***

Performance Information

(Denote critical steps with a check mark ✓)

7. Performance Step: Check Core Exit Thermocouples GREATER THAN 1200°F

Standard: Observes CETs > 1200°F

Comment:

8. Performance Step: Check if an idle RCS cooling loop is available

Standard: Observe Narrow Range SG Level GREATER THAN 27%
RCP in associated loop available and not running

Comment:

✓ 9. Performance Step: Place RCP BEARING LIFT PERMISSIVE BYPASS key switch in bypass located on the rear of SA Panel

Standard: Enter the Supervisory Panel and locate the key switches (near the floor) and place selected RCP switch in bypass

Comment:

Performance Information

(Denote critical steps with a check mark √)

√ 10. Performance Step: Start one RCP

Standard: Rotate RCP Switch to Start Position

Comment: CUE: If requested direct candidate to start 23 RCP

11. Performance Step: Check Core Exit Thermocouples GREATER THAN 1200°F

Standard: Observes CETs > 1200°F

Comment:

12. Performance Step: Check if an idle RCS cooling loop is available

Standard: Observe Narrow Range SG Level GREATER THAN 27%
RCP in associated loop available and not running

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 13. **Performance Step: Place RCP BEARING LIFT PERMISSIVE BYPASS key switch in bypass located on the rear of SA Panel**

Standard: Enter the Supervisory Panel and locate the key switches (near the floor) and place selected RCP switch in bypass

Comment:

✓ 14. **Performance Step: Start one RCP**

Standard: Rotate RCP Switch to Start Position

Comment: *CUE: If requested direct candidate to start 22 RCP*

15. **Performance Step:** Check Core Exit Thermocouples GREATER THAN 1200°F

Standard: Observes CETs LESS THAN 1200°F and lowering

Comment: *If CETs NOT < 1200°F and lowering, CUE: CETs are 1100° and lowering slowly*

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Reset Simulator to Snapshot for this JPM.

Initial Conditions:

- An event occurred a short time ago that resulted in a transition to FR-C.1, Response to Inadequate Core Cooling.
- The Steam Generator depressurization was ineffective.
- .

Initiating Cue:

You are the BOP and the CRS has directed you to determine if RCPs should be started and to start RCPs if conditions warrant in accordance with 2-FR-C.1 step 18.

Facility: Indian Point Unit 2Task No: 0000020501Task Title: **Verify Phase A Isolation**K/A Reference: 103000A3.01
RO-3.9 SRO-4.2Job Performance Measure
No: Sim-8

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	_____	Simulator	X
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- A Reactor Trip and Safety Injection have just occurred.
- The crew is performing the actions of E-0.

Task Standard: Phase A valves Manually closed.

Required Materials: None

General References: E-0 Attachments 1 and 2

Initiating Cue: You are the BOP. You are at the step to verify Phase A in E-0 Attachment 1. Continue with E-0 Attachment 1 actions.

Time Critical Task: No

Validation Time: 15 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain correct procedure

Standard: Obtains E-0 Attachments 1 and 2

Comment: CUE: Hand candidate a copy of Attachments 1 and 2

2. Performance Step: Verify Containment Isolation Phase A

Standard: Sub steps are listed below (JPM steps 3 – 7)

Comment:

3. Performance Step: Verify Phase A Actuated

Standard: Observes Phase A did not fully actuate (CA1 above rack E and CA2 above rack F)
Attempts to manually actuate Phase A (Not Successful)

Comment: This is Step 12 of Attachment 1 to E-0, Reactor Trip or Safety Injection

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4. Performance Step: Verify Phase A Valves Closed

Standard: Observes Yellow Labeled valve position and 2 is True indication on Panel SNF
Manually Close Valves

Comment: See Attachment 2 for list of valves that need to be closed.
Alternate Path Actions

✓ 5. Performance Step: Verify Containment Rad Monitor Isolation Valves CLOSED

Standard: Manually CLOSE the following Valves
PCV- 1234
PCV- 1235
PCV- 1236
PCV- 1237
956A
956B
1702
1705
1723
1728
PCV-1228

Comment: Alternate Path Actions

Performance Information

(Denote critical steps with a check mark √)

√ 6. Performance Step: Verify IVSW Valves OPEN:

Standard: Manually Open the following Valves
1410
1413
SOV-3518
SOV-3519

Comment: Alternate Path Actions

√ 7. Performance Step: Verify WCP Valves OPEN

Standard: Manually Open the following Valves
PCV- 1238
PCV- 1239
PCV- 1240
PCV- 1241

Comment: Alternate Path Actions

√ 8. Performance Step: Place Personnel and Equipment hatch solenoid control switches to INCIDENT on SM Panel

Standard: Rotate switches to INCIDENT

Comment:

Performance Information

(Denote critical steps with a check mark √)

9. Performance Step: Dispatch NOP to periodically check IVSW Tank Level and Pressure and WCP header pressure

Standard: Contact NPO and direct monitoring of IVSW and WCP

Comment:

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Reset the simulator to any at power IC

Insert the following Malfunctions to prevent Phase A Isolation:

RLY-PPL087 DE-ENERGIZED
RLY-PPL088 DE-ENERGIZED
RLY-PPL092 DE-ENERGIZED
RLY-PPL093 DE-ENERGIZED

Trip the reactor and initiate SI.

Perform the actions of E-0 Attachment 1 through step 10.

Initial Conditions:

- A Reactor Trip and Safety Injection have just occurred.
- The crew is performing the actions of E-0.

Initiating Cue:

You are the BOP. You are at the step to verify Phase A in E-0 Attachment 1.
Continue with E-0 Attachment 1 actions.

Facility: Indian Point Unit 2Task No: 2000010201Task Title: **Perform a Manual ECP Calculation**K/A Reference: 1940012137 -
RO-4.3Job Performance Measure
No: RO Admin-1

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u> </u> X <u> </u>	Actual Performance	<u> </u>
Classroom	<u> </u> X <u> </u>	Simulator	<u> </u> Plant <u> </u>

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The unit had been operating for 300 Days at 100% power.
- A Unit trip occurred due to a Main Transformer Fire
- The unit has been shutdown for 20 days (January 20, 2012 at 10:00) to effect repairs
- Prior to the trip:
 - Control Bank D at 223
 - Boron Concentrations 975 ppm
- Current Plant Conditions:
 - Tavg 547°F
 - Boron Concentrations 1472
- The Plant Computer is Out of Service
- Estimated time of Criticality 20:00 tonight

Task Standard: ECP Calculation complete and accurate.

Required Materials: Calculator

General References: 2-SOP-15.4, Estimated Critical Rod Position and Boron
Concentration Calculation
2-Graph-RV-1
2-Graph-RV-2
2-Graph-RV-3
2-Graph-RV-4
2-Graph-RV-5
2-Graph-RV-6
2-Graph-RV-7

Initiating Cue: You are the Spare RO and the CRS has directed you to perform an ECP by
hand.

Time Critical Task: No

Validation Time: 45 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure and Graphs

Standard: Obtains 2-SOP-15.4 and Graphs RV-1 through 7

Comment:

2. Performance Step: Obtain data for equilibrium operating conditions prior to shutdown and record data in Section 1.0 of data sheet

Standard: Data given in initial conditions.
Records data in Section 1.0

Comment:

3. Performance Step: Estimate the date, time, RCS Temperature, boron concentration and length of shutdown for forthcoming criticality. Record data in Section 2.0 of data sheet

Standard: Data given in initial conditions
Record data in Section 2.0

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

4. Performance Step: Perform required data entries AND Calculations using referenced graphs.

Standard: Actions listed in Steps below 5 -

Comment:

✓ 5. Performance Step: Determine Remaining Rod Worth from Graph RV-1

Standard: Determines Remaining Rod Worth is 0 and enters at step 3.1

Comment:

✓ 6. Performance Step: Determines Power Defect at Boron

Standard: Interpolate between 950 and 1000 ppm to achieve 1633.9 ± 0.5 and enter at step 4.1

Comment:

✓ 7. Performance Step: Determine Boron Concentration Differential

Standard: Calculate $975 - .1472 = -497$ and enters at step 5.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 8. Performance Step: Determine Boron Worth at Average Boron Concentration

Standard: Calculate $(975 + 1472)/2 = 1223.5$ and enters at Step 5.2

Comment:

✓ 9. Performance Step: Determine boron worth for 1223.5 ppm

Standard: Determines boron worth 7.14 ± 0.01 and enters at Step 5.2

Comment:

✓ 10. Performance Step: Determine Reactivity from boron change

Standard: Calculate Reactivity from Boron Change $(-497) \times 7.14 = 3548.6$ pcm and enters at Step 5.3

Comment:

✓ 11. Performance Step: Determine reactivity due to T_{avg} at Boron 975 and T_{avg} at 547°F

Standard: Determines Reactivity is 0 pcm from Graph RV-4 and enters at step 6.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 12. Performance Step: **Determine Xe Defect at 100% power**
Standard: **Identifies 2833 pcm from Graph RV-5 and enters at step 7.1**

Comment:

✓ 13. Performance Step: **Determine Sm Defect at 100% power**
Standard: **Identifies 1009 pcm from Graph RV-6 and enters at step 7.2**

Comment:

✓ 14. Performance Step: **Sum of step 7.1 and 7.2**
Standard: **Determines 3842 pcm and enters at step 7.3**

Comment:

✓ 15. Performance Step: **Determine Xe/Sm Correction Factor**
Standard: **Determines 0.905 from Graph RV-7 and enters at step 7.4**

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 16. Performance Step: Determine Corrected Xe/Sm prior to shutdown

Standard: Calculate $3842 \times 0.905 = 3477$ and enters at step 7.5

Comment:

✓ 17. Performance Step: Determine Xe Power for Startup

Standard: Determines Xe power is 100% (essentially constant for last 36 hours) and enters 100% at step 8.2

Comment:

✓ 18. Performance Step: Determine Sm Power for Startup

Standard: Determine Sm power is 100% (essentially constant for last 10 days) and enters 100% at step 9.2

Comment:

✓ 19. Performance Step: Determine Xe defect at startup

Standard: Determines 0 pcm from graph RV-5 and enters at step 10.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 20. Performance Step: Determine Sm Defect at startup

Standard: Determines -1202 pcm from graph RV-6 and enters at step 10.2

Comment:

✓ 21. Performance Step: Sum 10.1 and 10.2

Standard: Calculate $0 + -1202 = -1202$ pcm and enters at step 10.3

Comment:

✓ 22. Performance Step: Determine Xe/Sm Correction Factor at startup boron concentration

Standard: Interpolate to determine Correction Factor 0.861 (± 0.002) and enters at step 10.4

Comment:

✓ 23. Performance Step: Determine Corrected Xe/Sm at startup

Standard: Calculate $1202 \times 0.861 = 1033.72$ and enters at step 10.5

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ **24. Performance Step:** **Determine Corrected Xenon/Samarium Differential**

Standard: **Calculate $1033.72 - (-) 3477 = 2443.28 (\pm 2.0)$ and enters at step 11.1**

Comment:

✓ **25. Performance Step:** **Calculate Total Reactivity Effect**

Standard: **Sum $0 + 1633.9 + (-) 3548.6 + 0 + 2443.28 = (+) 528$ and enter at step 12.1**

Comment:

✓ **26. Performance Step:** **Estimate Critical Rod Position**

Standard: **Determine Control Bank D at 97 steps (± 5) and enter at step 13.1**

Comment:

27. Performance Step: Sign and Date the Calculations

Standard: Enters Signature and date

Comment: NOT CRITICAL

Terminating Cue: JPM Complete

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 1 of 8)

1.0 EQUILIBRIUM CONDITIONS PRIOR TO SHUTDOWN	
1.1 DATE	20 Days Ago
TIME	10:00
1.2 CONTROL BANK	D
STEPS	223
1.3 BORON CONCENTRATION (PPM)	975
1.4 POWER LEVEL (%)	100%

2.0 ESTIMATED CRITICAL CONDITION FOR STARTUP	
2.1 DATE	TODAY
TIME	20:00
2.2 TAVG	547°F
2.3 BORON CONCENTRATION (PPM)	1472 ppm
2.4 LENGTH OF SHUTDOWN (HRS)	490 hrs
FROM DATE/TIME	January 20, 2012 10:00

3.0 ROD DIFFERENTIAL	
3.1 REMAINING ROD WORTH AT POSITION (1.2) GRAPH RV-1	0

4.0 POWER DEFECT	
4.1 POWER DEFECT AT BORON (1.3) AND POWER (1.4) GRAPH RV-2	1633.9

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 2 of 8)

NOTE

The sign of reactivity in section 5.0 will be negative (-) IF boron at estimated critical condition is greater than boron at prior to shutdown condition (and vice versa).

5.0 EFFECT FROM BORON CONCENTRATION CHANGE

5.1 BORON CONCENTRATION DIFFERENTIAL = (1.3) - (2.3) = (±)PPM

BORON CONCENTRATION DIFFERENTIAL = (915) - (1412) = (-) 497 PPM

5.2 BORON WORTH AT AVERAGE OF BORON (1.3) AND (2.3) GRAPH RV-3

BORON WORTH AT AVERAGE OF BORON = $[(915) + (1412)] / 2 = 1223.5$ PPM

GRAPH RV-3 BORON WORTH = (+) 7.14 (±0.01) PCM/PPM

5.3 REACTIVITY FROM BORON CONCENTRATION CHANGE = $[(5.1) \times (5.2)] = (\pm) \text{PCM}$

REACTIVITY FROM BORON CONCENTRATION CHANGE = $[(497) \times ((+) 7.14)]$

REACTIVITY FROM BORON CONCENTRATION CHANGE = (-) 3548.6 ± 3.0 PGM

6.0 TEMPERATURE DEFECT

6.1 REACTIVITY DUE TO TAVG AT
BORON CONCENTRATION (1.3)
AND TAVG (2.2) GRAPH RV-4

(+)

0

PCM

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

(Page 3 of 8)

7.0 XENON/SAMARIUM PRIOR TO SHUTDOWN			
7.1 Xe DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-5	(-)	2833	PCM
7.2 Sm DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-6	(-)	1009	PCM
7.3 SUM OF ITEMS (7.1) AND (7.2)	(-)	3842	PCM
7.4 Xe/Sm CORRECTION FACTOR AT BORON(1.3) GRAPH RV-7		0.905	
7.5 CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [(7.3)×(7.4)] = (-) PCM			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [((-)3842) × (.905)]			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = (-) 3477 PCM			

8.0 XENON POWER FOR STARTUP			
8.1-HRS PRIOR TO SHUTDOWN	AVERAGE PERCENT POWER	MULTIPLIER	PRODUCT
0-1		0.07	
1-4		0.23	
4-9		0.22	
9-16		0.20	
16-25		0.22	
25-36		0.06	
			SUM TOTAL %
8.2 XENON POWER = SUM TOTAL (8.1) OR = PERCENT POWER IF POWER ESSENTIALLY CONSTANT FOR LAST 36 HOURS.			100%
XENON % =			

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 4 of 8)

9.0 SAMARIUM POWER FOR STARTUP	
9.1-DAYS PRIOR TO SHUTDOWN	AVERAGE POWER
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
SUM TOTAL	
9.2 SAMARIUM POWER = SUM TOTAL/10 SAMARIUM POWER/10 = PERCENT <u>OR</u> = PERCENT IF POWER ESSENTIALLY CONSTANT FOR LAST 10 DAYS SAMARIUM % = 100%	

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

(Page 5 of 8)

10.0 XENON/SAMARIUM AT STARTUP		
10.1 Xe DEFECT AT POWER (8.2) AND TIME (2.4) GRAPH RV-5	(-) 0	PCM
10.2 Sm DEFECT AT POWER (9.2) AND TIME (2.4) GRAPH RV-6	(-) 1202	PCM
10.3 SUM OF (10.1) + (10.2)	(-) 1202	PCM
10.4 Xe/Sm CORRECTION FACTOR AT BORON (2.3) GRAPH RV-7	0.86	
10.5 CORRECTED Xe/Sm AT STARTUP = (10.3) × (10.4) = (-) PCM		
CORRECTED Xe/Sm AT STARTUP = (1202) × (0.86) = (-) 1033.72 PCM		

11.0 CORRECTED XENON/SAMARIUM DIFFERENTIAL	
11.1 CORRECTED XENON/SAMARIUM DIFFERENTIAL = (10.5) - (7.5)	(±) PCM
CORRECTED XENON/SAMARIUM DIFFERENTIAL = [(-) 1033.72] - [(-) 3477] =	(+) 2443.28 (PCM)

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4

Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

(Page 6 of 8)

NOTE

IF Total Reactivity Effect in step 12.1 is negative OR IF estimated Critical Rod Position step 13.1 differs from desired startup position, THEN a Boron Concentration Adjustment is required per Section 14.0

12.0 TOTAL REACTIVITY EFFECT

12.1 TOTAL REACTIVITY EFFECT =
(3.1) + (4.1) + (5.3) + (6.1) + (11.1)

(±)PCM

TOTAL REACTIVITY EFFECT =
() + () + () + () + ()
D +1633.9 + (-3548.6) + 0 + 2445.28

(+) 528 PCM

13.0 ESTIMATED CRITICAL ROD POSITION

13.1 POSITION AT REACTIVITY (12.1) GRAPH RV-1

BANK

STEPS

D

97±5

ESTIMATE PERFORMED BY (RO/CRS/REACTOR ENGINEER)

DATE

ESTIMATE REVIEWED BY (SM/REACTOR ENGINEER)

DATE

Answer
Key

**INDIAN POINT ENERGY CENTER
UNIT NO. 2 - CYCLE 20**

Bank Overlap Remaining Rod Worth

D - Bank Steps	Worth PCM
223	0 (3.1)
213	12
203	40
193	83
183	134
173	186
163	236
153	284
143	330
133	374
123	417
113	459
(13.1) 100	515
97	526
93	547
83	599
73	659
63	727
53	801
43	878
33	955
23	1028
13	1094
3	1149
0	1164
C - Bank Steps	
113	1203
100	1253

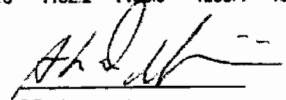
Answer
Key

[Signature]
RE APPROVED
5/24/11
EFFECTIVE DATE

Indian Point Unit 2 Cycle 20
 TOTAL POWER DEFECT (pcm) AS A FUNCTION OF POWER AND BORON CONCENTRATION AT MOL (12000 MWD/MTU)

Boron Conc. (ppm)	POWER LEVEL (%)																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
600	0.0	102.8	202.6	299.6	394.4	487.0	577.9	667.2	755.2	842.0	927.9	1013.0	1097.4	1181.2	1264.4	1347.2	1429.5	1511.3	1592.6	1673.4	1753.5
650	0.0	102.0	201.1	297.4	391.5	483.4	573.6	662.2	749.5	835.6	920.7	1004.9	1088.5	1171.4	1253.7	1335.5	1416.8	1497.6	1577.9	1657.6	1736.6
700	0.0	101.3	199.6	295.3	388.6	479.9	569.4	657.3	743.9	829.2	913.6	997.0	1079.7	1161.7	1243.1	1324.0	1404.3	1484.1	1563.4	1642.0	1720.0
750	0.0	100.5	198.2	293.2	385.9	476.5	565.3	652.5	738.4	823.0	906.6	989.2	1071.1	1152.2	1232.8	1312.7	1392.1	1470.9	1549.1	1626.7	1703.7
800	0.0	99.8	196.8	291.1	383.1	473.1	561.3	647.8	733.0	816.9	899.7	981.6	1062.6	1142.9	1222.6	1301.6	1380.0	1457.9	1535.1	1611.8	1687.7
850	0.0	99.1	195.4	289.1	380.4	469.8	557.3	643.2	727.7	810.9	893.0	974.1	1054.3	1133.8	1212.6	1290.7	1368.2	1445.1	1521.4	1597.0	1672.0
900	0.0	98.4	194.0	287.1	377.8	466.5	553.4	638.6	722.4	805.0	886.3	966.7	1046.2	1124.9	1202.8	1280.0	1356.6	1432.6	1507.9	1582.6	1656.5
950	0.0	97.7	192.7	285.1	375.2	463.3	549.6	634.2	717.3	799.2	879.8	959.5	1038.2	1116.1	1193.2	1269.5	1345.2	1420.3	1494.7	1568.4	1641.4
1000	0.0	97.1	191.4	283.2	372.7	460.2	545.8	629.8	712.3	793.5	873.5	952.4	1030.3	1107.4	1183.7	1259.2	1334.1	1408.2	1481.7	1554.4	1626.5
1050	0.0	96.4	190.1	281.3	370.2	457.1	542.1	625.5	707.4	787.9	867.2	945.4	1022.6	1098.9	1174.4	1249.1	1323.1	1396.3	1468.9	1540.7	1611.8
1100	0.0	95.8	188.9	279.5	367.8	454.1	538.5	621.3	702.5	782.4	861.0	938.5	1015.0	1090.6	1165.3	1239.2	1312.3	1384.7	1456.3	1527.3	1597.4
1150	0.0	95.2	187.6	277.7	365.4	451.1	535.0	617.1	697.7	777.0	855.0	931.8	1007.6	1082.4	1156.3	1229.4	1301.7	1373.2	1444.0	1514.0	1583.3
1200	0.0	94.6	186.4	275.9	363.1	448.2	531.5	613.0	693.1	771.7	849.0	925.2	1000.2	1074.3	1147.5	1219.8	1291.3	1362.0	1431.9	1501.0	1569.4
1250	0.0	94.0	185.3	274.1	360.8	445.3	528.0	609.0	688.5	766.5	843.1	918.6	993.0	1066.4	1138.8	1210.4	1281.1	1350.9	1420.0	1488.3	1555.8
1300	0.0	93.4	184.1	272.4	358.5	442.5	524.7	605.1	683.9	761.3	837.4	912.2	986.0	1058.6	1130.3	1201.1	1271.0	1340.1	1408.3	1475.7	1542.3
1350	0.0	92.8	183.0	270.7	356.3	439.8	521.4	601.2	679.5	756.3	831.7	905.9	979.0	1051.0	1122.0	1192.0	1261.1	1329.4	1396.8	1463.4	1529.2
1400	0.0	92.2	181.8	269.1	354.1	437.0	518.1	597.4	675.1	751.3	826.2	899.8	972.2	1043.5	1113.7	1183.0	1251.4	1318.9	1385.5	1451.3	1516.2
1475	0.0	91.4	180.2	266.6	350.9	433.0	513.3	591.8	668.7	744.0	818.0	890.7	962.1	1032.4	1101.6	1169.9	1237.1	1303.5	1368.9	1433.5	1497.2
1550	0.0	90.6	178.6	264.3	347.7	429.1	508.6	586.4	662.4	736.9	810.0	881.8	952.3	1021.6	1089.8	1157.0	1223.2	1288.4	1352.7	1416.1	1478.6
1625	0.0	89.8	177.1	262.0	344.7	425.3	504.1	581.0	656.3	730.0	802.2	873.1	942.7	1011.1	1078.3	1144.5	1209.6	1273.7	1336.9	1399.2	1460.5
1700	0.0	89.0	175.5	259.7	341.7	421.6	499.6	575.8	650.3	723.2	794.6	864.6	933.3	1000.8	1067.0	1132.2	1196.3	1259.4	1321.5	1382.6	1442.9

Answer
Key


 RE - Approved
 5/24/11
 Effective Date

1633.9
(4.1)

Ref. Cycle 20 NuPOP (MOL - 12000 MWD/MTU)
 Rev. 50

INDIAN POINT STATION
 UNIT NO. 2 - CYCLE 20
 Differential Boron Worth (MOL)

Boron Concentration (PPM)	Differential Boron Worth (PCM/PPM)
0	8.10
75	8.06
150	8.00
225	7.93
300	7.86
375	7.80
450	7.74
525	7.68
600	7.62
675	7.56
750	7.50
825	7.44
900	7.38
975	7.33
1050	7.27
1125	7.22
1200	7.16
1205.5	7.14 (5.3)
1275	7.11
1350	7.06
1425	7.01
1500	6.96
1575	6.91
1650	6.86
1725	6.81
1800	6.76

**Answer
Key**


RE- Approved

5/24/11
 Effective Date

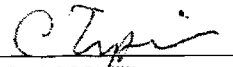
Indian Point Unit 2 Cycle 20

Total Temperature Defect (PCM) as a Function of Temperature and Boron Concentration MOL/EOL (18000 MWD/MTU)

Boron Conc. (ppm)	Core Average Temperature (F)											
	350	360	380	400	420	440	460	480	500	520	540	547
600	2242	2201	2096	1960	1793	1594	1364	1103	810	487	132	0
650	2152	2114	2017	1888	1729	1539	1319	1067	785	472	128	0
700	2062	2028	1938	1818	1667	1485	1274	1032	759	457	124	0
750	1974	1944	1860	1747	1605	1432	1229	997	734	442	120	0
800	1887	1860	1784	1678	1543	1379	1185	962	709	427	116	0
850	1800	1777	1708	1610	1483	1327	1142	928	685	413	112	0
900	1715	1694	1632	1542	1422	1275	1099	894	661	399	108	0
950	1630	1613	1558	1474	1363	1223	1056	860	636	385	105	0
1000	1546	1532	1484	1408	1304	1173	1014	827	612	371	101	0
1050	1463	1453	1411	1342	1246	1122	972	794	589	357	97	0
1100	1381	1374	1338	1276	1188	1072	930	761	565	343	94	0
1150	1300	1295	1267	1212	1130	1023	889	728	542	329	90	0
1200	1219	1218	1195	1147	1073	973	848	696	519	315	86	0
1250	1139	1141	1125	1084	1017	925	807	664	496	302	83	0
1300	1060	1064	1055	1020	961	876	767	632	473	288	79	0
1350	981	989	985	957	905	828	726	600	450	275	76	0
1400	903	914	916	895	849	780	686	569	427	262	72	0
1450	826	839	848	833	794	732	647	538	405	248	69	0
1500	749	765	780	771	740	685	607	506	382	235	65	0
1550	673	692	712	710	685	638	568	475	360	222	62	0
1600	597	619	645	650	632	592	529	445	338	209	58	0
1650	522	547	579	589	578	545	491	414	316	196	55	0
1700	448	475	513	530	525	499	452	384	294	183	51	0
1750	375	404	448	471	473	454	414	354	273	171	48	0
1800	302	334	383	412	421	409	377	324	251	158	45	0
1850	230	265	320	354	369	364	340	295	230	146	41	0
1900	159	197	257	298	319	321	303	266	209	133	38	0
1950	89	129	195	241	269	278	267	238	189	121	35	0

0 (6.1)

Answer
Key


 RE APPROVED
10/25/2007
 EFFECTIVE DATE

Ref. Cycle 20 NuPOP MOL/EOL (18000 MWD/MTU)
Rev. 54

2-GRAPH-RV-4

**Indian Point Unit 2 Cycle 20 Xenon Worth (PCM) versus Time Following Plant Trip
After Steady State Operation at MOL (12000 MWD/MTU)
(Page 1 of 2)**

Power (%)	Time After Trip (Hours)													
	0	2	4	6	8	10	12	14	16	18	20	25	30	35
100	-2833	(1.1)-3471	-3822	-3963	-3955	-3843	-3662	-3438	-3190	-2931	-2673	-2067	-1554	-1146
95	-2791	-3395	-3725	-3854	-3840	-3727	-3549	-3330	-3087	-2836	-2585	-1996	-1501	-1106
90	-2749	-3319	-3627	-3744	-3725	-3612	-3436	-3221	-2985	-2741	-2498	-1929	-1449	-1067
85	-2706	-3244	-3530	-3635	-3610	-3496	-3322	-3113	-2883	-2646	-2410	-1860	-1396	-1028
80	-2664	-3168	-3433	-3525	-3495	-3380	-3209	-3004	-2781	-2551	-2323	-1791	-1344	-989
75	-2602	-3066	-3307	-3385	-3349	-3234	-3067	-2869	-2653	-2433	-2214	-1705	-1279	-941
70	-2539	-2964	-3180	-3245	-3203	-3088	-2925	-2733	-2526	-2314	-2105	-1620	-1214	-882
65	-2477	-2862	-3054	-3105	-3057	-2942	-2782	-2597	-2398	-2196	-1996	-1534	-1149	-844
60	-2414	-2760	-2927	-2965	-2911	-2796	-2640	-2461	-2271	-2077	-1887	-1448	-1084	-796
55	-2319	-2625	-2768	-2793	-2735	-2621	-2472	-2302	-2122	-1939	-1760	-1350	-1009	-740
50	-2223	-2490	-2608	-2621	-2559	-2447	-2304	-2142	-1972	-1801	-1634	-1251	-934	-685
45	-2128	-2354	-2449	-2449	-2383	-2273	-2136	-1983	-1823	-1663	-1507	-1152	-859	-630
40	-2032	-2219	-2289	-2277	-2207	-2099	-1968	-1824	-1674	-1526	-1381	-1053	-784	-574
35	-1870	-2023	-2076	-2056	-1987	-1886	-1765	-1634	-1498	-1364	-1234	-940	-699	-511
30	-1708	-1828	-1862	-1836	-1768	-1674	-1563	-1444	-1322	-1202	-1087	-826	-614	-448
25	-1546	-1632	-1648	-1615	-1548	-1461	-1360	-1254	-1147	-1041	-940	-712	-528	-386
20	-1384	-1436	-1434	-1394	-1329	-1248	-1158	-1064	-971	-879	-792	-599	-443	-323
15	-1121	-1151	-1142	-1104	-1049	-982	-909	-834	-759	-687	-618	-466	-344	-250
10	-858	-866	-849	-814	-768	-715	-659	-603	-547	-494	-444	-333	-245	-178
5	-429	-433	-425	-407	-384	-358	-330	-301	-274	-247	-222	-167	-123	-89
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ref. Cycle 20 NuPOP MOL (12000 MWD/MTU)
Rev. 46

Answer
Key

[Signature]
RE APPROVED
5/24/11
EFFECTIVE DATE

2-GRAPH-RV-5

**Indian Point Unit 2 Cycle 20 Xenon Worth (PCM) versus Time Following Plant Trip
After Steady State Operation at MOL (12000 MWD/MTU)
(Page 2 of 2)**

Power (%)	Time After Trip (Hours)												
	40	45	50	55	60	65	70	75	80	85	90	95	100
100	-832	-598	-426	-301	-212	-148	-103	-72	-50	-34	-24	-16	-11
95	-804	-577	-411	-290	-204	-143	-100	-69	-48	-33	-23	-16	-11
90	-775	-556	-396	-280	-197	-138	-96	-67	-46	-32	-22	-15	-10
85	-746	-536	-381	-269	-189	-133	-92	-64	-45	-31	-21	-15	-10
80	-718	-515	-367	-259	-182	-127	-89	-62	-43	-30	-20	-14	-10
75	-682	-490	-348	-246	-173	-121	-84	-59	-41	-28	-19	-13	-9
70	-647	-464	-330	-233	-164	-115	-80	-55	-38	-27	-18	-13	-9
65	-612	-439	-312	-220	-155	-108	-75	-52	-36	-25	-17	-12	-8
60	-576	-413	-294	-207	-146	-102	-71	-49	-34	-24	-16	-11	-8
55	-536	-384	-273	-193	-135	-95	-66	-46	-32	-22	-15	-10	-7
50	-496	-355	-252	-178	-125	-87	-61	-42	-29	-20	-14	-10	-7
45	-455	-326	-231	-163	-115	-80	-56	-39	-27	-19	-13	-9	-6
40	-415	-297	-211	-149	-104	-73	-51	-35	-24	-17	-12	-8	-6
35	-369	-264	-187	-132	-93	-65	-45	-31	-22	-15	-10	-7	-5
30	-324	-231	-164	-116	-81	-57	-39	-27	-19	-13	-9	-6	-4
25	-278	-198	-141	-99	-69	-48	-34	-23	-16	-11	-8	-5	-4
20	-232	-166	-117	-83	-58	-40	-28	-19	-13	-9	-6	-4	-3
15	-180	-128	-91	-64	-45	-31	-22	-15	-10	-7	-5	-3	-2
10	-128	-91	-64	-45	-32	-22	-15	-11	-7	-5	-3	-2	-2
5	-64	-45	-32	-23	-16	-11	-8	-5	-4	-3	-2	-1	-1
0	0	0	0	0	0	0	0	0	0	0	0	0	0

490
0

**Answer
Key**

[Signature]
RE APPROVED
5/24/11
EFFECTIVE DATE

Ref Cycle 20 NuPOP MOL (12000 MWD/MTU)
Rev. 46

2-GRAPH-RV-5

Indian Point Unit 2 Cycle 20
Effective Samarium Worth (PCM) vs Time Following Plant Trip
After Steady State Operation at MOL (12000 MWD/MTU)

Power (%)	Time After Trip (Hours)																																																																																																																																																																													
	0	5	10	15	20	25	30	35	40	50	60	70	80	90	100	120	140	160	180	200	220	240	260	280	300	350	400																																																																																																																																																			
100	-1009	-1021	-1033	-1043	-1054	-1063	-1072	-1080	-1088	-1102	-1114	-1125	-1135	-1143	-1150	-1162	-1172	-1179	-1184	-1189	-1192	-1195	-1196	-1198	-1199	-1201	-1202	-1203	-1204	-1205	-1206	-1207	-1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227	-1228	-1229	-1230	-1231	-1232	-1233	-1234	-1235	-1236	-1237	-1238	-1239	-1240	-1241	-1242	-1243	-1244	-1245	-1246	-1247	-1248	-1249	-1250	-1251	-1252	-1253	-1254	-1255	-1256	-1257	-1258	-1259	-1260	-1261	-1262	-1263	-1264	-1265	-1266	-1267	-1268	-1269	-1270	-1271	-1272	-1273	-1274	-1275	-1276	-1277	-1278	-1279	-1280	-1281	-1282	-1283	-1284	-1285	-1286	-1287	-1288	-1289	-1290	-1291	-1292	-1293	-1294	-1295	-1296	-1297	-1298	-1299	-1300	-1301	-1302	-1303	-1304	-1305	-1306	-1307	-1308	-1309	-1310	-1311	-1312	-1313	-1314	-1315	-1316	-1317	-1318	-1319	-1320	-1321	-1322	-1323	-1324	-1325	-1326	-1327	-1328	-1329	-1330	-1331	-1332	-1333	-1334	-1335	-1336	-1337	-1338	-1339	-1340	-1341	-1342	-1343	-1344	-1345	-1346	-1347	-1348	-1349

Ref. Cycle 20 NuPOP
Rev. 47

Answer
Key

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5/24/11
EFFECTIVE DATE

2-GRAPH-RV-6

**INDIAN POINT STATION
UNIT NO. 2 - CYCLE 20**

Xenon/Samarium (Xe/Sm) Correction Factors

<u>Boron Concentration (PPM)</u>	<u>Xe/Sm Correction Factor</u>
0	1.000
75	0.992
150	0.985
225	0.977
300	0.970
375	0.962
450	0.955
525	0.948
600	0.941
675	0.934
750	0.926
825	0.919
900	0.912
975	0.905 (7.4)
1050	0.899
1125	0.892
1200	0.885
1275	0.878
1350	0.872
1425	0.865
1475	0.862 (10.4)
1500	0.858
1575	0.852
1650	0.845
1725	0.839
1800	0.832

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RE - Approved

5/24/11
Effective Date

Ref. Cycle 20 NuPOP - MOL (12000 MWD/MTU)
Rev. 50

2-GRAPH-RV-7

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The unit had been operating for 300 Days at 100% power.
- A Unit trip occurred due to a Main Transformer Fire
- The unit has been shutdown for 20 days (January 20, 2012 at 10:00) to effect repairs
- Prior to the trip:
 - Control Bank D at 223
 - Boron Concentrations 975 ppm
- Current Plant Conditions:
 - Tavg 547°F
 - Boron Concentrations 1472
- The Plant Computer is Out of Service
- Estimated time of Criticality 20:00 tonight

Initiating Cue:

You are the Spare RO and the CRS has directed you to perform an ECP by hand.

Facility: Indian Point Unit 2

Task No: 2000700102

Task Title: **Review a Completed Surveillance Test**

K/A Reference: 1940012212
RO – 3.7

Job Performance Measure
No: _____

RO
Admin - 3

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u> X </u>	Actual Performance	_____
Classroom	<u> X </u>	Simulator	_____
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- 2-PT-M110 was completed 5 hours ago

Task Standard: Surveillance Test Reviewed and errors found.

Required Materials: Completed 2-PT-M110

General References: IP-SMM-DC-904

Initiating Cue: You are the Spare RO and the CRS has directed you to perform a Peer Review of the completed Surveillance 2-PT-M110

Time Critical Task: No

Validation Time: 30 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain copy of IP-SMM-DC-904

Standard: Obtains copy of procedure, Reviews P&Ls and goes to Step 6.5.2

Comment: CUE: Hand out copy of IP-SMM-DC-904 with completed surveillance test procedure

2. Performance Step: Check Calibration due dates recorded

Standard: Determine Calibration Due Dates is Not Applicable and Checks Box N/A

Comment: From Peer Review Sheet

3. Performance Step: Check Instruments within calibration

Standard: Determines Instrument Calibration is Not Applicable and Checks Box N/A

Comment: From Peer Review Sheet

4. Performance Step: Changes documented by TPC

Standard: Determines no TPC are applicable
Checks Box N/A

Comment: From Peer Review Sheet

Performance Information

(Denote critical steps with a check mark ✓)

✓ 5. Performance Step: Check all procedural steps completed

Standard: Determine step 4.2.1 NOT initialed Checks Box YES

Comment: This step was completed; just the initials are missing. This should also be noted in the comments section

6. Performance Step: Check all steps NOT completed noted and explained in Comments Section

Standard: Determine all steps completed (Step 4.2.1 just not signed off)
Checks Box N/A

Comment:

7. Performance Step: Check all corrections lined out, dated and initialed

Standard: Determines no corrections with lineouts.
Checks Box N/A

Comment:

8. Performance Step: Check all calculations correct

Standard: Determines calculations are correct.
Checks Box YES

Comment:

Performance Information

(Denote critical steps with a check mark √)

9. Performance Step: Check data properly transcribed

Standard: Determines all data properly Transcribed from Attachment 1

Comment:

√10. Performance Step: Check Required CRs, WOs, PFs, or CTSs etc initiated

Standard: Determines a CR is required for the failed surveillance test.
Checks Box NO

Comment:

√ 11. Performance Step: Check Operability conclusions correct

Standard: Determine Operability Conclusion NOT correct for Jacket Water Temp.
Checks Box NO
Enters comment in comment section for Jacket Water Temperature

Comment:

√ 12. Performance Step: Check Overall Acceptance Criteria conclusions correct.

Standard: Determine Overall Acceptance Criteria NOT correct for Jacket Water Temp.
Checks Box NO
Enters comment in comment section for Jacket Water Temperature

Comment:

Performance Information

(Denote critical steps with a check mark √)

13. Performance Step: Contact on watch SM, CRS or FSS if operability criteria NOT satisfied

Standard: Contacts CRS or SM and describes the errors in the surveillance test documentation

Comment:

Terminating Cue: JPM Complete



Entergy

Nuclear Northeast



Procedure Use Is:

- Continuous
- Reference
- Information

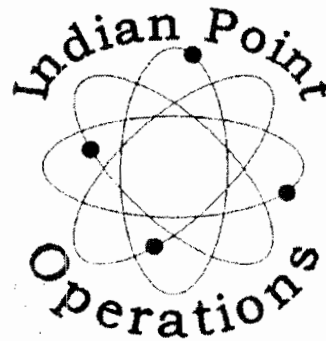
Control Copy: _____

Effective Date: 12/2/2010

Page 1 of 14

2-PT-M110, Revision **6** ^{Don F} TCDAV
APPENDIX R DG FUNCTIONAL TEST

ANSWER
KEY



Approved By:

John B. Hettler *[Signature]* 11/2/10
 RPO or Designee: Print Name / Sign / Date

Team 2A
 Procedure Owner

**ANSWER
KEY**

EDITORIAL REVISION

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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REVISION SUMMARY
(Page 1 of 1)

1.0 REASON FOR REVISION

1.1 Incorporate feedback IP2-10135.

2.0 SUMMARY OF CHANGES

- 2.1 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] revised wording in Prerequisite 3.3: from "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a glycol sample approximately 1 hour after diesel operations are secured" to "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured".
- 2.2 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] added CR-IP2-2010-00036, CA#9 to Development Docs step 9.2.7.

ANSWER KEY

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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2.0	PRECAUTIONS AND LIMITATIONS	4
3.0	PREREQUISITES	6
4.0	PROCEDURE	7
4.1	Initial Conditions	7
4.2	Test of Appendix R Diesel Generator	7
4.3	Restoration	8
5.0	COMMENTS	10
6.0	ACCEPTANCE CRITERIA	11
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8.0	EVALUATION.....	12
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ANSWER KEY

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev. 6
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1.0 PURPOSE

- 1.1 This procedure establishes requirements for the following:
- 1.1.1 Starting and running the SBO / Appendix R diesel generator for a period of time sufficient to reach stable operating temperatures in accordance with TRS 3.8.B.5.
 - 1.1.2 Demonstrating proper operation of Appendix R DG output breaker SBO/ASS in accordance with TRS 3.8.B.5.
 - 1.1.3 Demonstrating proper city water line up to the Appendix R DG heat exchangers in accordance with TRS 3.7.E.2.
 - 1.1.4 Verifying exhaust area fan runs in accordance with Vendor Recommendations.
- 1.2 This procedure applies to the following:
- 1.2.1 Appendix R DG
 - 1.2.2 Breaker SBO/ASS

ANSWER KEY

2.0 PRECAUTIONS AND LIMITATIONS**2.1 Precautions And Limitations**

- 2.1.1 This test may be performed in any plant mode.
- 2.1.2 It is preferable to perform this test during daylight hours to facilitate the observation of Appendix R DG exhaust.
- 2.1.3 Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

2.2 General Information

- 2.2.1 Test personnel SHALL complete Sections 3.0, 4.0, 5.0, 6.0, and 7.0, as applicable.
- 2.2.2 Personnel directing this test SHALL read it in its entirety prior to performance. Personnel otherwise involved SHALL read applicable sections.
- 2.2.3 Any discrepancies found SHALL be identified in Section 5.0, Comments.
- 2.2.4 Attachment 1, Appendix R DG Data Sheet, captures all of the data required by Attachment 1, in SOP-27.6, Appendix R Diesel Generator Operation. Therefore completion of Attachment 1 in 2-SOP-27.6, Appendix R Diesel Generator Operation, is NOT required during performance of this test.

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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2.2.5

Appendix R DG will be operated for a minimum of 1 hour at 2005 to 2045 KW to establish operability criteria. The test period may be extended as necessary to obtain data after temperature stability is reached.

**ANSWER
KEY**

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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Initials

3.0 PREREQUISITES

3.1 Equipment required for test:

EQUIPMENT	M&TE No.	CAL DUE DATE
Sample Bottle (minimum capacity 4 ounces)	N/A	N/A

JS

3.2 OBTAIN a current copy of 2-SOP-27.6, Appendix R Diesel Generator Operation, AND REVIEW Precautions and Limitations.

JS

3.3 NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured (Reference 9.2.7).

JS

3.4 Reason for Test – CHECK applicable listing:

- Normal Surveillance WO # 52297257-01
- Post Maintenance Test WO # _____
- WO # _____
- WO # _____
- Increased Test Frequency WO # _____
- Other Oil Sample 52297420-01

JS

**ANSWER
KEY**

APPENDIX R DG FUNCTIONAL TEST

No: 2-PT-M110

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Initials4.0 PROCEDURE4.1 Initial Conditions

- 4.1.1 OBTAIN permission from SM or Designated Alternate to perform Test:

Shift Manager TODAY
SM or Des. Alt. Signature / Date

4.2 Test of Appendix R Diesel Generator

- 4.2.1 START (Parallel Mode) AND LOAD Appendix R DG to between 2005 and 2045 KW per 2-SOP-27.6. Appendix R Diesel Generator Operation.

- 4.2.2 IF Appendix R DG does NOT start OR load, THEN:

4.2.2.1 NOTIFY the SM. NA

4.2.2.2 DOCUMENT in detail any problems and/or specific components that may have caused the failure in Section 5.0. NA

- 4.2.3 WHEN Appendix R DG reaches load window of 2005-2045 KW, THEN RECORD time and load:

Time 5 Hours Ago

Load 2000 KW OF

- 4.2.4 VERIFY the DG Area fan is running. OF

- 4.2.5 WHEN lube oil and jacket water temperatures stabilize, THEN INITIATE data collection every 30 minutes in accordance with Attachment 1, Appendix R DG Data Sheet. OF

- 4.2.6 WHEN lube oil and jacket water temperatures have stabilized during load run, THEN OBSERVE exhaust from Appendix R DG. OF

**ANSWER
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APPENDIX R DG FUNCTIONAL TEST

No: 2-PT-M110

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Initials

- 4.27 CHECK appropriate box indicating color of Appendix R DG exhaust observed.

APPENDIX R DG EXHAUST COLOR					
CLEAR	<input checked="" type="checkbox"/>	LT. GRAY	<input type="checkbox"/>	BLACK	<input type="checkbox"/>
WHITE	<input type="checkbox"/>	DK. GRAY	<input type="checkbox"/>	BLUE	<input type="checkbox"/>

NOTE

Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

- 4.28 MAINTAIN Appendix R DG load at 2005 to 2045 KW for a minimum of 1 hour.

- 4.29 RECORD present time and run time at target load (2005 - 2045 KW):

Present time CURRENT TIME

Time loaded \geq 2005 KW 77 minutes (\geq 1 hour)

- 4.30 WHEN time and load conditions have been met, THEN UNLOAD AND SECURE Appendix R DG (Parallel Mode) per 2-SOP-27.6, Appendix R Diesel Generator Operation.

4.3 Restoration

- 4.31 OBTAIN a lube oil sample of approximately 4 ounces from the Appendix R DG dipstick.

- 4.32 LABEL lube oil sample with the following information:

Unit 2 Appendix R DG

2-PT-M110

Date

- 4.33 VERIFY GT1 North and South combined Fuel Oil Storage Tank level is greater than or equal to 12,500 gallons

**ANSWER
KEY**

APPENDIX R DG FUNCTIONAL TEST

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- | | | <u>Initials</u> |
|-------|---|-----------------|
| 4.3.4 | VERIFY Fuel Oil Day Tank level is between 7/8 - FULL. | <u>OF</u> |
| 4.3.5 | VERIFY UW-831, City Water Supply Valve For Appendix 'R' Diesel Gen. Heat Exchangers, is open. | <u>OF</u> |
| 4.3.6 | VERIFY UW-833, City Water Supply Line Valve For Appendix 'R' Diesel Gen. J/W Heat Exchanger, is open. | <u>OF</u> |
| 4.3.7 | VERIFY UW-837, City Water Supply Line Valve For Appendix 'R' Diesel Gen. A/C Heat Exchanger, is open. | <u>OF</u> |
| 4.3.8 | NOTIFY CRS or SM the Appendix R DG has been returned to standby service. | <u>OF</u> |
| 4.3.9 | DELIVER lube oil sample to Maintenance. | <u>OF</u> |

ANSWER KEY

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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5.0 COMMENTS

① There is no TE to read.

**ANSWER
KEY**

Test Performers:

Print Name:

Initials:

Signature/Date:

Tim Jenkins

TJ

Tim Jenkins TODAY

Tom Feenan

TF

Tom Feenan TODAY

Craig Wergall

CW

Craig Wergall TODAY

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6.0 ACCEPTANCE CRITERIA

6.1 TRM Requirements

Equipment/Parameter/Instrument	Step/Att.	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
Generator Output Breaker / SBO/ASS	4.2.1	TRS 3.8 B.5	Breaker Closes	N/A	<input checked="" type="checkbox"/> YES / NO	a
AC Wattmeter - Generator / WM	4.2.9		Load >2005 KW Maintained For ≥ 1 Hour	<input checked="" type="checkbox"/> YES / NO	YES / NO	e
Jacket Water Temp	Att. 1		165-198 °F (60 Min Data)	<input checked="" type="checkbox"/> YES / NO	163	a
Lube Oil Temp	Att. 1		≤ 250°F (60 Min Data)	<input checked="" type="checkbox"/> YES / NO	212 °F	e
UW-831	4.3.5	TRS 3.7.E.2	OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	a
UW-833	4.3.6		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	e
UW-837	4.3.7		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	e

6.2 Other Program Requirements

Equipment	Step	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
DG Area Fan	4.2.4	Vendor Recommendation	Fans Starts	<input checked="" type="checkbox"/> YES / NO	<input checked="" type="checkbox"/> YES / NO	a

7.0 TEST ACCEPTANCE

7.1 TRM Acceptance Criteria

7.1.1 Based on recorded data, are all Acceptance Criteria of Section 6.1 satisfied?

YES NO N/A

7.1.2 IF all Acceptance Criteria of Section 6.1 are NOT satisfied, THEN:

- NOTIFY CRS/SM to declare Appendix R Diesel Generator inoperable.
- INITIATE a WR and a CR.
- TAKE applicable action in accordance with TRO 3.8 B.

ANSWER KEY

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7.2 **Other Programs Acceptance Criteria**

7/21 Based on the recorded data, are all Acceptance Criteria of Section 6.2 satisfied?

7/22 YES NO N/A

7/22 IF component(s) failed to meet the Acceptance Criteria of Section 6.2, THEN:

- NOTIFY CRS/SM.
 - INITIATE a WR and a CR.
- NA

7.3 IF NO is circled in Step 7.1.1 OR Step 7.2.1, THEN LIST corrective action(s) taken, with any comments:

Comments: _____

Reviewed By: _____
SM or Des. Alt: **Print Name / Sign / Date**

8.0 EVALUATION

8.1 SURVEILLANCE COORDINATOR REVIEW

Comments: _____

Reviewed By: _____
Surveillance Coordinator Review: **Print Name / Sign / Date**

**ANSWER
KEY**

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9.0 REFERENCES**9.1 Commitment Documents**

None

9.2 Development Documents

- 9.2.1 250907, Electrical Distribution and Transmission System
- 9.2.2 400882, Station Blackout and Appendix R Diesel Generator Set P&ID Diesel Cooling Water System Mechanical
- 9.2.3 EC-5000033794, IP2 Station Blackout and Appendix R Diesel Generator Set
- 9.2.4 NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
- 9.2.5 NSAC-108, Reliability of Diesel Generators at U.S. Power Plants
- 9.2.6 Cummins Operation and Maintenance Manual QSK78 Series Engines
- 9.2.7 CR-IP2-2010-00036, CA#9

9.3 Interface Documents

- 9.3.1 2-SOP-27.6, Appendix R Diesel Generator Operation
- 9.3.2 TRO 3.8.B
- 9.3.3 TRS 3.7.E.2

10.0 RECORDS AND DOCUMENTATION**10.1 Records**

The following required records resulting from [redacted] controlled and maintained in accordance with the IPEC Records Retention Schedule.

- 10.1.1 This Performance Procedure becomes a Quality Record when completed.

10.2 Documentation

None

**ANSWER
KEY**

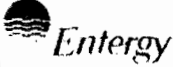
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**ATTACHMENT 1,
APPENDIX R DG DATA SHEET**
(Page 1 of 1)

Date: TODAY

PARAMETER	FULL LOAD	TIME/ READINGS			
		0	30	60	90
Appendix R DG Engine Data					
Coolant Temperature	≥ 40 - ≤ 215 °F	160	162	163	
Lube Oil Pressure	≥ 45 psig	79	76	77	
Engine Speed	1800 RPM	1801	1801	1801	
Fuel Pump Pressure	200 - 400 psig @ 1800 RPM	378	371	382	
Fuel Inlet Temperature	≤ 150 °F	73	77	84	
Coolant Pressure	≥ 11 psig	25	25	24	
Lube Oil Temperature	≤ 250 °F	181	210	212	
Lube Oil Level (Between Run High / Run Low)	Midpoint	1/2	1/2	1/2	
Air Intake Temperature	≤ 180 °F	135	136	136	
After Cooler Temperature	≤ 160 °F	107	107	107	
Appendix R D/G Generator Data					
L1 Amps	≤ 141.0 Amps	94	94	94	
L2 Amps	≤ 141.0 Amps	88	87	88	
L3 Amps	≤ 141.0 Amps	87	87	88	
Frequency	59.7 - 60.3 Hz	60.0	60.0	60.0	
Total kW	≤ 2700 kW	2213	2211	2209	
Total kVA	≤ 3375 kVA	2226	2220	2201	
Total PF (nominal 0.9)	(≥ 0.8 - ≤ 0.95)	.9	.9	.9	
Appendix R DG Other Data					
Day Tank Level	7/8 - Full	7/8	7/8	7/8	
PI-8030, Day Tank Fill Pump Pressure	psig	55	55	55	
TE-8027, Day Tank Oil Cooler Temperature	F	①	①	①	
Lube Oil Reservoir Sight Glass Level	3/4 - Full	3/4	3/4	3/4	
LG-8032, Jacket Water Surge Tank Sight Glass Level	2/3 - 3/4	3/4	3/4	3/4	
LG-8031, After Cooler Surge Tank Sight Glass Level	2/3 - 3/4	3/4	2/3	2/3	
TI-908, Jacket Water Heat Exchanger Outlet Temperature	F	115	121	121	
TI-909 After Cooler Heat Exchanger Outlet Temperature	F	73	72	72	
FI-7979, Appendix R DG Jacket Water Flow (City Water)	≤ 118 gpm	160	160	160	
FI-7979, Appendix R DG Jacket Water Flow (Service Water)	≤ 160 gpm	160	160	160	
FI-7980, Appendix R DG Aftercooler Water Flow (City Water)	≤ 87 gpm	135	135	135	
FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)	≤ 137 gpm	135	135	135	
Battery Voltage	≥ 24 VDC	26.6	26.8	26.7	

**ANSWER
KEY**

	IPEC SITE MANAGEMENT MANUAL	QUALITY RELATED ADMINISTRATIVE PROCEDURE	IP-SMM Revision 3 DC-904
		INFORMATIONAL USE	Page 20 of 20

ATTACHMENT 10.2

PEER REVIEW SHEET

PEER REVIEW SHEET

PROCEDURE NUMBER: 2-PT-M110
 DATE PERFORMED: TODAY

	YES	NO*	N/A
1. Calibration due dates recorded?			✓
2. Instrument(s) within calibration?			✓
3. Changes documented by TPC?			✓
4. All required procedural steps completed?	① ✓		
5. All steps <u>NOT</u> completed noted & explained in Comments Section?			✓
6. All corrections lined out, dated and initialed?			✓
7. All calculations correct?	✓		
8. All data properly transcribed?	✓		
9. Required CRs, WOs, PFs or CTSs, etc. initiated?		② ✓	
10. Operability conclusions correct?		③ ✓	
11. Overall acceptance conclusions correct?		④ ✓	

* Explain all NOs

COMMENTS:

- ① Step 4.2.1 Initials missing
- ② Surveillance Test Failed. No CR's written
- ③ Jacket Water Temperature unsatisfactory 163 vs 165
Acceptance improperly circled yes
- ④ TRM Acceptance Criteria improperly circled YES vs NO

PEER REVIEWER: _____
 Signature/Date

**ANSWER
KEY**

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- 2-PT-M110 was completed 5 hours ago

Initiating Cue:

You are the Spare RO and the CRS has directed you to perform a Peer Review of the completed Surveillance 2-PT-M110



Entergy

Nuclear Northeast



Procedure Use Is:

- Continuous
- Reference
- Information

Control Copy: _____

Effective Date: 12/21/2010

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2-PT-M110, Revision **6** ^{DMF} TODAY
APPENDIX R DG FUNCTIONAL TEST

Approved By:

John B. Hetherington *[Signature]* 11/15/10
 RPO or Designee: Print Name / Sign / Date



Team 2A
 Procedure Owner

EDITORIAL REVISION

APPENDIX R DG FUNCTIONAL TEST

No: 2-P[™]-M110

Rev: 6

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REVISION SUMMARY

(Page 1 of 1)

1.0 REASON FOR REVISION

- 1.1 Incorporate feedback IP2-10135.

2.0 SUMMARY OF CHANGES

- 2.1 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] revised wording in Prerequisite 3.3: from "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a glycol sample approximately 1 hour after diesel operations are secured" to "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured".
- 2.2 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] added CR-IP2-2010-00036, CA#9 to Development Docs step 9.2.7.

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1.0 PURPOSE

~~1.1~~ This procedure establishes requirements for the following:

- ~~1.1.1~~ Starting and running the SBO / Appendix R diesel generator for a period of time sufficient to reach stable operating temperatures in accordance with TRS 3.8.B.5.
- ~~1.1.2~~ Demonstrating proper operation of Appendix R DG output breaker SBO/ASS in accordance with TRS 3.8.B.5.
- ~~1.1.3~~ Demonstrating proper city water line up to the Appendix R DG heat exchangers in accordance with TRS 3.7.E.2.
- ~~1.1.4~~ Verifying exhaust area fan runs in accordance with Vendor Recommendations.

~~1.2~~ This procedure applies to the following:

- ~~1.2.1~~ Appendix R DG
- ~~1.2.2~~ Breaker SBO/ASS

2.0 PRECAUTIONS AND LIMITATIONS**2.1 Precautions And Limitations**

- ~~2.1.1~~ This test may be performed in any plant mode.
- ~~2.1.2~~ It is preferable to perform this test during daylight hours to facilitate the observation of Appendix R DG exhaust.
- ~~2.1.3~~ Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

2.2 General Information

- ~~2.2.1~~ Test personnel SHALL complete Sections 3.0, 4.0, 5.0, 6.0, and 7.0, as applicable.
- ~~2.2.2~~ Personnel directing this test SHALL read it in its entirety prior to performance. Personnel otherwise involved SHALL read applicable sections.
- ~~2.2.3~~ Any discrepancies found SHALL be identified in Section 5.0. Comments.
- ~~2.2.4~~ Attachment 1, Appendix R DG Data Sheet, captures all of the data required by Attachment 1, in SOP-27.6, Appendix R Diesel Generator Operation. Therefore completion of Attachment 1 in 2-SOP-27.5, Appendix R Diesel Generator Operation, is NOT required during performance of this test.

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2.2.5

Appendix R DG will be operated for a minimum of 1 hour at 2005 to 2045 KW to establish operability criteria. The test period may be extended as necessary to obtain data after temperature stability is reached.

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Initials4.0 PROCEDURE4.1 Initial Conditions

4.1.1 OBTAIN permission from SM or Designated Alternate to perform Test:

Shift Manager TODAY
SM or Des. Alt. Signature / Date

4.2 Test of Appendix R Diesel Generator

4.2.1 START (Parallel Mode) AND LOAD Appendix R DG to between 2005 and 2045 KW per 2-SOP-27.6, Appendix R Diesel Generator Operation.

4.2.2 IF Appendix R DG does NOT start OR load, THEN:

4.2.2.1 NOTIFY the SM. NA

4.2.2.2 DOCUMENT in detail any problems and/or specific components that may have caused the failure in Section 5.0. NA

4.2.3 WHEN Appendix R DG reaches load window of 2005-2045 KW, THEN RECORD time and load:

Time 5 Hours AGO

Load 2000 KW OF

4.2.4 VERIFY the DG Area fan is running. OF

4.2.5 WHEN lube oil and jacket water temperatures stabilize, THEN INITIATE data collection every 30 minutes in accordance with Attachment 1, Appendix R DG Data Sheet. OF

4.2.6 WHEN lube oil and jacket water temperatures have stabilized during load run, THEN OBSERVE exhaust from Appendix R DG. OF

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Initials

- 4.27 CHECK appropriate box indicating color of Appendix R DG exhaust observed.

APPENDIX R DG EXHAUST COLOR				
CLEAR	<input checked="" type="checkbox"/>	LT. GRAY	BLACK	
WHITE	<input type="checkbox"/>	DK. GRAY	BLUE	

df

NOTE

Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

- 4.28 MAINTAIN Appendix R DG load at 2005 to 2045 KW for a minimum of 1 hour.

df

- 4.29 RECORD present time and run time at target load (2005 - 2045 KW):

Present time CURRENT TIME

Time loaded \geq 2005 KW 77 minutes (\geq 1 hour)

df

- 4.30 WHEN time and load conditions have been met, THEN UNLOAD AND SECURE Appendix R DG (Parallel Mode) per 2-SOP-27.6, Appendix R Diesel Generator Operation.

df

4.3 Restoration

- 4.3.1 OBTAIN a lube oil sample of approximately 4 ounces from the Appendix R DG dipstick.

df

- 4.3.2 LABEL lube oil sample with the following information:

Unit 2 Appendix R DG

2-PT-M110

Date

df

- 4.3.3 VERIFY GT1 North and South combined Fuel Oil Storage Tank level is greater than or equal to 12,500 gallons.

df

APPENDIX R DG FUNCTIONAL TEST

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Initials

- ~~4.3.4~~ VERIFY Fuel Oil Day Tank level is between 7/8 - FULL. DF
- ~~4.3.5~~ VERIFY UW-831, City Water Supply Valve For Appendix 'R' Diesel Gen. Heat Exchangers, is open. DF
- ~~4.3.6~~ VERIFY UW-833, City Water Supply Line Valve For Appendix 'R' Diesel Gen. J/W Heat Exchanger, is open. DF
- ~~4.3.7~~ VERIFY UW-837, City Water Supply Line Valve For Appendix 'R' Diesel Gen. A/C Heat Exchanger, is open. DF
- ~~4.3.8~~ NOTIFY CRS or SM the Appendix R DG has been returned to standby service. DF
- ~~4.3.9~~ DELIVER lube oil sample to Maintenance. DF

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6.0 ACCEPTANCE CRITERIA

6.1 TRM Requirements

Equipment/Parameter/Instrument	Step/Att.	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
Generator Output Breaker / SBO/ASS	4.2.1	TRS 3.8.B.5	Breaker Closes	N/A	<input checked="" type="checkbox"/> YES / NO	a
AC Wattmeter -- Generator / WM	4.2.9		Load >2005 KW Maintained For ≥ 1 Hour	<input checked="" type="checkbox"/> YES / NO	YES / NO	e
Jacket Water Temp	Att. 1		165-198 °F (60 Min Data)	163 °F	<input checked="" type="checkbox"/> YES / NO	a
Lube Oil Temp	Att. 1		≤ 250°F (60 Min Data)	212 °F	<input checked="" type="checkbox"/> YES / NO	ea
UW-831	4.3.5	TRS 3.7.E.2	OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	ae
UW-833	4.3.6		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	ca
UW-837	4.3.7		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	ea

6.2 Other Program Requirements

Equipment	Step	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
DG Area Fan	4.2.4	Vendor Recommendation	Fans Starts	<input checked="" type="checkbox"/> YES / NO	<input checked="" type="checkbox"/> YES / NO	a

7.0 TEST ACCEPTANCE

7.1 TRM Acceptance Criteria

7.1.1 Based on recorded data, are all Acceptance Criteria of Section 6.1 satisfied?

YES NO N/A

7.1.2 IF all Acceptance Criteria of Section 6.1 are NOT satisfied. THEN:

- NOTIFY CRS/SM to declare Appendix R Diesel Generator inoperable.
- INITIATE a WR and a CR.
- TAKE applicable action in accordance with TRO 3.8.B.

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~~7.2~~ **Other Programs Acceptance Criteria**

~~7.2.1~~ Based on the recorded data, are all Acceptance Criteria of Section 6.2 satisfied?

~~7.2.2~~ **YES** NO N/A

~~7.2.2~~ IF component(s) failed to meet the Acceptance Criteria of Section 6.2, THEN:

- NOTIFY CRS/SM.
- INITIATE a WR and a CR.

7.3 IF NO is circled in Step 7.1.1 OR Step 7.2.1, THEN LIST corrective action(s) taken, with any comments:

Comments: _____

Reviewed By: _____
 SM or Des. Alt: **Print Name / Sign / Date**

8.0 EVALUATION

8.1 SURVEILLANCE COORDINATOR REVIEW

Comments: _____

Reviewed By: _____
 Surveillance Coordinator Review: **Print Name / Sign / Date**

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9.0 REFERENCES**9.1 Commitment Documents**

None

9.2 Development Documents

- 9.2.1 250907, Electrical Distribution and Transmission System
- 9.2.2 400882, Station Blackout and Appendix R Diesel Generator Set P&ID Diesel Cooling Water System Mechanical
- 9.2.3 EC-5000033794, IP2 Station Blackout and Appendix R Diesel Generator Set
- 9.2.4 NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
- 9.2.5 NSAC-108, Reliability of Diesel Generators at U.S. Power Plants
- 9.2.6 Cummins Operation and Maintenance Manual QSK78 Series Engines
- 9.2.7 CR-IP2-2010-00036, CA#9

9.3 Interface Documents

- 9.3.1 2-SOP-27.6, Appendix R Diesel Generator Operation
- 9.3.2 TRO 3.8.B
- 9.3.3 TRS 3.7.E.2

10.0 RECORDS AND DOCUMENTATION**10.1 Records**

The following required records resulting from this procedure are controlled and maintained in accordance with the IPEC Records Retention Schedule.

- 10.1.1 This Performance Procedure becomes a Quality Record when completed.

10.2 Documentation

None

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**ATTACHMENT 1,
APPENDIX R DG DATA SHEET**
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Date: TODAY

PARAMETER	FULL LOAD	TIME/ READINGS			
		0	30	60	90
Appendix R DG Engine Data					
Coolant Temperature	≥ 40 - ≤ 215 °F	160	162	163	
Lube Oil Pressure	≥ 45 psig	79	76	77	
Engine Speed	1800 RPM	1801	1801	1801	
Fuel Pump Pressure	200 - 400 psig @ 1800 RPM	378	371	382	
Fuel Inlet Temperature	≤ 150 °F	73	77	84	
Coolant Pressure	≥ 11 psig	25	25	24	
Lube Oil Temperature	≤ 250 °F	181	210	212	
Lube Oil Level (Between Run High / Run Low)	Midpoint	1/2	1/2	1/2	
Air Intake Temperature	≤ 180 °F	135	136	136	
After Cooler Temperature	≤ 160 °F	107	107	107	
Appendix R D/G Generator Data					
L1 Amps	≤ 141.0 Amps	94	94	94	
L2 Amps	≤ 141.0 Amps	88	87	88	
L3 Amps	≤ 141.0 Amps	87	87	88	
Frequency	59.7 - 60.3 Hz	60.0	60.0	60.0	
Total kW	≤ 2700 kW	2013	2011	2007	
Total kVA	≤ 3375 kVA	2226	2220	2201	
Total PF (nominal 0.9)	(≥ 0.8 - ≤ 0.95)	.9	.9	.9	
Appendix R DG Other Data					
Day Tank Level	7/8 - Full	7/8	7/8	7/8	
PI-8030, Day Tank Fill Pump Pressure	psig	55	55	55	
TE-8027, Day Tank Oil Cooler Temperature	F	0	0	0	
Lube Oil Reservoir Sight Glass Level	3/4 - Full	3/4	3/4	3/4	
LG-8032, Jacket Water Surge Tank Sight Glass Level	2/3 - 3/4	3/4	3/4	3/4	
LG-8031, After Cooler Surge Tank Sight Glass Level	2/3 - 3/4	3/4	2/3	2/3	
TI-908, Jacket Water Heat Exchanger Outlet Temperature	F	115	121	121	
TI-909 After Cooler Heat Exchanger Outlet Temperature	F	73	72	72	
FI-7979, Appendix R DG Jacket Water Flow (City Water)	≤ 118 gpm				
FI-7979, Appendix R DG Jacket Water Flow (Service Water)	≤ 160 gpm	160	160	160	
FI-7980, Appendix R DG Aftercooler Water Flow (City Water)	≤ 87 gpm				
FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)	≤ 137 gpm	135	135	135	
Battery Voltage	≥ 24 VDC	26.6	26.8	26.7	

Facility: Indian Point Unit 2Task No: 2000130101Task Title: **Prepare a VC Pressure Relief Release Permit**K/A Reference: 1940012311
RO-3.8Job Performance Measure
No: _____RO Admin 4

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	X	Simulator	Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- VC pressure has increased to approximately 0.4 psig.
- The Computer Release Permit Program has been corrupted.
- Given:
 - Condenser Air In leakage is 5.25 scfm
 - Plant vent flow is 7.06×10^4 scfm
 - Current reading R-45 is 7.15×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-42 is 1.82×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-44 is 1.14×10^{-6} $\mu\text{Ci/cc}$
 - Current High Alarm R-42 is 8.54×10^{-7} $\mu\text{Ci/cc}$
 - Current High Alarm R-44 is 1.5×10^{-4} $\mu\text{Ci/cc}$
 - Current Warn R-44 is 1.0×10^{-4} $\mu\text{Ci/cc}$
 - Instantaneous Release Rate 70,000 $\mu\text{Ci/sec}$
 - Most recent grab sample is 8.3×10^{-7} $\mu\text{Ci/cc}$
 - Release Permit Number is 120005

Task Standard: Release Permit complete and accurate.

Required Materials: Calculator

General References: 2-SOP-5.4.1, VC Pressure Relief

Initiating Cue: You are the spare RO and the CRS has directed you to prepare a Manual VC Pressure Relief Gaseous Release Permit in accordance with 2-SOP-5.4.1, VC Pressure Reliefs

Time Critical Task: No

Validation Time: 30 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain a current copy of 2-SOP-5.4.1 and review P&Ls

Standard: Obtains procedure and reviews P&Ls

Comment:

2. Performance Step: Enter given data on Attachment 1

Standard: Enters data on attachment 1

Comment:

✓ 3. Performance Step: Calculate Pressure Release Rate

Standard: $0.8 \times 1.82 \times 10^{-7} \mu\text{Ci/cc} =$
 $1.46 \times 10^{-7} \mu\text{Ci/cc}$

Comment: Step 4.2.4.1

✓ 4. Performance Step: Calculate Plant Vent Release Rate

Standard: $4.72 \times 10^{-4} \times 1.14 \times 10^{-6} \mu\text{Ci/cc} \times 7.06 \times 10^4 \text{ scfm} =$
 $3.80 \times 10^{-5} \text{ Ci/sec}$

Comment: Sep 4.2.4.2

Performance Information

(Denote critical steps with a check mark ✓)

✓ 5. Performance Step: Calculate Plant Vent Release Rate Equivalent of CAE Release Rate

Standard: $4.72 \times 10^{-4} \times 7.15 \times 10^{-7} \mu\text{Ci/cc} \times 5.25 = 1.77 \times 10^{-9} \text{ Ci/sec}$

Comment: Step 4.2.4.3

✓ 6. Performance Step: Calculate Total Calculated Release Rate

Standard: $1.46 \times 10^{-7} \mu\text{Ci/cc} + 3.80 \times 10^{-5} \text{ Ci/sec} + 0 = 3.81 \times 10^{-5} \text{ Ci/sec}$

Comment: Step 4.2.4.4

✓ 7. Performance Step: Calculate R-44 Alarm Setpoint

Standard: $[(.0072 \mu\text{Ci/sec} - 3.81 \times 10^{-5} \text{ Ci/sec}) \times 2119] / (7.06 \times 10^4 \text{ scfm} + 1700) = 2.09 \times 10^{-4} \mu\text{Ci/cc}$

Comment: Step 4.2.6.1

✓ 8. Performance Step: Calculate R42 Alarm Setpoint

Standard: $70,000 \times 1.25 \times 10^{-6} \text{ sec/cc} = 8.75 \times 10^{-2} \mu\text{Ci/cc}$

Comment: Step 4.2.7

Performance Information

(Denote critical steps with a check mark ✓)

✓ 9. Performance Step: Calculate R44 Warn Setpoint

Standard: $.75 \times 2.09 \times 10^{-4} \text{ sec/cc} =$
 $8.75 \times 10^{-4} \mu\text{Ci/cc}$

Comment: Step 4.2.7

10. Performance Step: Sign Attachment 1 as Preparer.

Standard: Signs Attachment 1

Comment:

Terminating Cue: JPM Complete

ANSWER KEY

VC PRESSURE RELIEFS	No: 2-SOP-5.4.1	Rev: 17
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ATTACHMENT 1
VC PRESSURE RELIEF GASEOUS RELEASE PERMIT

(Page 1 of 1)

Date: TODAY Time: Now Permit No. 120005

VC Sample # 1	<u>NA</u>	Date: _____	Time: _____	Activity (A)	_____ $\mu\text{Ci/cc}$
VC Sample # 2	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
Plant Vent Sample #	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
CAE Concentration ²	<u>7.15×10^{-7}</u>	Date: <u>TODAY</u>	Time: <u>Now</u>	Activity (E)	<u>7.15×10^{-7}</u> $\mu\text{Ci/cc}$
CAE In Leakage (F _c)	<u>5.25</u> scfm				
Plant Vent Flow (F)	<u>7.06×10^4</u> scfm				
				R-44 Current Warn	<u>1.8×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current High Alarm	<u>1.5×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current Reading (C _{pv})	<u>1.14 x 10⁻⁶</u> $\mu\text{Ci/cc}$
				R-42 Reading (A)	<u>1.82×10^{-7}</u> $\mu\text{Ci/cc}$

- 1 Per P&L 2.11, R-42 may be used to obtain containment Noble gas concentration in lieu of sampling and analysis.
- 2 R-45 OR noble gas activity grab sample.

Pressure Relief Release Rate: [Step 4.2.4.1]

$$RR_{pr} = 0.8 \cdot \left(\frac{1.82 \times 10^{-7}}{(A)} \right) = \frac{1.46 \times 10^{-7}}{(RR_{pr})} \text{ Ci/sec}$$

Plant Vent Release Rate: [Step 4.2.4.2]

$$RR_{pv} = 4.72 \text{ E-4} \cdot \left(\frac{1.14 \times 10^{-6}}{(C_{pv})} \right) \cdot \left(\frac{7.06 \times 10^4}{(F)} \right) = \frac{3.80 \times 10^{-5}}{(RR_{pv})} \text{ Ci/sec}$$

Plant Vent Release Rate Equivalent of CAE Release Rate: [Step 4.2.4.3]

$$RR_{cae} = 4.72 \text{ E-4} \cdot \left(\frac{7.15 \times 10^{-7}}{(E)} \right) \cdot \left(\frac{5.25}{(F_c)} \right) = \frac{1.77 \times 10^{-9}}{(RR_{cae})} \text{ Ci/sec}^3$$

Total Calculated Release Rate: [Step 4.2.4.4]

$$RR = \frac{1.46 \times 10^{-7}}{(RR_{pr})} + \frac{3.80 \times 10^{-5}}{(RR_{pv})} + \frac{0}{(RR_{cae})} = \frac{3.81 \times 10^{-5}}{(RR)} \text{ Ci/sec}$$

Note 3: If RR_{cae} is LESS THAN 2.0 E-4 , then no further consideration of CAE is required.

R-44 Alarm Setpoints: [Step 4.2.6.1]

$$\text{R-44 reading in } \mu\text{Ci/cc} = \left[\frac{1.77 \times 10^{-9}}{(ARR)} - \frac{3.81 \times 10^{-5}}{(RR)} \right] \cdot 2119 \cdot \left(\frac{7.06 \times 10^4}{(F)} + 1700 \right) = 2.09 \times 10^{-4}$$

R-42 Alarm Setpoint (Step 4.2.7)

$$\text{R-42 Maximum Setpoint } (\mu\text{Ci/cc}) = \frac{70,000}{(IR)} \cdot (1.25 \text{ E-6 sec/cc}) \quad \text{Actual R-42 Setpoint } \frac{8.54 \times 10^{-7}}{\mu\text{Ci/cc}}$$

$$\text{Warn} = 0.75 \cdot \left(\frac{2.09 \times 10^{-4}}{(S)} \right) = \frac{1.56 \times 10^{-4}}{\text{Warn}} \mu\text{Ci/cc}$$

**ANSWER
KEY**

Prepared By: Name Verified By: _____

Discharge Authorization: _____ Date: _____

(Authorization Level must be greater than or equal to RR to permit release)

Start → Date: _____ Time: _____ Initial VC Pressure: _____

Terminate → Date: _____ Time: _____ Final VC Pressure: _____

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- VC pressure has increased to approximately 0.4 psig.
- The Computer Release Permit Program has been corrupted.
- Given:
 - Condenser Air In leakage is 5.25 scfm
 - Plant vent flow is 7.06×10^4 scfm
 - Current reading R-45 is 7.15×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-42 is 1.82×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-44 is 1.14×10^{-6} $\mu\text{Ci/cc}$
 - Current High Alarm R-42 is 8.54×10^{-7} $\mu\text{Ci/cc}$
 - Current High Alarm R-44 is 1.5×10^{-4} $\mu\text{Ci/cc}$
 - Current Warn R-44 is 1.0×10^{-4} $\mu\text{Ci/cc}$
 - Instantaneous Release Rate 70,000 $\mu\text{Ci/sec}$
 - Most recent grab sample is 8.3×10^{-7} $\mu\text{Ci/cc}$
 - Release Permit Number is 120005

Initiating Cue:

You are the spare RO and the CRS has directed you to prepare a Manual VC Pressure Relief Gaseous Release Permit in accordance with 2-SOP-5.4.1, VC Pressure Reliefs

Facility: Indian Point Unit 2Task No: 1500040502Task Title: **Perform Initial Unusual Event Notification**K/A Reference: 1940012439
RO-3.9Job Performance Measure
No: _____RO Admin-5

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u>X</u>	Actual Performance	_____
Classroom	_____	Simulator	<u>X</u>
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- A small plane crash in the Buchanan Switchyard has caused all Buchanan Ring Bus Breakers to Trip
- Rescue efforts have prevented restoration of power to the Ring Bus
- The Shift Manager Declared an Unusual Event based on EAL-6.1.1 5 minutes ago.

Task Standard: Notification of event in progress complete to State, Counties and NRC.

Required Materials: Simulator RECS phone
Completed NYS Radiological Data Form Part 1

General References: IP-EP-115 Form EP-3, NUE Notification Checklist

Initiating Cue: You are the Spare RO, and the Shift Manager has directed you to perform the duties of the Control Room Offsite Communicator.

Time Critical Task: YES

Validation Time: 15 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain the Control Room Communicator Binder

Standard: Obtains Binder from Shift Manager Office

Comment:

2. Performance Step: Inform the Shift Manager that you have assumed the duties of the Control Room Communicator

Standard: Same as above

Comment: CUE: Acknowledge communication.

✓ 3. Performance Step: Obtain the completed and signed NYS Radiological Emergency Data Form Part 1 (IP-EP-115 Form EP-1) from the Shift Manager

Standard: Request Form from the Shift Manager.

Comment: CUE: Give the candidate the completed form.

Performance Information

(Denote critical steps with a check mark √)

4. Performance Step: Review the form to ensure all required information is entered including the Shift Manager (Emergency Director) Signature

Standard: Determines all necessary data is correctly entered.

Comment:

5. Performance Step: Verify SM has sent electronic Fax and email of the NYS Radiological Data Form Part 1 to State/Counties/EOF.

Standard: Contact SM to determine if Fax and email have been sent.

Comment: CUE: Fax and email have been sent.

√ 6. Performance Step: Pick up RECS Handset

Standard: Picks up RECS Handset

Comment: NOTE: This step starts with the NUE Notification Checklist.

Performance Information

(Denote critical steps with a check mark ✓)

✓ **7. Performance Step:** When you hear the message “Welcome to Wave Please enter session ID” depress the “7” button

Standard: Depresses the “7” button

Comment:

✓ **8. Performance Step:** You will hear two tones wait 5 seconds and state “This is to report an event at Indian Point Energy Center. Standby for roll call”.

Standard: After 5 seconds states “This is to report an event at Indian Point Energy Center. Standby for roll call”.

Comment:

✓ **9. Performance Step:** Enter Time you are starting the initial roll call

Standard: Enters time on NUE Notification Checklist

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 10. **Performance Step: Initiate roll call by asking “(location title) are you on the line for each of the stations, stopping after each name is read to allow station to identify itself. Check off each location as they answer the roll call**

Standard: Reads each station name, when station acknowledges, checks it on NUE Notification Checklist

Comment: If using the booth operator to acknowledge message, no CUE is needed. If acknowledging yourself then CUE candidate”
New York State
Westchester County
Putnam County
Rockland County
Orange County
Peekskill City
West Point

✓ 11. **Performance Step: State, “This is the Unit 2 Central Control Room. An Unusual Event has been declared at the Indian Point Energy Center based on EAL# 6.1.1. A Part 1 Notification # 1 has been sent to you vial Email and FAX”.**

Standard: Reads statement

Comment:

Performance Information

(Denote critical steps with a check mark √)

√ 12. Performance Step: Confirm the receipt of email or FAX by asking “(location Title) do you acknowledge receipt of an Email of FAX from IPEC”?

Standard: Reads roll call list and asks for acknowledgment. Checks off each station when acknowledgment is received.

Comment: If using the booth operator to acknowledge message, no CUE is needed. If acknowledging yourself then CUE candidate”
New York State has received the email.
Westchester County has received the email.
Putnam County has received the email.
Rockland County has received the email.
Orange County has received the email.
Peekskill City has received the email.
West Point has received the email.

13. Performance Step: If any of the above did not receive either an email of FAX, THEN FAX part 1 to location and verbally read the entire Part 1 form. IF all locations received (or you completed reading) proceed

Standard: All locations received email

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 14. Performance Step: End notifications by saying "Indian Point out at _____". Enters time

Standard: Makes statement and enters current time

Comment: The time entered at checklist step 9 must be within 15 minutes of the time of declaration used for the Part 1 form.

15. Performance Step: Signs Reported by and Enters RECS on Part 1 Form

Standard: Signs form and enters RECS

Comment:

16. Performance Step: Other Notifications

Standard: IF not already completed, notify

- Security
- On Duty Communications Representative
- NRC Resident Inspector

Comment: CUE: All of the above notifications have been made.

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- A small plane crash in the Buchanan Switchyard has caused all Buchanan Ring Bus Breakers to Trip
- Rescue efforts have prevented restoration of power to the Ring Bus
- The Shift Manager Declared an Unusual Event based on EAL-6.1.1 5 minutes ago.

Initiating Cue: You are the Spare RO, and the Shift Manager has directed you to perform the duties of the Control Room Offsite Communicator.

Facility: Indian Point Unit 2Task No: 2000020202Task Title: **Review a Manual ECP Calculation**K/A Reference: 1940012137 -
SRO-4.6Job Performance Measure
No: _____SRO
Admin-1

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	X	Simulator	Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The unit had been operating for 300 Days at 100% power.
- A Unit trip occurred due to a Main Transformer Fire
- The unit has been shutdown for 20 days (January 20, 2012 at 10:00) to effect repairs
- Prior to the trip:
 - Control Bank D at 223
 - Boron Concentrations 975 ppm
- Current Plant Conditions:
 - Tavg 547°F
 - Boron Concentrations 1472
- The Plant Computer is Out of Service
- Estimated time of Criticality 20:00 tonight
- The spare RO prepared a manual ECP

Task Standard: ECP Calculation reviewed and errors found.

Required Materials: Calculator

General References: 2-SOP-15.4, Estimated Critical Rod Position and Boron
Concentration Calculation
2-Graph-RV-1
2-Graph-RV-2
2-Graph-RV-3
2-Graph-RV-4
2-Graph-RV-5
2-Graph-RV-6
2-Graph-RV-7

Initiating Cue: You are the CRS and the SM has directed you to review the ECP.

Time Critical Task: No

Validation Time: 45 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Correct Procedure and Graphs

Standard: Obtains 2-SOP-15.4 and Graphs RV-1 through 7

Comment:

2. Performance Step: Review data for equilibrium operating conditions prior to shutdown in Section 1.0 of data sheet

Standard: Data given in initial conditions.
Determines data entered correctly

Comment:

3. Performance Step: Review estimated date, time, RCS Temperature, boron concentration and length of shutdown for forthcoming criticality recorded in Section 2.0 of data sheet

Standard: Data given in initial conditions
Determine data entered correctly

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

4. Performance Step: Perform required data entries AND Calculations using referenced graphs.

Standard: Actions listed in JPM Steps below 5 - 26

Comment:

5. Performance Step: Determine Remaining Rod Worth from Graph RV-1

Standard: Determines Remaining Rod Worth is 0
Determines data entered correctly at step 3.1

Comment:

✓ 6. Performance Step: **Determines Power Defect at Boron**

**Standard: Interpolate between 950 and 1000 ppm to achieve 1633.9 ± 0.5 and enter at step 4.1
Determine data NOT entered correctly.**

Comment: NOTE 1623.9 pcm is incorrect.

7. Performance Step: Determine Boron Concentration Differential

Standard: Calculate $975 - .1472 = -497$
Determines data entered correctly at step 5.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

8. Performance Step: Determine Boron Worth at Average Boron Concentration

Standard: Calculate $(975 + 1472)/2 = 1223.5$
Determines data entered correctly at Step 5.2

Comment:

9. Performance Step: Determine boron worth for 1223.5 ppm

Standard: Determines boron worth 7.14 ± 0.01
Determines data entered correctly at Step 5.2

Comment:

✓ 10. Performance Step: Determine Reactivity from boron change

Standard: Calculate Reactivity from Boron Change $(-497) \times 7.14 = 3548.6$ pcm
Determines data NOT entered correctly at Step 5.3

Comment: NOTE: 3584.6 is NOT correct.

11. Performance Step: Determine reactivity due to T_{avg} at Boron 975 and T_{avg} at 547°F

Standard: Determines Reactivity is 0 pcm from Graph RV-4
Determines data entered correctly at step 6.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

12. Performance Step:	Determine Xe Defect at 100% power
Standard:	Identifies 2833 pcm from Graph RV-5 Determines data entered correctly at step 7.1
Comment:	

13. Performance Step:	Determine Sm Defect at 100% power
Standard:	Identifies 1009 pcm from Graph RV-6 Determines data entered correctly at step 7.2
Comment:	

14. Performance Step:	Sum of step 7.1 and 7.2
Standard:	Determines 3842 pcm Determines data entered correctly at step 7.3
Comment:	

15. Performance Step:	Determine Xe/Sm Correction Factor
Standard:	Determines 0.905 from Graph RV-7 Determines data entered correctly at step 7.4
Comment:	

Performance Information

(Denote critical steps with a check mark ✓)

16. Performance Step: Determine Corrected Xe/Sm prior to shutdown

Standard: Calculate $3842 \times 0.905 = 3477$
Determines data entered correctly at step 7.5

Comment:

17. Performance Step: Determine Xe Power for Startup

Standard: Determines Xe power is 100% (essentially constant for last 36 hours)
Determines data entered correctly at step 8.2

Comment:

18. Performance Step: Determine Sm Power for Startup

Standard: Determine Sm power is 100% (essentially constant for last 10 days)
Determines data entered correctly at step 9.2

Comment:

19. Performance Step: Determine Xe defect at startup

Standard: Determines 0 pcm from graph RV-5
Determines data entered correctly at step 10.1

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

20. Performance Step:	Determine Sm Defect at startup
Standard:	Determines -1202 pcm from graph RV-6 Determined data entered correctly at step 10.2
Comment:	

21. Performance Step:	Sum 10.1 and 10.2
Standard:	Calculate $0 + -1202 = -1202$ pcm Determines data entered correctly at step 10.3
Comment:	

22. Performance Step:	Determine Xe/Sm Correction Factor at startup boron concentration
Standard:	Interpolate to determine Correction Factor 0.861 (± 0.002) Determines data entered correctly at step 10.4
Comment:	

23. Performance Step:	Determine Corrected Xe/Sm at startup
Standard:	Calculate $1202 \times 0.861 = 1033.72$ (± 1.5) Determines data entered correctly at step 10.5
Comment:	

Performance Information

(Denote critical steps with a check mark ✓)

24. Performance Step: Determine Corrected Xenon/Samarium Differential

Standard: Calculate $1044.39 - (-) 3477 = 2443.28 (\pm 2.0)$
Determines data entered correctly at step 11.1

Comment:

✓ 25. Performance Step: Calculate Total Reactivity Effect

Standard: Sum $0 + 1633.9 + (-) 3548.6 + 0 + 2443.28 = (+) 528$
(CORRECT VALUE)
Sum $0 + 1623.9 + (-) 3584.6 + 0 + 2443.28 = (+) 483$
(INCORRECT VALUE)
Determines data NOT entered correctly at step 12.1

Comment: NOTE: The calculation is correct; however the input numbers are incorrect causing this number to be wrong.

✓ 26. Performance Step: Estimate Critical Rod Position

Standard: Determine Control Bank D at 97 steps (± 5) **(CORRECT VALUE)**
Determine Control Bank D at 106 Steps **(INCORRECT VALUE)**
Determines data NOT entered correctly at step 13.1

Comment:

Performance Information

(Denote critical steps with a check mark √)

27. Performance Step: Sign and Date the Calculations

Standard: Determines RO did NOT sign and date the calculation

Comment:

Terminating Cue: JPM Complete

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 1 of 8)

1.0 EQUILIBRIUM CONDITIONS PRIOR TO SHUTDOWN	
1.1 DATE	20 January 2012
TIME	10:00
1.2 CONTROL BANK	D
STEPS	223
1.3 BORON CONCENTRATION (PPM)	975 ppm
1.4 POWER LEVEL (%)	100%

2.0 ESTIMATED CRITICAL CONDITION FOR START	
2.1 DATE	TODAY
TIME	20:00
2.2 TAVG	547°F
2.3 BORON CONCENTRATION (PPM)	1472 ppm
2.4 LENGTH OF SHUTDOWN (HRS)	> 490
FROM DATE/TIME	20 January 2012 10:00

3.0 ROD DIFFERENTIAL	
3.1 REMAINING ROD WORTH AT POSITION (1.2) GRAPH RV-1	0

4.0 POWER DEFECT	
4.1 POWER DEFECT AT BORON (1.3) AND POWER (1.4) GRAPH RV-2	1623.9

ANSWER KEY

Answer
Key

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

2-SOP-15.4
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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 2 of 8)

NOTE

The sign of reactivity in section 5.0 will be negative (-) if boron at estimated critical condition is greater than boron at prior to shutdown condition (and vice versa).

5.0 EFFECT FROM BORON CONCENTRATION CHANGE	
5.1 BORON CONCENTRATION DIFFERENTIAL = (1.3) - (2.3) = (±)PPM	
BORON CONCENTRATION DIFFERENTIAL = $(975) - (1472) = -497$	PPM
5.2 BORON WORTH AT AVERAGE OF BORON (1.3) AND (2.3) GRAPH RV-3	
BORON WORTH AT AVERAGE OF BORON = $[(975) + (1472)] / 2 = 1223.5$	PPM
GRAPH RV-3 BORON WORTH = (+) 7.14	PCM/PPM
5.3 REACTIVITY FROM BORON CONCENTRATION CHANGE = $[(5.1) \times (5.2)] = (\pm)PCM$	
REACTIVITY FROM BORON CONCENTRATION CHANGE = $[-497 \times (+)7.14]$	
REACTIVITY FROM BORON CONCENTRATION CHANGE =	<u>3584.6</u>

6.0 TEMPERATURE EFFECT	
6.1 REACTIVITY DUE TO TAVG AT BORON CONCENTRATION (1.3) AND TAVG (2.2) GRAPH RV-4	0

Answer
Key

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

2-SOP-15.4
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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 3 of 8)

7.0 XENON/SAMARIUM PRIOR TO SHUTDOWN			
7.1 Xe DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-5	(-)	2833	PCM
7.2 Sm DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-6	(-)	1009	PCM
7.3 SUM OF ITEMS (7.1) AND (7.2)	(-)	3842	PCM
7.4 Xe/Sm CORRECTION FACTOR AT BORON(1.3) GRAPH RV-7		0.905	
7.5 CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [(7.3)×(7.4)] = (-) PCM			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [((-)3842) × (.905)]			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = (-) 3477 PCM			

8.0 XENON POWER FOR STARTUP			
8.1-HRS PRIOR TO SHUTDOWN	AVERAGE PERCENT POWER	MULTIPLIER	PRODUCT
0-1		0.07	
1-4		0.23	
4-9		0.22	
9-16		0.20	
16-25		0.22	
25-36		0.06	
			SUM TOTAL %
8.2 XENON POWER = SUM TOTAL (8.1) OR = PERCENT POWER IF POWER ESSENTIALLY CONSTANT FOR LAST 36 HOURS. XENON % =			160%

Answer
Key

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

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**ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 4 of 8)**

9.0 SAMARIUM POWER FOR STARTUP	
9.1-DAYS PRIOR TO SHUTDOWN	AVERAGE POWER
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
SUM TOTAL	
9.2 SAMARIUM POWER = SUM TOTAL/10 SAMARIUM POWER/10 = PERCENT OR = PERCENT IF POWER ESSENTIALLY CONSTANT FOR LAST 10 DAYS SAMARIUM % =	

100%

Answer
Key

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 5 of 8)

10.0 XENON/SAMARIUM AT STARTUP		
10.1 Xe DEFECT AT POWER (8.2) AND TIME (2.4) GRAPH RV-5	(-) 0	PCM
10.2 Sm DEFECT AT POWER (9.2) AND TIME (2.4) GRAPH RV-6	(-) 1202	PCM
10.3 SUM OF (10.1) + (10.2)	(-) 1202	PCM
10.4 Xe/Sm CORRECTION FACTOR AT BORON (2.3) GRAPH RV-7	0.861	
10.5 CORRECTED Xe/Sm AT STARTUP = (10.3) × (10.4) = (-) PCM		
CORRECTED Xe/Sm AT STARTUP = (1202) × (.86) = (-) 1033.72 PCM		

11.0 CORRECTED XENON/SAMARIUM DIFFERENTIAL	
11.1 CORRECTED XENON/SAMARIUM DIFFERENTIAL = (10.5) - (7.5)	(±) PCM
CORRECTED XENON/SAMARIUM DIFFERENTIAL = [(-) 1033.72] - [(-) 347.7] =	2443.28 (±)

ANSWER KEY

Answer
Key

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

2-SOP-15.4
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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 6 of 8)

NOTE

IF Total Reactivity Effect in step 12.1 is negative OR IF estimated Critical Rod Position step 13.1 differs from desired startup position, THEN a Boron Concentration Adjustment is required per Section 14.0

12.0 TOTAL REACTIVITY EFFECT	
12.1 TOTAL REACTIVITY EFFECT = (3.1) + (4.1) + (5.3) + (6.1) + (11.1)	(±)PCM
TOTAL REACTIVITY EFFECT = () + () + () + () + () = + 1623.9 + (-3584.6) + 0 + 2443.72	(+) 483.0 PCM

13.0 ESTIMATED CRITICAL ROD POSITION		
13.1 POSITION AT REACTIVITY (12.1) GRAPH RV-1	BANK	STEPS
	D	106

ESTIMATE PERFORMED BY (RO/CRS/REACTOR ENGINEER)	DATE

ESTIMATE REVIEWED BY (SM/REACTOR ENGINEER)	DATE

ANSWER KEY

Answer
Key

**INDIAN POINT ENERGY CENTER
UNIT NO. 2 - CYCLE 20**

Bank Overlap Remaining Rod Worth

D - Bank Steps	Worth PCM
223	0 (3.1)
213	12
203	40
193	83
183	134
173	186
163	236
153	284
143	330
133	374
123	417
113	459
100	515
93	547
83	599
73	659
63	727
53	801
43	878
33	955
23	1028
13	1094
3	1149
0	1164
C - Bank Steps	
113	1203
100	1253

**Answer
Key**

[Signature]
 RE APPROVED
 5/24/11
 EFFECTIVE DATE

Ref. Cycle 20 NuPOP HZP (MOL - 12000 MWD/MTU)
Rev. 60

Z-GRAPH-RV-1

Indian Point Unit 2 Cycle 20
 TOTAL POWER DEFECT (pcm) AS A FUNCTION OF POWER AND BORON CONCENTRATION AT MOL (12000 MWD/MTU)

Boron Conc. (ppm)	POWER LEVEL (%)																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
600	0.0	102.8	202.6	299.6	394.4	487.0	577.9	667.2	755.2	842.0	927.9	1013.0	1097.4	1181.2	1264.4	1347.2	1429.5	1511.3	1592.6	1673.4	1753.5
650	0.0	102.0	201.1	297.4	391.5	483.4	573.6	662.2	749.5	835.6	920.7	1004.9	1088.5	1171.4	1253.7	1335.5	1416.8	1497.6	1577.9	1657.6	1736.6
700	0.0	101.3	199.6	295.3	388.6	479.9	569.4	657.3	743.9	829.2	913.6	997.0	1079.7	1161.7	1243.1	1324.0	1404.3	1484.1	1563.4	1642.0	1720.0
750	0.0	100.5	198.2	293.2	385.9	476.5	565.3	652.5	738.4	823.0	906.6	989.2	1071.1	1152.2	1232.8	1312.7	1392.1	1470.9	1549.1	1626.7	1703.7
800	0.0	99.8	196.8	291.1	383.1	473.1	561.3	647.8	733.0	816.9	899.7	981.6	1062.6	1142.9	1222.6	1301.6	1380.0	1457.9	1535.1	1611.8	1687.7
850	0.0	99.1	195.4	289.1	380.4	469.8	557.3	643.2	727.7	810.9	893.0	974.1	1054.3	1133.8	1212.6	1290.7	1368.2	1445.1	1521.4	1597.0	1672.0
900	0.0	98.4	194.0	287.1	377.8	466.5	553.4	638.6	722.4	805.0	886.3	966.7	1046.2	1124.9	1202.8	1280.0	1356.6	1432.6	1507.9	1582.6	1656.5
950	0.0	97.7	192.7	285.1	375.2	463.3	549.6	634.2	717.3	799.2	879.8	959.5	1038.2	1116.1	1193.2	1269.5	1345.2	1420.3	1494.7	1568.4	1641.4
1000	0.0	97.1	191.4	283.2	372.7	460.2	545.8	629.8	712.3	793.5	873.5	952.4	1030.3	1107.4	1183.7	1259.2	1334.1	1408.2	1481.7	1554.4	1626.5
1050	0.0	96.4	190.1	281.3	370.2	457.1	542.1	625.5	707.4	787.9	867.2	945.4	1022.6	1098.9	1174.4	1249.1	1323.1	1396.3	1468.9	1540.7	1611.8
1100	0.0	95.8	188.9	279.5	367.8	454.1	538.5	621.3	702.5	782.4	861.0	938.5	1015.0	1090.6	1165.3	1239.2	1312.3	1384.7	1456.3	1527.3	1597.4
1150	0.0	95.2	187.6	277.7	365.4	451.1	535.0	617.1	697.7	777.0	855.0	931.8	1007.6	1082.4	1156.3	1229.4	1301.7	1373.2	1444.0	1514.0	1583.3
1200	0.0	94.6	186.4	275.9	363.1	448.2	531.5	613.0	693.1	771.7	849.0	925.2	1000.2	1074.3	1147.5	1219.8	1291.3	1362.0	1431.9	1501.0	1569.4
1250	0.0	94.0	185.3	274.1	360.8	445.3	528.0	609.0	688.5	766.5	843.1	918.6	993.0	1066.4	1138.8	1210.4	1281.1	1350.9	1420.0	1488.3	1555.8
1300	0.0	93.4	184.1	272.4	358.5	442.5	524.7	605.1	683.9	761.3	837.4	912.2	986.0	1058.6	1130.3	1201.1	1271.0	1340.1	1408.3	1475.7	1542.3
1350	0.0	92.8	183.0	270.7	356.3	439.8	521.4	601.2	679.5	756.3	831.7	905.9	979.0	1051.0	1122.0	1192.0	1261.1	1329.4	1396.8	1463.4	1529.2
1400	0.0	92.2	181.8	269.1	354.1	437.0	518.1	597.4	675.1	751.3	826.2	899.8	972.2	1043.5	1113.7	1183.0	1251.4	1318.9	1385.5	1451.3	1516.2
1475	0.0	91.4	180.2	266.6	350.9	433.0	513.3	591.8	668.7	744.0	818.0	890.7	962.1	1032.4	1101.6	1169.9	1237.1	1303.5	1368.9	1433.5	1497.2
1550	0.0	90.6	178.6	264.3	347.7	429.1	508.6	586.4	662.4	736.9	810.0	881.8	952.3	1021.6	1089.8	1157.0	1223.2	1288.4	1352.7	1416.1	1478.6
1625	0.0	89.8	177.1	262.0	344.7	425.3	504.1	581.0	656.3	730.0	802.2	873.1	942.7	1011.1	1078.3	1144.5	1209.6	1273.7	1336.9	1399.2	1460.5
1700	0.0	89.0	175.5	259.7	341.7	421.6	499.6	575.8	650.3	723.2	794.6	864.6	933.3	1000.8	1067.0	1132.2	1196.3	1259.4	1321.5	1382.6	1442.9

Answer
Key

A.H. [Signature]
 RE - Approved
 5/24/11
 Effective Date

1633.9
(4.1)

Ref. Cycle 20 NuPOP (MOL - 12000 MWD/MTU)
 Rev. 50

INDIAN POINT STATION
UNIT NO. 2 - CYCLE 20
Differential Boron Worth (MOL)

<u>Boron Concentration (PPM)</u>	<u>Differential Boron Worth (PCM/PPM)</u>
0	8.10
75	8.08
150	8.00
225	7.93
300	7.88
375	7.80
450	7.74
525	7.68
600	7.62
675	7.56
750	7.50
825	7.44
900	7.38
975	7.33
1050	7.27
1125	7.22
1200	7.16
1225.5	7.14 (5.3)
1275	7.11
1350	7.06
1425	7.01
1500	6.96
1575	6.91
1650	6.86
1725	6.81
1800	6.76

Answer
Key


RE- Approved

5/24/11
Effective Date

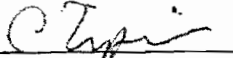
Indian Point Unit 2 Cycle 20

Total Temperature Defect (PCM) as a Function of Temperature and Boron Concentration MOL/EOL (18000 MWD/MTU)

Boron Conc. (ppm)	Core Average Temperature (F)											
	350	360	380	400	420	440	460	480	500	520	540	547
600	2242	2201	2096	1960	1793	1594	1364	1103	810	487	132	0
650	2152	2114	2017	1888	1729	1539	1319	1067	785	472	128	0
700	2062	2028	1938	1818	1667	1485	1274	1032	759	457	124	0
750	1974	1944	1860	1747	1605	1432	1229	997	734	442	120	0
800	1887	1860	1784	1678	1543	1379	1185	962	709	427	116	0
850	1800	1777	1708	1610	1483	1327	1142	928	685	413	112	0
900	1715	1694	1632	1542	1422	1275	1099	894	661	399	108	0
950	1630	1613	1558	1474	1363	1223	1056	860	636	385	105	0
1000	1546	1532	1484	1408	1304	1173	1014	827	612	371	101	0
1050	1463	1453	1411	1342	1246	1122	972	794	589	357	97	0
1100	1381	1374	1338	1276	1188	1072	930	761	565	343	94	0
1150	1300	1295	1267	1212	1130	1023	889	728	542	329	90	0
1200	1219	1218	1195	1147	1073	973	848	696	519	315	86	0
1250	1139	1141	1125	1084	1017	925	807	664	496	302	83	0
1300	1060	1064	1055	1020	961	876	767	632	473	288	79	0
1350	981	989	985	957	905	828	726	600	450	275	76	0
1400	903	914	916	895	849	780	686	569	427	262	72	0
1450	826	839	848	833	794	732	647	538	405	248	69	0
1500	749	765	780	771	740	685	607	506	382	235	65	0
1550	673	692	712	710	685	638	568	475	360	222	62	0
1600	597	619	645	650	632	592	529	445	338	209	58	0
1650	522	547	579	589	578	545	491	414	316	196	55	0
1700	448	475	513	530	525	499	452	384	294	183	51	0
1750	375	404	448	471	473	454	414	354	273	171	48	0
1800	302	334	383	412	421	409	377	324	251	158	45	0
1850	230	265	320	354	369	364	340	295	230	146	41	0
1900	159	197	257	298	319	321	303	266	209	133	38	0
1950	89	129	195	241	269	278	267	238	189	121	35	0

0 (6.1)

Answer
Key


 RE APPROVED
10/25/2001
 EFFECTIVE DATE

Ref. Cycle 20 NuPOP MOL/EOL (18000 MWD/MTU)
Rev. 54

2-GRAPH-RV-4

**Indian Point Unit 2 Cycle 20 Xenon Worth (PCM) versus Time Following Plant Trip
After Steady State Operation at MOL (12000 MWD/MTU)
(Page 1 of 2)**

Power (%)	Time After Trip (Hours)													
	0	2	4	6	8	10	12	14	16	18	20	25	30	35
100	-2833	-3471	-3822	-3963	-3955	-3843	-3662	-3438	-3190	-2931	-2673	-2067	-1554	-1146
95	-2791	-3395	-3725	-3854	-3840	-3727	-3549	-3330	-3087	-2836	-2585	-1996	-1501	-1106
90	-2749	-3319	-3627	-3744	-3725	-3612	-3436	-3221	-2985	-2741	-2498	-1929	-1449	-1067
85	-2706	-3244	-3530	-3635	-3610	-3496	-3322	-3113	-2883	-2646	-2410	-1860	-1396	-1028
80	-2664	-3168	-3433	-3525	-3495	-3380	-3209	-3004	-2781	-2551	-2323	-1791	-1344	-989
75	-2602	-3066	-3307	-3385	-3349	-3234	-3067	-2869	-2653	-2433	-2214	-1705	-1279	-941
70	-2539	-2964	-3180	-3245	-3203	-3088	-2925	-2733	-2526	-2314	-2105	-1620	-1214	-892
65	-2477	-2862	-3054	-3105	-3057	-2942	-2782	-2597	-2398	-2196	-1996	-1534	-1149	-844
60	-2414	-2760	-2927	-2965	-2911	-2796	-2640	-2461	-2271	-2077	-1887	-1448	-1084	-796
55	-2319	-2625	-2768	-2793	-2735	-2621	-2472	-2302	-2122	-1939	-1760	-1350	-1009	-740
50	-2223	-2490	-2608	-2621	-2559	-2447	-2304	-2142	-1972	-1801	-1634	-1251	-934	-685
45	-2128	-2354	-2449	-2449	-2383	-2273	-2136	-1983	-1823	-1663	-1507	-1152	-859	-630
40	-2032	-2219	-2289	-2277	-2207	-2099	-1968	-1824	-1674	-1526	-1381	-1053	-784	-574
35	-1870	-2023	-2076	-2056	-1987	-1886	-1765	-1634	-1498	-1364	-1234	-940	-699	-511
30	-1708	-1828	-1862	-1836	-1768	-1674	-1563	-1444	-1322	-1202	-1087	-826	-614	-448
25	-1546	-1632	-1648	-1615	-1548	-1461	-1360	-1254	-1147	-1041	-940	-712	-528	-386
20	-1384	-1436	-1434	-1394	-1329	-1248	-1158	-1064	-971	-879	-792	-599	-443	-323
15	-1121	-1151	-1142	-1104	-1049	-982	-909	-834	-759	-687	-618	-466	-344	-250
10	-858	-866	-849	-814	-768	-715	-659	-603	-547	-494	-444	-333	-245	-178
5	-429	-433	-425	-407	-384	-358	-330	-301	-274	-247	-222	-167	-123	-89
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Answer
Key**

ph. [Signature]
RE APPROVED
5/24/11
EFFECTIVE DATE
2-GRAPH-RV-5

Ref. Cycle 20 NuPOP MOL (12000 MWD/MTU)
Rev. 46

**Indian Point Unit 2 Cycle 20 Xenon Worth (PCM) versus Time Following Plant Trip
After Steady State Operation at MOL (12000 MWD/MTU)**
(Page 2 of 2)

Power (%)	Time After Trip (Hours)												
	40	45	50	55	60	65	70	75	80	85	90	95	100 (10.1)
100	-832	-598	-426	-301	-212	-148	-103	-72	-50	-34	-24	-16	-11
95	-804	-577	-411	-290	-204	-143	-100	-69	-48	-33	-23	-16	-11
90	-775	-556	-396	-280	-197	-138	-96	-67	-46	-32	-22	-15	-10
85	-746	-536	-381	-269	-189	-133	-92	-64	-45	-31	-21	-15	-10
80	-718	-515	-367	-259	-182	-127	-89	-62	-43	-30	-20	-14	-10
75	-682	-490	-348	-246	-173	-121	-84	-59	-41	-28	-19	-13	-9
70	-647	-464	-330	-233	-164	-115	-80	-55	-38	-27	-18	-13	-9
65	-612	-439	-312	-220	-155	-108	-75	-52	-36	-25	-17	-12	-8
60	-576	-413	-294	-207	-146	-102	-71	-49	-34	-24	-16	-11	-8
55	-536	-384	-273	-193	-135	-95	-66	-46	-32	-22	-15	-10	-7
50	-496	-355	-252	-178	-125	-87	-61	-42	-29	-20	-14	-10	-7
45	-455	-326	-231	-163	-115	-80	-56	-39	-27	-19	-13	-9	-6
40	-415	-297	-211	-149	-104	-73	-51	-35	-24	-17	-12	-8	-6
35	-369	-264	-187	-132	-93	-65	-45	-31	-22	-15	-10	-7	-5
30	-324	-231	-164	-116	-81	-57	-39	-27	-19	-13	-9	-6	-4
25	-278	-198	-141	-99	-69	-48	-34	-23	-16	-11	-8	-5	-4
20	-232	-166	-117	-83	-58	-40	-28	-19	-13	-9	-6	-4	-3
15	-180	-128	-91	-64	-45	-31	-22	-15	-10	-7	-5	-3	-2
10	-128	-91	-64	-45	-32	-22	-15	-11	-7	-5	-3	-2	-2
5	-64	-45	-32	-23	-16	-11	-8	-5	-4	-3	-2	-1	-1
0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ref Cycle 20 NuPOP MOL (12000 MWD/MTU)
Rev. 46

**Answer
Key**

[Signature]
RE APPROVED
5/24/11
EFFECTIVE DATE

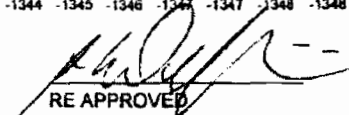
2-GRAPH-RV-5

Indian Point Unit 2 Cycle 20
Effective Samarium Worth (PCM) vs Time Following Plant Trip
After Steady State Operation at MCL (12000 MWD/MTU)

Power (%)	Time After Trip (Hours)																																																	
	0	5	10	15	20	25	30	35	40	50	60	70	80	90	100	120	140	160	180	200	220	240	260	280	300	350	400																							
100	-1009	-1021	-1033	-1043	-1054	-1063	-1072	-1080	-1088	-1102	-1114	-1125	-1135	-1143	-1150	-1162	-1172	-1179	-1184	-1189	-1192	-1195	-1196	-1198	-1199	-1201	-1202	-1203	-1204	-1205	-1206	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219								
95	-1016	-1028	-1039	-1049	-1059	-1068	-1077	-1085	-1092	-1106	-1118	-1129	-1138	-1146	-1153	-1165	-1174	-1181	-1186	-1190	-1193	-1196	-1198	-1199	-1200	-1202	-1203	-1204	-1205	-1206	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224				
90	-1023	-1035	-1045	-1056	-1065	-1074	-1082	-1090	-1097	-1111	-1122	-1133	-1142	-1149	-1156	-1168	-1177	-1183	-1189	-1193	-1196	-1198	-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226			
85	-1029	-1040	-1051	-1060	-1070	-1078	-1086	-1094	-1101	-1114	-1125	-1135	-1144	-1151	-1158	-1169	-1178	-1184	-1189	-1193	-1196	-1198	-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227		
80	-1036	-1047	-1057	-1066	-1075	-1084	-1091	-1099	-1106	-1118	-1129	-1138	-1147	-1154	-1161	-1171	-1180	-1186	-1191	-1194	-1197	-1200	-1201	-1202	-1203	-1204	-1205	-1206	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227			
75	-1048	-1058	-1068	-1077	-1085	-1093	-1101	-1108	-1114	-1126	-1137	-1146	-1154	-1161	-1167	-1177	-1185	-1191	-1195	-1199	-1202	-1204	-1206	-1207	-1208	-1209	-1210	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227	-1228	-1229	-1230	-1231		
70	-1060	-1070	-1079	-1088	-1096	-1103	-1111	-1117	-1123	-1135	-1145	-1153	-1161	-1168	-1174	-1183	-1191	-1197	-1201	-1205	-1207	-1209	-1211	-1212	-1213	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227	-1228	-1229	-1230	-1231	-1232	-1233	-1234	-1235	-1236		
65	-1072	-1081	-1090	-1098	-1106	-1113	-1120	-1126	-1132	-1143	-1152	-1161	-1168	-1174	-1180	-1189	-1196	-1202	-1206	-1209	-1212	-1214	-1215	-1216	-1217	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227	-1228	-1229	-1230	-1231	-1232	-1233	-1234	-1235	-1236	-1237	-1238	-1239	-1240	-1241	
60	-1084	-1093	-1101	-1109	-1116	-1123	-1129	-1135	-1141	-1151	-1160	-1168	-1175	-1181	-1188	-1195	-1201	-1207	-1211	-1214	-1216	-1218	-1219	-1220	-1221	-1222	-1223	-1224	-1225	-1226	-1227	-1228	-1229	-1230	-1231	-1232	-1233	-1234	-1235	-1236	-1237	-1238	-1239	-1240	-1241	-1242	-1243	-1244	-1245	-1246
55	-1103	-1111	-1119	-1126	-1133	-1140	-1146	-1151	-1157	-1166	-1175	-1182	-1189	-1194	-1199	-1207	-1214	-1219	-1222	-1225	-1228	-1229	-1231	-1232	-1233	-1234	-1235	-1236	-1237	-1238	-1239	-1240	-1241	-1242	-1243	-1244	-1245	-1246	-1247	-1248	-1249	-1250	-1251	-1252	-1253	-1254	-1255	-1256	-1257	
50	-1123	-1131	-1138	-1145	-1151	-1157	-1163	-1168	-1173	-1182	-1190	-1197	-1203	-1208	-1213	-1220	-1226	-1231	-1234	-1237	-1239	-1241	-1242	-1243	-1244	-1245	-1246	-1247	-1248	-1249	-1250	-1251	-1252	-1253	-1254	-1255	-1256	-1257	-1258	-1259	-1260	-1261	-1262	-1263	-1264	-1265	-1266	-1267	-1268	
45	-1142	-1149	-1156	-1162	-1168	-1174	-1179	-1184	-1188	-1197	-1204	-1210	-1216	-1221	-1225	-1232	-1238	-1242	-1245	-1248	-1250	-1251	-1252	-1253	-1254	-1255	-1256	-1257	-1258	-1259	-1260	-1261	-1262	-1263	-1264	-1265	-1266	-1267	-1268	-1269	-1270	-1271	-1272	-1273	-1274	-1275	-1276	-1277	-1278	
40	-1161	-1168	-1174	-1180	-1185	-1190	-1195	-1200	-1204	-1211	-1218	-1224	-1229	-1234	-1238	-1244	-1249	-1253	-1256	-1258	-1260	-1261	-1262	-1263	-1264	-1265	-1266	-1267	-1268	-1269	-1270	-1271	-1272	-1273	-1274	-1275	-1276	-1277	-1278	-1279	-1280	-1281	-1282	-1283	-1284	-1285	-1286	-1287	-1288	-1289
35	-1191	-1197	-1203	-1208	-1213	-1218	-1222	-1226	-1230	-1237	-1243	-1249	-1253	-1257	-1261	-1267	-1272	-1275	-1278	-1280	-1282	-1283	-1284	-1285	-1286	-1287	-1288	-1289	-1290	-1291	-1292	-1293	-1294	-1295	-1296	-1297	-1298	-1299	-1300	-1301	-1302	-1303	-1304	-1305	-1306	-1307	-1308	-1309	-1310	-1311
30	-1221	-1226	-1232	-1236	-1241	-1245	-1249	-1253	-1256	-1263	-1268	-1273	-1277	-1281	-1284	-1290	-1294	-1297	-1300	-1302	-1303	-1304	-1305	-1306	-1307	-1308	-1309	-1310	-1311	-1312	-1313	-1314	-1315	-1316	-1317	-1318	-1319	-1320	-1321	-1322	-1323	-1324	-1325	-1326	-1327	-1328	-1329	-1330	-1331	-1332
25	-1250	-1255	-1260	-1264	-1268	-1272	-1275	-1279	-1282	-1287	-1292	-1297	-1301	-1304	-1307	-1312	-1315	-1318	-1321	-1322	-1324	-1325	-1326	-1327	-1328	-1329	-1330	-1331	-1332	-1333	-1334	-1335	-1336	-1337	-1338	-1339	-1340	-1341	-1342	-1343	-1344	-1345	-1346	-1347	-1348	-1349	-1350	-1351	-1352	-1353
20	-1280	-1284	-1288	-1292	-1296	-1299	-1302	-1305	-1308	-1313	-1317	-1321	-1325	-1328	-1330	-1335	-1338	-1340	-1342	-1344	-1345	-1346	-1347	-1348	-1349	-1350	-1351	-1352	-1353	-1354	-1355	-1356	-1357	-1358	-1359	-1360	-1361	-1362	-1363	-1364	-1365	-1366	-1367	-1368	-1369	-1370	-1371	-1372	-1373	-1374

Ref. Cycle 20 NuPOP
 Rev. 47

Answer
Key


 RE APPROVED
5/24/11
 EFFECTIVE DATE

2-GRAPH-RV-6

INDIAN POINT STATION**UNIT NO. 2 - CYCLE 20**Xenon/Samarium (Xe/Sm) Correction Factors

<u>Boron Concentration (PPM)</u>	<u>Xe/Sm Correction Factor</u>
0	1.000
75	0.992
150	0.985
225	0.977
300	0.970
375	0.962
450	0.955
525	0.948
600	0.941
675	0.934
750	0.926
825	0.919
900	0.912
975	0.905 (7.4)
1050	0.899
1125	0.892
1200	0.885
1275	0.878
1350	0.872
1425	0.865
1475	0.861 (10.4)
1500	0.858
1575	0.852
1650	0.845
1725	0.839
1800	0.832

Answer
Key

[Signature]
RE - Approved

5/24/11
Effective Date

Ref. Cycle 20 NuPOP - MOL (12000 MWD/MTU)
Rev. 50

2-GRAPH-RV-7

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The unit had been operating for 300 Days at 100% power.
- A Unit trip occurred due to a Main Transformer Fire
- The unit has been shutdown for 20 days (January 20, 2012 at 10:00) to effect repairs
- Prior to the trip:
 - Control Bank D at 223
 - Boron Concentrations 975 ppm
- Current Plant Conditions:
 - Tavg 547°F
 - Boron Concentrations 1472
- The Plant Computer is Out of Service
- Estimated time of Criticality 20:00 tonight
- The spare RO prepared a manual ECP

Initiating Cue:

You are the CRS and the SM has directed you to review the ECP.

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
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1.0 EQUILIBRIUM CONDITIONS PRIOR TO SHUTDOWN	
1.1 DATE	20 January 2012
TIME	10:00
1.2 CONTROL BANK	0
STEPS	223
1.3 BORON CONCENTRATION (PPM)	975
1.4 POWER LEVEL (%)	100%

2.0 ESTIMATED CRITICAL CONDITION FOR STARTUP	
2.1 DATE	TODAY
TIME	20:00
2.2 TAVG	547°F
2.3 BORON CONCENTRATION (PPM)	1472 ppm
2.4 LENGTH OF SHUTDOWN (HRS)	> 490
FROM DATE/TIME	20 January 2012 10:00

3.0 ROD DIFFERENTIAL	
3.1 REMAINING ROD WORTH AT POSITION (1.2) GRAPH RV-1	0 (R5)

4.0 POWER DEFECT	
4.1 POWER DEFECT AT BORON (1.3) AND POWER (1.4) GRAPH RV-2	1623.9 (R5)

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

2-SOP-15.4
Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 2 of 8)

NOTE

The sign of reactivity in section 5.0 will be negative (-) if boron at estimated critical condition is greater than boron at prior to shutdown condition (and vice versa).

5.0 EFFECT FROM BORON CONCENTRATION CHANGE

5.1 BORON CONCENTRATION DIFFERENTIAL = (1.3) - (2.3) = (±)PPM

BORON CONCENTRATION DIFFERENTIAL = (975) - (1472) = (-)497 PPM

5.2 BORON WORTH AT AVERAGE OF BORON (1.3) AND (2.3) GRAPH RV-3

BORON WORTH AT AVERAGE OF BORON = $[(975) + (1472)] / 2 = 1223.5$ PPM

GRAPH RV-3 BORON WORTH = (+) 7.14 PCM/PPM

5.3 REACTIVITY FROM BORON CONCENTRATION CHANGE = $[(5.1) \times (5.2)] = (\pm)PCM$

REACTIVITY FROM BORON CONCENTRATION CHANGE = $[(497) \times (+)7.14]$

REACTIVITY FROM BORON CONCENTRATION CHANGE = 3584.6

6.0 TEMPERATURE DEFE

6.1 REACTIVITY DUE TO TAVG AT
BORON CONCENTRATION (1.3)
AND TAVG (2.2) GRAPH RV-4

0

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

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7.0 XENON/SAMARIUM PRIOR TO SHUTDOWN			
7.1 Xe DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-5	(-)	2833	PCM
7.2 Sm DEFECT AT POWER (1.4) AND TIME ZERO GRAPH RV-6	(-)	1009	PCM
7.3 SUM OF ITEMS (7.1) AND (7.2)	(-)	3842	PCM
7.4 Xe/Sm CORRECTION FACTOR AT BORON(1.3) GRAPH RV-7		0.905	
7.5 CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [(7.3)×(7.4)] = (-) PCM			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = [((-)3842) × (.905)]			
CORRECTED Xe/Sm PRIOR TO SHUTDOWN = (-) 3477 PCM			

8.0 XENON POWER FOR STARTUP			
8.1-HRS PRIOR TO SHUTDOWN	AVERAGE PERCENT POWER	MULTIPLIER	PRODUCT
0-1		0.07	
1-4		0.23	
4-9		0.22	
9-16		0.20	
16-25		0.22	
25-36		0.06	
			SUM TOTAL %
8.2 XENON POWER = SUM TOTAL (8.1) OR = PERCENT POWER IF POWER ESSENTIALLY CONSTANT FOR LAST 36 HOURS.			160%
XENON % =			

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
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9.0. SAMARIUM POWER FOR STARTUP	
9.1-DAYS PRIOR TO SHUTDOWN	AVERAGE POWER
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
SUM TOTAL	
9.2 SAMARIUM POWER = SUM TOTAL/10 SAMARIUM POWER/10 = PERCENT OR = PERCENT IF POWER ESSENTIALLY CONSTANT FOR LAST 10 DAYS SAMARIUM % =	

100%

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

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Rev. 10

ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

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10.0 XENON/SAMARIUM AT STARTUP		
10.1 Xe DEFECT AT POWER (8.2) AND TIME (2.4) GRAPH RV-5	(-) 0	PCM
10.2 Sm DEFECT AT POWER (9.2) AND TIME (2.4) GRAPH RV-6	(-) 1202	PCM
10.3 SUM OF (10.1) + (10.2)	(-) 1202	PCM
10.4 Xe/Sm CORRECTION FACTOR AT BORON (2.3) GRAPH RV-7	0.861	
10.5 CORRECTED Xe/Sm AT STARTUP = (10.3) × (10.4) = (-) PCM		
CORRECTED Xe/Sm AT STARTUP = (1202) × (0.86) = (-) 1033.72 PCM		

11.0 CORRECTED XENON/SAMARIUM DIFFERENTIAL	
11.1 CORRECTED XENON/SAMARIUM DIFFERENTIAL = (10.5) - (7.5)	(±)PCM
CORRECTED XENON/SAMARIUM DIFFERENTIAL = [(-) 1033.72] - [(-) 3477] =	2443.28 (±)

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION

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NOTE

IF Total Reactivity Effect in step 12.1 is negative OR IF estimated Critical Rod Position step 13.1 differs from desired startup position, THEN a Boron Concentration Adjustment is required per Section 14.0

12.0 TOTAL REACTIVITY EFFECT	
12.1 TOTAL REACTIVITY EFFECT = (3.1) + (4.1) + (5.3) + (6.1) + (11.1)	(±)PCM
TOTAL REACTIVITY EFFECT = () + () + () + () + () = 1623.9 + 6358.6 + 0 + 2443.72	(+) 483.0 PCM

13.0 ESTIMATED CRITICAL ROD POSITION		
13.1 POSITION AT REACTIVITY (12.1) GRAPH RV-1	BANK	STEPS
	D	106

ESTIMATE PERFORMED BY (RO/CRS/REACTOR ENGINEER)	DATE

ESTIMATE REVIEWED BY (SM/REACTOR ENGINEER)	DATE

**ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION**

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**ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
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NOTES	
To check sign of calculated boron change:	
<ul style="list-style-type: none"> • The sign is negative (dilution) for more inserted critical rod position. • The sign is positive (boration) for more withdrawn critical rod position. 	

14.0 BORON CONCENTRATION ADJUSTMENT	
14.1- DESIRED ECP	
BANK	
STEPS	
REACTIVITY VALUE GRAPH RV-1	(+) PCM
14.2 REACTIVITY CHANGE REQUIRED (12.1) - (14.1) =	
[()] - [(+)]	() PCM
14.3 BORON WORTH AT BORON (2.3) GRAPH RV-3	(+) PCM/PPM
14.4 REQUIRED BORON CHANGE (14.2)/(14.3)=	
[()] / [(+)]	() PPM
14.5 REVISED STARTUP BORON CONCENTRATION IS THE SUM OF (2.3) AND (14.4)	
[] + [()]	PPM
14.6 USING REVISED STARTUP BORON (14.5), REPEAT THIS CALCULATION STARTING AT STEP (1.0)	INITIAL

ESTIMATED CRITICAL ROD POSITION
AND BORON CONCENTRATION CALCULATION

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ATTACHMENT 1 DATA SHEET ESTIMATED CRITICAL POSITION
(Page 8 of 8)

15.0 CRITICAL DATA (STABLE AT APPROXIMATELY 1.0×10^{-8} AMPS)	
BANK	
STEPS	
TAVG	
BORON CONCENTRATION	
DATE	
TIME	
PERFORMED BY (RO/CRS)	
REVIEWED BY SM	

Facility: Indian Point Unit 2Task No: 0080030402Task Title: **Determine Isolation Boundaries for CCW Leak Using Plant Print**K/A Reference: 1940012125
SRO 4.2Job Performance Measure
No: _____SRO
Admin-2

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	X	Actual Performance	
Classroom	X	Simulator	Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The plant is in cold shutdown on RHR
- CCW Surge Tank level is lowering at approximately 0.5% per minute
- The NPO in Containment reports a significant leak downstream of Check Valve 770 CCW Supply to RCPs.

Task Standard: Isolation boundary valves identified and NPOs notified to close valves.

Required Materials:

General References: 227781 Auxiliary Coolant System sheet 1
9321-2720 Auxiliary Coolant System sheet 2
9321-2746 Isolation Valve Seal Water System

Initiating Cue: You are the FSS and the CRS has directed you to identify all valves that must be shut to isolate the leak on Check Valve 770.

Identify valves needed for Isolation and list below.

Time Critical Task: No

Validation Time: 25 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain Prints

Standard: Obtains Prints:
227781 Auxiliary Coolant System sheet 1
9321-2720 Auxiliary Coolant System sheet 2
9321-2746 Isolation Valve Seal Water System

Comment:

✓ 2. Performance Step: Determine MOV-769 and/or 797 must be shut

Standard: Identifies MOV-769 and/or 797 must be shut

Comment: Both valves are operated from the same switch in the control room. Either valve will satisfy the requirement.

✓ 3. Performance Step: Determine 734C must be shut

Standard: Identifies 734C, Supply Stop must be shut

Comment: Print 9321-2720

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4. **Performance Step: Determine 771A – D must be shut**

Standard: Identifies 771A – D

Comment: Print 9321-2720

5. Performance Step: Determine Isolation Valve Seal Water System valve 1421, RCPs Cooling Water Inlet Stop must be closed

Standard: Identify 1421 must be closed

Comment: Print 9321-2746. Candidate may or may not identify this valve for isolation. This step is NOT critical.

Terminating Cue: JPM Complete

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The plant is in cold shutdown on RHR
- CCW Surge Tank level is lowering at approximately 0.5% per minute
- The NPO in Containment reports a significant leak downstream of Check Valve 770 CCW Supply to RCPs.

Initiating Cue:

You are the FSS and the CRS has directed you to identify all valves that must be shut to isolate the leak on Check Valve 770.

Identify valves needed for Isolation and list below.

Facility: Indian Point Unit 2Task No: 2000700102Task Title: **Review a Completed Surveillance Test**K/A Reference: 1940012212
SRO – 4.2Job Performance Measure
No: _____SRO
Admin - 3

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u> </u> X	Actual Performance	<u> </u>
Classroom	<u> </u> X	Simulator	<u> </u>
		Plant	<u> </u>

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- 2-PT-M110 was completed 5 hours ago
- A Peer Review was completed

Task Standard: Surveillance Test Reviewed and errors found.

Required Materials: Completed 2-PT-M110

General References: IP-SMM-DC-904

Initiating Cue: You are the FSS and the SM has directed you to review the completed 2-PT-M110 in accordance with IP-SMM-DC-904

Time Critical Task: No

Validation Time: 30 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain copy of IP-SMM-DC-904

Standard: Obtains copy of procedure, Reviews P&Ls and goes to Step 6.5.3

Comment: CUE: Hand out copy of IP-SMM-DC-904 with completed surveillance test procedure

2. Performance Step: Spot Check Review completed Surveillance Test

Standard: Identify missing initials at step 4.2.1

Comment: This is not critical for SROs.
Step 6.5.3.1
"The primary focus of this review is to ensure that all OPERABILITY criteria and test criteria are satisfied – other sections of the ST may be spot-checked at the reviewer's discretion."

✓ 3. Performance Step: **Determine Jacket Water Temperature is less than minimum**

Standard: **Identify 163° is below the limit of 165°**

Comment:

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4. **Performance Step:** Identify that Jacket Water Temp is NOT Acceptable

Standard: Identify that YES is incorrectly circled

Comment:

✓ 5. **Performance Step:** Identify that TRM Acceptance Criteria is NOT correct

Standard: Identify that YES is incorrectly circled

Comment:

✓ 6. **Performance Step:** Determines PT is NOT Satisfactory and does not sign

Standard: Candidate should document errors found in test.
Does Not Sign for Review

Comment:

Terminating Cue: JPM Complete



Entergy

Nuclear Northeast



Procedure Use Is:

- Continuous
- Reference
- Information

Control Copy: _____

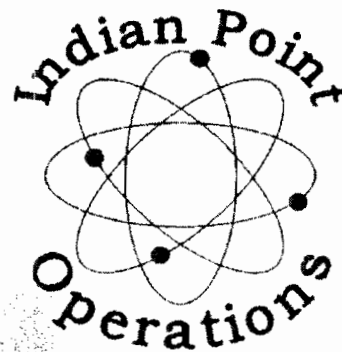
Effective Date: 12/31/2010

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2-PT-M110, Revision 6 ^{BA TODAY}
APPENDIX R DG FUNCTIONAL TEST

Approved By:

John B. Letts *[Signature]* 11/5/10
 RPO or Designee: **Print Name / Sign / Date**



Team 2A
 Procedure Owner

**ANSWER
 KEY**

EDITORIAL REVISION

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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REVISION SUMMARY

(Page 1 of 1)

1.0 REASON FOR REVISION

1.1 Incorporate feedback IP2-10135.

2.0 SUMMARY OF CHANGES

- 2.1 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] revised wording in Prerequisite 3.3: from "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a glycol sample approximately 1 hour after diesel operations are secured" to "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured".
- 2.2 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] added CR-IP2-2010-00036, CA#9 to Development Docs step 9.2.7.

ANSWER KEY

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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ANSWER KEY

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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1.0 PURPOSE

1.1 This procedure establishes requirements for the following:

- 1.1.1 Starting and running the SBO / Appendix R diesel generator for a period of time sufficient to reach stable operating temperatures in accordance with TRS 3.8.B.5.
- 1.1.2 Demonstrating proper operation of Appendix R DG output breaker SBO/ASS in accordance with TRS 3.8.B.5.
- 1.1.3 Demonstrating proper city water line up to the Appendix R DG heat exchangers in accordance with TRS 3.7.E.2.
- 1.1.4 Verifying exhaust area fan runs in accordance with Vendor Recommendations.

1.2 This procedure applies to the following:

- 1.2.1 Appendix R DG
- 1.2.2 Breaker SBO/ASS

ANSWER KEY

2.0 PRECAUTIONS AND LIMITATIONS**2.1 Precautions And Limitations**

- 2.1.1 This test may be performed in any plant mode.
- 2.1.2 It is preferable to perform this test during daylight hours to facilitate the observation of Appendix R DG exhaust.
- 2.1.3 Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

2.2 General Information

- 2.2.1 Test personnel SHALL complete Sections 3.0, 4.0, 5.0, 6.0, and 7.0, as applicable.
- 2.2.2 Personnel directing this test SHALL read it in its entirety prior to performance. Personnel otherwise involved SHALL read applicable sections.
- 2.2.3 Any discrepancies found SHALL be identified in Section 5.0. Comments.
- 2.2.4 Attachment 1, Appendix R DG Data Sheet, captures all of the data required by Attachment 1, in SOP-27.6, Appendix R Diesel Generator Operation. Therefore completion of Attachment 1 in SOP-27.6, Appendix R Diesel Generator Operation, is NOT required during performance of this test.

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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2.25

Appendix R DG will be operated for a minimum of 1 hour at 2005 to 2045 KW to establish operability criteria. The test period may be extended as necessary to obtain data after temperature stability is reached.

**ANSWER
KEY**

APPENDIX R DG FUNCTIONAL TEST

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Initials

3.0 PREREQUISITES

3.1 Equipment required for test:

EQUIPMENT	M&TE No.	CAL DUE DATE
Sample Bottle (minimum capacity 4 ounces)	N/A	N/A

3.2 OBTAIN a current copy of 2-SOP-27.6, Appendix R Diesel Generator Operation, AND REVIEW Precautions and Limitations.

3.3 NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured (Reference 9.2.7).

3.4 Reason for Test – CHECK applicable listing:

- Normal Surveillance WO # 52297257-01
- Post Maintenance Test WO # _____
WO # _____
WO # _____
- Increased Test Frequency WO # _____
- Other Oil Sample 52297420-01

ANSWER
KEY

APPENDIX R DG FUNCTIONAL TEST

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Initials4.0 PROCEDURE4.1 Initial Conditions

- 4.1.1 OBTAIN permission from SM or Designated Alternate to perform Test:

Shift Manager TODAY
SM or Des. Alt. Signature / Date

4.2 Test of Appendix R Diesel Generator

- 4.2.1 START (Parallel Mode) AND LOAD Appendix R DG to between 2005 and 2045 KW per 2-SOP-27.6, Appendix R Diesel Generator Operation.

- 4.2.2 IF Appendix R DG does NOT start OR load, THEN:

4.2.2.1 NOTIFY the SM. NA

4.2.2.2 DOCUMENT in detail any problems and/or specific components that may have caused the failure in Section 5.0. NA

- 4.2.3 WHEN Appendix R DG reaches load window of 2005-2045 KW, THEN RECORD time and load:

Time 5 HOURS AGO

Load 2000 KW JS

- 4.2.4 VERIFY the DG Area fan is running. JS

- 4.2.5 WHEN lube oil and jacket water temperatures stabilize, THEN INITIATE data collection every 30 minutes in accordance with Attachment 1, Appendix R DG Data Sheet. JS

- 4.2.6 WHEN lube oil and jacket water temperatures have stabilized during load run, THEN OBSERVE exhaust from Appendix R DG. JS

**ANSWER
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APPENDIX R DG FUNCTIONAL TEST

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Initials

- 4.2.7 CHECK appropriate box indicating color of Appendix R DG exhaust observed.

APPENDIX R DG EXHAUST COLOR					
CLEAR	<input checked="" type="checkbox"/>	LT. GRAY	<input type="checkbox"/>	BLACK	<input type="checkbox"/>
WHITE	<input type="checkbox"/>	DK. GRAY	<input type="checkbox"/>	BLUE	<input type="checkbox"/>

NOTE

Momentary excursions outside the desired loading of 2005 to 2045 KW do **NOT** invalidate the test results.

- 4.2.8 MAINTAIN Appendix R DG load at 2005 to 2045 KW for a minimum of 1 hour.

- 4.2.9 RECORD present time and run time at target load (2005 - 2045 KW):

Present time CURRENT TIME

Time loaded \geq 2005 KW 77 minutes (\geq 1 hour)

- 4.3.10 **WHEN** time and load conditions have been met, **THEN UNLOAD AND SECURE** Appendix R DG (Parallel Mode) per 2-SOP-27.6, Appendix R Diesel Generator Operation.

**ANSWER
KEY**

4.3 **Restoration**

- 4.3.1 OBTAIN a lube oil sample of approximately 4 ounces from the Appendix R DG dipstick.

- 4.3.2 LABEL lube oil sample with the following information:

Unit 2 Appendix R DG

2-PT-M110

Date

- 4.3.3 VERIFY GT1 North and South combined Fuel Oil Storage Tank level is greater than or equal to 12,500 gallons.

APPENDIX R DG FUNCTIONAL TEST

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		<u>Initials</u>
4.3.4	VERIFY Fuel Oil Day Tank level is between 7/8 - FULL.	<u>JS</u>
4.3.5	VERIFY UW-831, City Water Supply Valve For Appendix 'R' Diesel Gen. Heat Exchangers, is open.	<u>JS</u>
4.3.6	VERIFY UW-833, City Water Supply Line Valve For Appendix 'R' Diesel Gen. J/W Heat Exchanger, is open.	<u>JS</u>
4.3.7	VERIFY UW-837, City Water Supply Line Valve For Appendix 'R' Diesel Gen. A/C Heat Exchanger, is open.	<u>JS</u>
4.3.8	NOTIFY CRS or SM the Appendix R DG has been returned to standby service.	<u>JS</u>
4.3.9	DELIVER lube oil sample to Maintenance.	<u>JS</u>

**ANSWER
KEY**

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5.0 COMMENTS

① There is no TE to read

ANSWER KEY

Test Performers:

Print Name:

Initials:

Signature/Date:

Tim Jenkins

TJ

Tim Jenkins 1/24/12

Tom Feenan

TF

Tom Feenan 1/24/12

Greg Wenzel

GW

Greg Wenzel 1/24/12

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6.0 ACCEPTANCE CRITERIA

6.1 TRM Requirements

Equipment/Parameter/Instrument	Step/Att.	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
Generator Output Breaker / SBO/ASS	4.2.1	TRS 3.8.B.5	Breaker Closes	N/A	<input checked="" type="checkbox"/> YES / NO	a
AC Wattmeter – Generator / WM	4.2.9		Load >2005 KW Maintained For ≥ 1 Hour	<input checked="" type="checkbox"/> YES / NO	YES / NO	e
Jacket Water Temp	Att. 1		165-198 °F (60 Min Data)	163 °F	<input checked="" type="checkbox"/> YES / NO	a
Lube Oil Temp	Att. 1		≤ 250°F (60 Min Data)	212 °F	<input checked="" type="checkbox"/> YES / NO	e
UW-831	4.3.5	TRS 3.7.E.2	OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	a
UW-833	4.3.6		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	e
UW-837	4.3.7		OPEN	OPEN	<input checked="" type="checkbox"/> YES / NO	e

6.2 Other Program Requirements

Equipment	Step	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
DG Area Fan	4.2.4	Vendor Recommendation	Fans Starts	<input checked="" type="checkbox"/> YES / NO	<input checked="" type="checkbox"/> YES / NO	a

7.0 TEST ACCEPTANCE

7.1 TRM Acceptance Criteria

7.1.1 Based on recorded data, are all Acceptance Criteria of Section 6.1 satisfied?

YES NO N/A

7.1.2 IF all Acceptance Criteria of Section 6.1 are NOT satisfied. THEN:

- NOTIFY CRS/SM to declare Appendix R Diesel Generator inoperable.
- INITIATE a WR and a CR.
- TAKE applicable action in accordance with TRO 3.8.B.

ANSWER KEY

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7.2 **Other Programs Acceptance Criteria**

7.2.1 Based on the recorded data, are all Acceptance Criteria of Section 6.2 satisfied?

7.2.2 YES NO N/A

7.2.2 IF component(s) failed to meet the Acceptance Criteria of Section 6.2, THEN:

- NOTIFY CRS/SM.
 - INITIATE a WR and a CR.
- NA

7.3 IF NO is circled in Step 7.1.1 OR Step 7.2.1, THEN LIST corrective action(s) taken, with any comments:

Comments: Candidate should enter here that the Surveillance Test Failed to meet acceptance criteria

Reviewed By: _____
SM or Des. Alt: **Print Name / Sign / Date**

8.0 EVALUATION

8.1 SURVEILLANCE COORDINATOR REVIEW

Comments: _____

**ANSWER
KEY**

Reviewed By: _____
Surveillance Coordinator Review. **Print Name / Sign / Date**

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9.0 REFERENCES**9.1 Commitment Documents**

None

9.2 Development Documents

- 9.2.1 250907, Electrical Distribution and Transmission System
- 9.2.2 400882, Station Blackout and Appendix R Diesel Generator Set P&ID Diesel Cooling Water System Mechanical
- 9.2.3 EC-5000033794, IP2 Station Blackout and Appendix R Diesel Generator Set
- 9.2.4 NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
- 9.2.5 NSAC-108, Reliability of Diesel Generators at U.S. Power Plants
- 9.2.6 Cummins Operation and Maintenance Manual QSK78 Series Engines
- 9.2.7 CR-IP2-2010-00036, CA#9

9.3 Interface Documents

- 9.3.1 2-SOP-27.6, Appendix R Diesel Generator Operation
- 9.3.2 TRO 3.8.B
- 9.3.3 TRS 3.7.E.2

10.0 RECORDS AND DOCUMENTATION**10.1 Records**

The following required records resulting from this procedure are controlled and maintained in accordance with the IPEC Records Retention Schedule.

- 10.1.1 This Performance Procedure becomes a Quality Record when completed.

10.2 Documentation

None

**ANSWER
KEY**


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**ATTACHMENT 1,
APPENDIX R DG DATA SHEET**
(Page 1 of 1)

Date: TODAY

PARAMETER	FULL LOAD	TIME/ READINGS			
		0	30	60	90
Appendix R DG Engine Data					
Coolant Temperature	≥ 40 - ≤ 215 °F	160	162	163	
Lube Oil Pressure	≥ 45 psig	79	76	77	
Engine Speed	1800 RPM	1801	1801	1801	
Fuel Pump Pressure	200 - 400 psig @ 1800 RPM	378	371	382	
Fuel Inlet Temperature	≤ 150 °F	73	77	84	
Coolant Pressure	≥ 11 psig	25	25	24	
Lube Oil Temperature	≤ 250 °F	181	210	212	
Lube Oil Level (Between Run High / Run Low)	Midpoint	1/2	1/2	1/2	
Air Intake Temperature	≤ 180 °F	135	136	136	
After Cooler Temperature	≤ 160 °F	107	107	107	
Appendix R D/G Generator Data					
L1 Amps	≤ 141.0 Amps	94	94	94	
L2 Amps	≤ 141.0 Amps	88	87	88	
L3 Amps	≤ 141.0 Amps	87	87	88	
Frequency	59.7 - 60.3 Hz	60.0	60.0	60.0	
Total kW	≤ 2700 kW	2013	2011	2007	
Total kVA	≤ 3375 kVA	2226	2220	2201	
Total PF (nominal 0.9)	(≥ 0.8 - ≤ 0.95)	.9	.9	.9	
Appendix R DG Other Data					
Day Tank Level	7/8 - Full	7/8	7/8	7/8	
PI-8030, Day Tank Fill Pump Pressure	psig	55	55	55	
TE-8027, Day Tank Oil Cooler Temperature	F	①	①	①	
Lube Oil Reservoir Sight Glass Level	3/4 - Full	3/4	3/4	3/4	
LG-8032, Jacket Water Surge Tank Sight Glass Level	2/3 - 3/4	3/4	3/4	3/4	
LG-8031, After Cooler Surge Tank Sight Glass Level	2/3 - 3/4	3/4	2/3	2/3	
TI-908, Jacket Water Heat Exchanger Outlet Temperature	F	115	121	121	
TI-909 After Cooler Heat Exchanger Outlet Temperature	F	73	72	72	
FI-7979, Appendix R DG Jacket Water Flow (City Water)	≤ 118 gpm	160	160	160	
FI-7979, Appendix R DG Jacket Water Flow (Service Water)	≤ 160 gpm				
FI-7980, Appendix R DG Aftercooler Water Flow (City Water)	≤ 87 gpm	135	135	135	
FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)	≤ 137 gpm				
Battery Voltage	≥ 24 VDC	26.6	26.8	26.7	

**ANSWER
KEY**

	IPEC SITE MANAGEMENT MANUAL	QUALITY RELATED ADMINISTRATIVE PROCEDURE	IP-SMM DC-904	Revision 3
		INFORMATIONAL USE	Page	20 of 20

ATTACHMENT 10.2

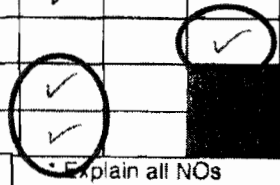
PEER REVIEW SHEET

PEER REVIEW SHEET

PROCEDURE NUMBER: 2-PT-M110

DATE PERFORMED: TODAY

	YES	NO*	N/A
1. Calibration due dates recorded?			✓
2. Instrument(s) within calibration?			✓
3. Changes documented by TPC?			✓
4. All required procedural steps completed?	✓		
5. All steps <u>NOT</u> completed noted & explained in Comments Section?			✓
6. All corrections lined out, dated and initialed?			✓
7. All calculations correct?	✓		
8. All data properly transcribed?	✓		
9. Required CRs, WOs, PFs or CTSs, etc. initiated?			✓
10. Operability conclusions correct?	✓		
11. Overall acceptance conclusions correct?	✓		



* Explain all NOs

COMMENTS:

**ANSWER
KEY**

PEER REVIEWER: _____
Signature/Date

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- 2-PT-M110 was completed 5 hours ago
- A Peer Review was completed

Initiating Cue:

You are the FSS and the SM has directed you to review the completed 2-PT-M110 in accordance with IP-SMM-DC-904.



Entergy

Nuclear Northeast



Procedure Use Is:

- Continuous
- Reference
- Information

Control Copy: _____

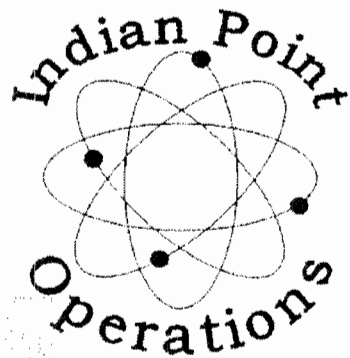
Effective Date: 12/24/2010

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2-PT-M110, Revision **6** ^{DMJ TODAY}
APPENDIX R DG FUNCTIONAL TEST

Approved By:

John B. Heltzer *[Signature]* 11/18/10
 RPO or Designee: **Print Name / Sign / Date**



Team 2A
 Procedure Owner

EDITORIAL REVISION

APPENDIX R DG FUNCTIONAL TEST

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REVISION SUMMARY

(Page 1 of 1)

1.0 REASON FOR REVISION

1.1 Incorporate feedback IP2-10135.

2.0 SUMMARY OF CHANGES

2.1 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] revised wording in Prerequisite 3.3: from "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a glycol sample approximately 1 hour after diesel operations are secured" to "NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured".

2.2 **Editorial change** [per step 4.6.13 of IP-SMM-AD-102] added CR-IP2-2010-00036, CA#9 to Development Docs step 9.2.7.

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1.0 PURPOSE

- 1.1 This procedure establishes requirements for the following:
- 1.1.1 Starting and running the SBO / Appendix R diesel generator for a period of time sufficient to reach stable operating temperatures in accordance with TRS 3.8.B.5.
 - 1.1.2 Demonstrating proper operation of Appendix R DG output breaker SBO/ASS in accordance with TRS 3.8.B.5.
 - 1.1.3 Demonstrating proper city water line up to the Appendix R DG heat exchangers in accordance with TRS 3.7.E.2.
 - 1.1.4 Verifying exhaust area fan runs in accordance with Vendor Recommendations.
- 1.2 This procedure applies to the following:
- 1.2.1 Appendix R DG
 - 1.2.2 Breaker SBO/ASS

2.0 PRECAUTIONS AND LIMITATIONS**2.1 Precautions And Limitations**

- 2.1.1 This test may be performed in any plant mode.
- 2.1.2 It is preferable to perform this test during daylight hours to facilitate the observation of Appendix R DG exhaust.
- 2.1.3 Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

2.2 General Information

- 2.2.1 Test personnel SHALL complete Sections 3.0, 4.0, 5.0, 6.0, and 7.0, as applicable.
- 2.2.2 Personnel directing this test SHALL read it in its entirety prior to performance. Personnel otherwise involved SHALL read applicable sections.
- 2.2.3 Any discrepancies found SHALL be identified in Section 5.0, Comments.
- 2.2.4 Attachment 1, Appendix R DG Data Sheet, captures all of the data required by Attachment 1, in SOP 27.6, Appendix R Diesel Generator Operation. Therefore completion of Attachment 1 in 2-SOP-27.6, Appendix R Diesel Generator Operation, is NOT required during performance of this test.

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2.2.5

Appendix R DG will be operated for a minimum of 1 hour at 2005 to 2045 KW to establish operability criteria. The test period may be extended as necessary to obtain data after temperature stability is reached.

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Initials

3.0 PREREQUISITES

3.1 Equipment required for test:

EQUIPMENT	M&TE No.	CAL DUE DATE
Sample Bottle (minimum capacity 4 ounces)	N/A	N/A

af

3.2 OBTAIN a current copy of 2-SOP-27.6, Appendix R Diesel Generator Operation, AND REVIEW Precautions and Limitations.

af

3.3 NOTIFY Watch Chemist prior to start of the diesel in order to obtain a coolant sample within 1 hour after diesel operations are secured (Reference 9.2.7).

af

3.4 Reason for Test – CHECK applicable listing:

- Normal Surveillance WO # 52297257-01
- Post Maintenance Test WO # _____
WO # _____
WO # _____
- Increased Test Frequency WO # _____
- Other Oil Sample 52297420-01

af

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Initials4.0 PROCEDURE4.1 Initial Conditions

- 4.1.1 OBTAIN permission from SM or Designated Alternate to perform Test:

Shift Manager TODAY
SM or Des. Alt. Signature / Date

4.2 Test of Appendix R Diesel Generator

- 4.2.1 START (Parallel Mode) AND LOAD Appendix R DG to between 2005 and 2045 KW per 2-SOP-27.6, Appendix R Diesel Generator Operation.

- 4.2.2 IF Appendix R DG does NOT start OR load, THEN:

4.2.2.1 NOTIFY the SM. NA

4.2.2.2 DOCUMENT in detail any problems and/or specific components that may have caused the failure in Section 5.0. NA

- 4.2.3 WHEN Appendix R DG reaches load window of 2005-2045 KW, THEN RECORD time and load:

Time 5 HOURS AGO

Load 2020 KW OF

- 4.2.4 VERIFY the DG Area fan is running. OF

- 4.2.5 WHEN lube oil and jacket water temperatures stabilize, THEN INITIATE data collection every 30 minutes in accordance with Attachment 1, Appendix R DG Data Sheet. OF

- 4.2.6 WHEN lube oil and jacket water temperatures have stabilized during load run, THEN OBSERVE exhaust from Appendix R DG. OF

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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Initials

- 4.27 CHECK appropriate box indicating color of Appendix R DG exhaust observed.

APPENDIX R DG EXHAUST COLOR				
CLEAR	<input checked="" type="checkbox"/>	LT. GRAY	<input type="checkbox"/>	BLACK
WHITE	<input type="checkbox"/>	DK. GRAY	<input type="checkbox"/>	BLUE

df

NOTE

Momentary excursions outside the desired loading of 2005 to 2045 KW do NOT invalidate the test results.

- 4.28 MAINTAIN Appendix R DG load at 2005 to 2045 KW for a minimum of 1 hour.

df

- 4.29 RECORD present time and run time at target load (2005 - 2045 KW):

Present time CURRENT TIME

Time loaded \geq 2005 KW 77 minutes (\geq 1 hour)

df

- 4.30 WHEN time and load conditions have been met, THEN UNLOAD AND SECURE Appendix R DG (Parallel Mode) per 2-SOP-27.6, Appendix R Diesel Generator Operation.

df

4.3 Restoration

- 4.31 OBTAIN a lube oil sample of approximately 4 ounces from the Appendix R DG dipstick.

df

- 4.32 LABEL lube oil sample with the following information:

Unit 2 Appendix R DG

2-PT-M110

Date

df

- 4.33 VERIFY GT1 North and South combined Fuel Oil Storage Tank level is greater than or equal to 12,500 gallons.

df

APPENDIX R DG FUNCTIONAL TEST

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Initials

- ~~4.3.4~~ VERIFY Fuel Oil Day Tank level is between 7/8 - FULL. JF
- ~~4.3.5~~ VERIFY UW-831, City Water Supply Valve For Appendix 'R' Diesel Gen. Heat Exchangers, is open. JF
- ~~4.3.6~~ VERIFY UW-833, City Water Supply Line Valve For Appendix 'R' Diesel Gen. J/W Heat Exchanger, is open. JF
- ~~4.3.7~~ VERIFY UW-837, City Water Supply Line Valve For Appendix 'R' Diesel Gen. A/C Heat Exchanger, is open. JF
- ~~4.3.8~~ NOTIFY CRS or SM the Appendix R DG has been returned to standby service. JF
- ~~4.3.9~~ DELIVER lube oil sample to Maintenance. JF

APPENDIX R DG FUNCTIONAL TEST

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6.0 ACCEPTANCE CRITERIA

6.1 TRM Requirements

Equipment/Parameter/Instrument	Step/Att.	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
Generator Output Breaker / SBO/ASS	4.2.1	TRS 3.8.B.5	Breaker Closes	N/A	<input checked="" type="radio"/> YES / NO	a
AC Wattmeter – Generator / WM	4.2.9		Load >2005 KW Maintained For ≥ 1 Hour	<input checked="" type="radio"/> YES / NO	YES / NO	e
Jacket Water Temp	Att. 1		165-198 °F (60 Min Data)	163 °F	<input checked="" type="radio"/> YES / NO	a
Lube Oil Temp	Att. 1		≤ 250 °F (60 Min Data)	212 °F	<input checked="" type="radio"/> YES / NO	ea
UW-831	4.3.5	TRS 3.7.E.2	OPEN	OPEN	<input checked="" type="radio"/> YES / NO	ae
UW-833	4.3.6		OPEN	OPEN	<input checked="" type="radio"/> YES / NO	ca
UW-837	4.3.7		OPEN	OPEN	<input checked="" type="radio"/> YES / NO	ca

6.2 Other Program Requirements

Equipment	Step	Surveillance Requirement	Acceptance Criteria	Actual	Acceptable	Initials
DG Area Fan	4.2.4	Vendor Recommendation	Fans Starts	<input checked="" type="radio"/> YES / NO	<input checked="" type="radio"/> YES / NO	ca

7.0 TEST ACCEPTANCE

7.1 TRM Acceptance Criteria

7.1.1 Based on recorded data, are all Acceptance Criteria of Section 6.1 satisfied?

 YES

NO

N/A

7.1.2 IF all Acceptance Criteria of Section 6.1 are NOT satisfied, THEN:

- NOTIFY CRS/SM to declare Appendix R Diesel Generator inoperable.
- INITIATE a WR and a CR.
- TAKE applicable action in accordance with TRO 3.8.B.

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7.2 **Other Programs Acceptance Criteria**

7.2.1 Based on the recorded data, are all Acceptance Criteria of Section 6.2 satisfied?

YES NO N/A

7.2.2 IF component(s) failed to meet the Acceptance Criteria of Section 6.2, THEN:

- NA
- NOTIFY CRS/SM.
 - INITIATE a WR and a CR.

7.3 IF NO is circled in Step 7.1.1 OR Step 7.2.1, THEN LIST corrective action(s) taken, with any comments:

Comments: _____

Reviewed By: _____
 SM or Des. Alt: **Print Name / Sign / Date**

8.0 EVALUATION

8.1 SURVEILLANCE COORDINATOR REVIEW

Comments: _____

Reviewed By: _____
 Surveillance Coordinator Review: **Print Name / Sign / Date**

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9.0 REFERENCES**9.1 Commitment Documents**

None

9.2 Development Documents

- 9.2.1 250907, Electrical Distribution and Transmission System
- 9.2.2 400882, Station Blackout and Appendix R Diesel Generator Set P&ID Diesel Cooling Water System Mechanical
- 9.2.3 EC-5000033794, IP2 Station Blackout and Appendix R Diesel Generator Set
- 9.2.4 NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors
- 9.2.5 NSAC-108, Reliability of Diesel Generators at U.S. Power Plants
- 9.2.6 Cummins Operation and Maintenance Manual QSK78 Series Engines
- 9.2.7 CR-IP2-2010-00036, CA#9

9.3 Interface Documents

- 9.3.1 2-SOP-27.6, Appendix R Diesel Generator Operation
- 9.3.2 TRO 3.8.B
- 9.3.3 TRS 3.7.E.2

10.0 RECORDS AND DOCUMENTATION**10.1 Records**

The following required records resulting from this procedure are controlled and maintained in accordance with the IPEC Records Retention Schedule.

- 10.1.1 This Performance Procedure becomes a Quality Record when completed.

10.2 Documentation

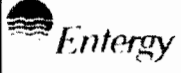
None

APPENDIX R DG FUNCTIONAL TEST	No: 2-PT-M110	Rev: 6
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**ATTACHMENT 1,
APPENDIX R DG DATA SHEET**
(Page 1 of 1)

Date: TODAY

PARAMETER	FULL LOAD	TIME/ READINGS			
		0	30	60	90
Appendix R DG Engine Data					
Coolant Temperature	$\geq 40 - \leq 215$ °F	160	162	163	
Lube Oil Pressure	≥ 45 psig	79	76	77	
Engine Speed	1800 RPM	1801	1801	1801	
Fuel Pump Pressure	200 - 400 psig @ 1800 RPM	378	371	382	
Fuel Inlet Temperature	≤ 150 °F	73	77	84	
Coolant Pressure	≥ 11 psig	25	25	24	
Lube Oil Temperature	≤ 250 °F	181	210	212	
Lube Oil Level (Between Run High / Run Low)	Midpoint	1/2	1/2	1/2	
Air Intake Temperature	≤ 180 °F	135	136	136	
After Cooler Temperature	≤ 160 °F	107	107	107	
Appendix R D/G Generator Data					
L1 Amps	≤ 141.0 Amps	94	94	94	
L2 Amps	≤ 141.0 Amps	88	87	88	
L3 Amps	≤ 141.0 Amps	87	87	88	
Frequency	59.7 - 60.3 Hz	60.0	60.0	60.0	
Total kW	≤ 2700 kW	2013	2011	2007	
Total kVA	≤ 3375 kVA	2226	2220	2201	
Total PF (nominal 0.9)	($\geq 0.8 - \leq 0.95$)	.9	.9	.9	
Appendix R DG Other Data					
Day Tank Level	7/8 - Full	7/8	7/8	7/8	
PI-8030, Day Tank Fill Pump Pressure	psig	55	55	55	
TE-8027, Day Tank Oil Cooler Temperature	F	①	①	①	
Lube Oil Reservoir Sight Glass Level	3/4 - Full	3/4	3/4	3/4	
LG-8032, Jacket Water Surge Tank Sight Glass Level	2/3 - 3/4	3/4	3/4	3/4	
LG-8031, After Cooler Surge Tank Sight Glass Level	2/3 - 3/4	3/4	2/3	2/3	
TI-908, Jacket Water Heat Exchanger Outlet Temperature	F	115	121	121	
TI-909 After Cooler Heat Exchanger Outlet Temperature	F	73	72	72	
FI-7979, Appendix R DG Jacket Water Flow (City Water)	≤ 118 gpm	160	160	160	
FI-7979, Appendix R DG Jacket Water Flow (Service Water)	≤ 160 gpm				
FI-7980, Appendix R DG Aftercooler Water Flow (City Water)	≤ 87 gpm	135	135	135	
FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)	≤ 137 gpm				
Battery Voltage	≥ 24 VDC	26.6	26.8	26.7	

	IPEC SITE MANAGEMENT MANUAL	QUALITY RELATED ADMINISTRATIVE PROCEDURE	IP-SMM DC-904	Revision 3
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ATTACHMENT 10.2

PEER REVIEW SHEET

PEER REVIEW SHEET

PROCEDURE NUMBER: 2-PE-M110

DATE PERFORMED: TODAY

	YES	NO*	N/A
1. Calibration due dates recorded?			✓
2. Instrument(s) within calibration?			✓
3. Changes documented by TPC?			✓
4. All required procedural steps completed?	✓		
5. All steps <u>NOT</u> completed noted & explained in Comments Section?			✓
6. All corrections lined out, dated and initialed?			✓
7. All calculations correct?	✓		
8. All data properly transcribed?	✓		
9. Required CRs, WOs, PFs or CTSs, etc. initiated?			✓
10. Operability conclusions correct?	✓		
11. Overall acceptance conclusions correct?	✓		

* Explain all NOs

COMMENTS:

PEER REVIEWER: _____
Signature/Date

Facility: Indian Point Unit 2Task No: 2000180102Task Title: Review a Manual VC Pressure Relief Release PermitK/A Reference: 1940012306
SRO-3.8Job Performance Measure
No: _____SRO Admin
4

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u>X</u>	Actual Performance	_____
Classroom	<u>X</u>	Simulator	_____
		Plant	_____

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- VC pressure has increased to approximately 0.4 psig.
- The Computer Release Permit Program has been corrupted.
- The Spare RO prepared a manual Release Permit
- Given:
 - Condenser Air In leakage is 5.25 scfm
 - Plant vent flow is 7.06×10^4 scfm
 - Current reading R-45 is 7.15×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-42 is 1.82×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-44 is 1.14×10^{-6} $\mu\text{Ci/cc}$
 - Current High Alarm R-42 is 8.54×10^{-7} $\mu\text{Ci/cc}$
 - Current High Alarm R-44 is 1.5×10^{-4} $\mu\text{Ci/cc}$
 - Current Warn R-44 is 1.0×10^{-4} $\mu\text{Ci/cc}$
 - Instantaneous Release Rate 70,000 $\mu\text{Ci/sec}$
 - Release Permit Number is 120005

Task Standard: Release Permit Reviewed and errors identified.

Required Materials: Calculator

General References: 2-SOP-5.4.1, VC Pressure Relief

Initiating Cue: You are the CRS and the SM has directed you to review the Manual VC Pressure Relief Gaseous Release Permit and authorize discharge if acceptable.

Time Critical Task: No

Validation Time: 30 minutes

Performance Information

(Denote critical steps with a check mark ✓)

1. Performance Step: Obtain a current copy of 2-SOP-5.4.1 and review P&Ls

Standard: Obtains procedure and reviews P&Ls

Comment:

2. Performance Step: Review given data entered on Attachment 1

Standard: Reviews given data on attachment 1 and determines all is correct.

Comment:

3. Performance Step: Review Pressure Release Rate Calculation

Standard: Determines calculation is correct
 $0.8 \times 1.82 \times 10^{-7} \mu\text{Ci/cc} = 1.46 \times 10^{-7} \mu\text{Ci/cc}$

Comment: Step 4.2.4.1

Performance Information

(Denote critical steps with a check mark ✓)

✓ 4. Performance Step: Review Plant Vent Release Rate Calculation

Standard: Determines C_{pv} was incorrectly entered resulting in an incorrect calculation
 $4.72 \times 10^{-4} \times 1.14 \times 10^{-5} \mu\text{Ci/cc} \times 7.06 \times 10^4 \text{ scfm} = 3.80 \times 10^{-4} \text{ Ci/sec}$
Should be $3.80 \times 10^{-5} \text{ Ci/sec}$

Comment: Step 4.2.4.2

5. Performance Step: Review Plant Vent Release Rate Equivalent of CAE Release Rate Calculation

Standard: Determines result is incorrectly entered
 $4.72 \times 10^{-4} \times 7.15 \times 10^{-7} \mu\text{Ci/cc} \times 5.25 = 7.11 \times 10^{-9} \text{ Ci/sec}$
Should be $1.77 \times 10^{-9} \text{ Ci/sec}$

Comment: Step 4.2.4.3

This step does not impact the final calculation as the result is still so small; however, it is an error on the form. This step is NOT Critical.

Performance Information

(Denote critical steps with a check mark ✓)

✓ 6. Performance Step: Review Total Calculated Release Rate Calculation

Standard: Determines Total Calculated Release Rate is incorrect. This is due to the incorrect calculation in calculating RR_{pv} .
 $1.46 \times 10^{-7} \mu\text{Ci/cc} + 3.80 \times 10^{-4} \text{ Ci/sec} + 0 =$
 $3.80 \times 10^{-4} \text{ Ci/sec}$
 Should be $3.80 \times 10^{-5} \text{ Ci/sec}$

Comment: Step 4.2.4.4. This is the result of a previous error.

✓ 7. Performance Step: Review R-44 Alarm Setpoint Calculation

Standard: Determine R-44 Alarm Setpoint calculation is incorrect. This is due to the incorrect calculation in calculating RR_{pv}
 $[(.0072 \mu\text{Ci/sec} - 3.80 \times 10^{-4} \text{ Ci/sec}) \times 2119] / (7.06 \times 10^4 \text{ scfm} + 1700)$
 $1.99 \times 10^{-4} \mu\text{Ci/cc}$
 Should be $2.09 \times 10^{-4} \mu\text{Ci/cc}$

Comment: Step 4.2.6.1. This is the result of a previous error.

8. Performance Step: Review R42 Alarm Setpoint Calculations

Standard: Determines Calculations are correct.
 $70,000 \times 1.25 \times 10^{-6} \text{ sec/cc} =$
 $8.75 \times 10^{-2} \mu\text{Ci/cc}$

Comment: Step 4.2.7

Performance Information

(Denote critical steps with a check mark ✓)

✓ 9. Performance Step: Review R-44 Warn Calculation

Standard: Determines wrong value used ($1.99 \times 10^{-4} \mu\text{Ci/cc}$) thus the calculation is wrong.

Comment:

✓ 10. Performance Step: Determines calculation not correct. Does not sign for Discharge Authorization

Standard: Does not sign for Discharge Authorization

Comment:

Terminating Cue: JPM Complete

VC PRESSURE RELIEFS	No: 2-SOP-5.4.1 Rev: 17
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ATTACHMENT 1
VC PRESSURE RELIEF GASEOUS RELEASE PERMIT

(Page 1 of 1)

Date: TODAY Time: Now Permit No. 120005

VC Sample # 1 ¹	<u>NA</u>	Date: _____	Time: _____	Activity (A)	_____ $\mu\text{Ci/cc}$
VC Sample # 2	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
Plant Vent Sample #	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
CAE Concentration ²	<u>7.15×10^{-7}</u>	Date: <u>TODAY</u>	Time: <u>3:21 PM</u>	Activity (E)	<u>7.15×10^{-7}</u> $\mu\text{Ci/cc}$
CAE In Leakage (F _c)	<u>5.25</u>	scfm			
Plant Vent Flow (F)	<u>7.06×10^4</u>	scfm			
				R-44 Current Warn	<u>1.6×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current High Alarm	<u>1.5×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current Reading (C _{pv})	<u>1.14×10^{-6}</u> $\mu\text{Ci/cc}$
				R-42 Reading (A)	<u>1.82×10^{-7}</u> $\mu\text{Ci/cc}$

1 Per P&L 2.11, R-42 may be used to obtain containment Noble gas concentration in lieu of sampling and analysis.
2 R-45 OR noble gas activity grab sample.

Pressure Relief Release Rate: [Step 4.2.4.1]

$$RR_{pr} = 0.8 \cdot \left(\frac{1.82 \times 10^{-7}}{(A)} \right) = \frac{1.46 \times 10^{-7}}{(RR_{pr})} \text{ Ci/sec}$$

Plant Vent Release Rate: [Step 4.2.4.2]

$$RR_{pv} = 4.72 \text{ E-4} \cdot \left(\frac{1.14 \times 10^{-5}}{(C_{pv})} \right) \cdot \left(\frac{7.06 \times 10^4}{(F)} \right) = \frac{3.86 \times 10^{-4}}{(RR_{pv})} \text{ Ci/sec}$$

Plant Vent Release Rate Equivalent of CAE Release Rate: [Step 4.2.4.3]

$$RR_{cae} = 4.72 \text{ E-4} \cdot \left(\frac{7.15 \times 10^{-7}}{(E)} \right) \cdot \left(\frac{5.25}{(F_c)} \right) = \frac{7.11 \times 10^{-9}}{(RR_{cae})} \text{ Ci/sec}^3$$

Total Calculated Release Rate: [Step 4.2.4.4]

$$RR = \frac{1.46 \times 10^{-7}}{(RR_{pr})} + \frac{3.86 \times 10^{-4}}{(RR_{pv})} + \frac{0}{(RR_{cae})} = \frac{3.86 \times 10^{-4}}{(RR)} \text{ Ci/sec}$$

Note 3: If RR_{cae} is LESS THAN 2.0 E-4 then no further consideration of CAE is required.

R-44 Alarm Setpoints: [Step 4.2.6.1]

$$R-44 \text{ reading in } \mu\text{Ci/cc} = \left[\frac{0.0072}{(ARR)} \cdot \frac{3.86 \times 10^{-4}}{(RR)} \cdot 2119 \right] / \left(\frac{7.06 \times 10^4}{(F)} + 1700 \right) = \frac{1.99 \times 10^{-4}}{(F)}$$

R-42 Alarm Setpoint (Step 4.2.7)

R-42 Maximum Setpoint ($\mu\text{Ci/cc}$) = $\frac{70000}{(RR)} \cdot (1.25 \text{ E-6 sec/cc})$ Actual R-42 Setpoint 8.54×10^{-7} $\mu\text{Ci/cc}$

$$\text{Warn} = 0.75 \cdot \left(\frac{1.99 \times 10^{-4}}{(S)} \right) = \frac{1.49 \times 10^{-4}}{\text{Warn}} \mu\text{Ci/cc}$$

ANSWER KEY

Prepared By: Name Verified By: _____
 Discharge Authorization: _____ Date: _____
(Authorization Level must be greater than or equal to RR to permit release)

Start → Date: _____ Time: _____ Initial VC Pressure: _____
 Terminate → Date: _____ Time: _____ Final VC Pressure: _____

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- VC pressure has increased to approximately 0.4 psig.
- The Computer Release Permit Program has been corrupted.
- The Spare RO prepared a manual Release Permit
- Given:
 - Condenser Air In leakage is 5.25 scfm
 - Plant vent flow is 7.06×10^4 scfm
 - Current reading R-45 is 7.15×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-42 is 1.82×10^{-7} $\mu\text{Ci/cc}$
 - Current reading R-44 is 1.14×10^{-6} $\mu\text{Ci/cc}$
 - Current High Alarm R-42 is 8.54×10^{-7} $\mu\text{Ci/cc}$
 - Current High Alarm R-44 is 1.5×10^{-4} $\mu\text{Ci/cc}$
 - Current Warn R-44 is 1.0×10^{-4} $\mu\text{Ci/cc}$
 - Instantaneous Release Rate 70,000 $\mu\text{Ci/sec}$
 - Release Permit Number is 120005

Initiating Cue:

You are the CRS and the SM has directed you to review the Manual VC Pressure Relief Gaseous Release Permit and authorize discharge if acceptable.

VC PRESSURE RELIEFS	No: 2-SOP-5.4.1 Rev: 17
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ATTACHMENT 1

VC PRESSURE RELIEF GASEOUS RELEASE PERMIT

(Page 1 of 1)

Date: TODAY Time: Now Permit No. 120005

VC Sample # 1 ¹	<u>NA</u>	Date: _____	Time: _____	Activity (A)	_____ $\mu\text{Ci/cc}$
VC Sample # 2	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
Plant Vent Sample #	<u>NA</u>	Date: _____	Time: _____	Activity	_____ $\mu\text{Ci/cc}$
CAE Concentration ²	<u>7.15×10^{-7}</u>	Date: <u>TODAY</u>	Time: <u>30 MIN AGO</u>	Activity (E)	<u>7.15×10^{-7}</u> $\mu\text{Ci/cc}$
CAE In Leakage (F _c)	<u>5.25</u> scfm				
Plant Vent Flow (F)	<u>7.06×10^4</u> scfm				
				R-44 Current Warn	<u>1.0×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current High Alarm	<u>1.5×10^{-4}</u> $\mu\text{Ci/cc}$
				R-44 Current Reading (C _{pv})	<u>1.14×10^{-6}</u> $\mu\text{Ci/cc}$
				R-42 Reading (A)	<u>1.82×10^{-7}</u> $\mu\text{Ci/cc}$

- 1 Per P&L 2.11, R-42 may be used to obtain containment Noble gas concentration in lieu of sampling and analysis.
- 2 R-45 OR noble gas activity grab sample.

Pressure Relief Release Rate: [Step 4.2.4.1]

$$RR_{pv} = 0.8 \cdot \left(\frac{1.82 \times 10^{-7}}{(A)} \right) = \frac{1.46 \times 10^{-7}}{(RR_{pv})} \text{ Ci/sec}$$

Plant Vent Release Rate: [Step 4.2.4.2]

$$RR_{pv} = 4.72 \text{ E-4} \cdot \left(\frac{1.14 \times 10^{-5}}{(C_{pv})} \right) \cdot \left(\frac{7.06 \times 10^4}{(F)} \right) = \frac{3.80 \times 10^{-4}}{(RR_{pv})} \text{ Ci/sec}$$

Plant Vent Release Rate Equivalent of CAE Release Rate: [Step 4.2.4.3]

$$RR_{cae} = 4.72 \text{ E-4} \cdot \left(\frac{7.15 \times 10^{-7}}{(E)} \right) \cdot \left(\frac{5.25}{(F_c)} \right) = \frac{7.11 \times 10^{-9}}{(RR_{cae})} \text{ Ci/sec}^3$$

Total Calculated Release Rate: [Step 4.2.4.4]

$$RR = \frac{1.46 \times 10^{-7}}{(RR_{pv})} + \frac{3.80 \times 10^{-4}}{(RR_{pv})} + \frac{0}{(RR_{cae})} = \frac{3.80 \times 10^{-4}}{(RR)} \text{ Ci/sec}$$

Note 3: If RR_{cae} is LESS THAN 2.0 E-4 then no further consideration of CAE is required.

R-44 Alarm Setpoints: [Step 4.2.6.1]

$$\text{R-44 reading in } \mu\text{Ci/cc} = \left[\frac{(.0012)}{(ARR)} - \frac{3.80 \times 10^{-4}}{(RR)} \right] \cdot 2119 / \left(\frac{7.06 \times 10^4}{(F)} + 1700 \right) = 1.99 \times 10^{-4}$$

R-42 Alarm Setpoint (Step 4.2.7)

$$\text{R-42 Maximum Setpoint } (\mu\text{Ci/cc}) = \frac{70,000}{(IR)} \cdot (1.25 \text{ E-6 sec/cc}) \quad \text{Actual R-42 Setpoint } \underline{8.54 \times 10^{-7}} \mu\text{Ci/cc}$$

$$\text{Warn} = 0.75 \cdot \left(\frac{1.99 \times 10^{-4}}{(S)} \right) = \frac{1.49 \times 10^{-4}}{\text{Warn}} \mu\text{Ci/cc}$$

Prepared By: Name Verified By: _____

Discharge Authorization: _____ Date: _____
(Authorization Level must be greater than or equal to RR to permit release)

Start → Date: _____ Time: _____ Initial VC Pressure: _____

Terminate → Date: _____ Time: _____ Final VC Pressure: _____

Facility: Indian Point Unit 2Task No: 1500010503Task Title: **Classify Emergency Plan Events Requiring Emergency Plan Implementation**K/A Reference: 1940012438
SRO-4.4Job Performance Measure
No: _____SRO
Admin-5

Examinee: _____

NRC Examiner: _____

Facility Evaluator: _____

Date: _____

Method of testing:

Simulated Performance	<u> </u> X	Actual Performance	<u> </u>
Classroom	<u> </u> X	Simulator	<u> </u> Plant

READ TO THE EXAMINEE

I will explain the initial conditions, which steps to simulate or discuss, and provide initiating cues. When you complete the task successfully, the objective for this job performance measure will be satisfied.

Initial Conditions:

- The unit was operating at 100% power.
- An event occurred 5 minutes ago.
- RCS Pressure rapidly decreased to approximately 40 psig
- VC Pressure peaked at 27 psig
- The unit tripped
- All safety equipment started as designed
- Approximately 5 minutes after the event the following conditions exist:
 - RCS Temperature 265°F
 - RCS Pressure 25 psig
 - Containment Pressure 3 psig and lowering
 - Containment Radiation 19 R/hr
 - Wind Speed 7 meters per second @ 10 meters
 - Wind Direction 270 degrees @ 10 meters
 - Stability Class C
- Unit 3 is at 100% Power

Task Standard: Event properly classified and Part 1 form correctly completed within the required time.

Required Materials:

General References: IP-EP-120, Emergency Classification
IP-EP-210, Central control Room
IP-EP-410, Protective Action Recommendation
EAL Wall Chart
EAL Technical Basis Document

Initiating Cue: The Shift Manager has become ill. You are the CRS and you must perform the duties of the Emergency Director until a replacement SM can arrive on site.

This is a Time Critical Job Performance Measure

You must Classify the event and Complete the NYS Part 1 form.

Inform the examiner when you have classified the event.

Inform the examiner when you have completed the Part 1 form.

Time Critical Task: **YES**

Validation Time: 25 Minutes

Performance Information

(Denote critical steps with a check mark ✓)

Inform the operator to BEGIN after completion of review of the Initial Conditions

1. Performance Step: Obtain Correct Procedure

Standard: Obtains IP-EP-120

Comment: CUE: Candidate will be given all necessary procedure before the JPM is started.

Record the time the JPM is started: _____

✓ 2. Performance Step: Evaluate Plant Status to determine if GE, SAE, Alert, or NUE applies. Determine the highest classification and make declaration.

Standard: Determines Event is GE per EAL 4.1.5 (see attached)

TIME CRITICAL – Must complete this step within 15 minutes of start of JPM.

Comment: Record the Time Declaration Made: _____

Containment Pressure rapidly rises on a LBLOCA. With Spray Actuation and Fan Cooler Units operating, Containment pressure should be approximately 15 psig after 5 minutes. Pressure of 3 psig is not consistent with LOCA conditions and indicates a breach in containment.

Performance Information

(Denote critical steps with a check mark ✓)

✓ 3. **Performance Step:** Complete and approve “New York State Radiological Emergency Data Form”, IP-EP-115 EP-1

Standard: Completes all necessary information on the form and signs the form

TIME CRITICAL – Must complete this step within 15 minutes of Time of Declaration (JPM step 2)

Comment: Record the Time Form is complete: _____

4. **Performance Step:** Refer to procedure IP-EP-210, Attachment 9.1.

Standard: Refers to Attachment 9.1

Comment:

5. **Performance Step:** Initiate County, State and NRC Notification per IP-EP-115, Form EP-6.

Standard: Request a communicator

Comment: CUE: Acknowledge the communicator is prepared to make notifications

Terminating Cue: JPM Complete

New York State Indian Point Energy Center RADIOLOGICAL EMERGENCY DATA FORM - PART 1		Notification # <u>1</u>
This is the Indian Point Energy Center with a Part 1 Notification on: <u>TODAY</u>		
1.	<p>Reactor Status: This is an: <u>EXERCISE</u> ACTUAL EMERGENCY at: <u>UNIT 2</u> UNIT 3 BOTH UNITS</p> <p><u>Unit 2</u> Operational (Date) <u>TODAY</u> (Time) <u>Start Time - 5 minutes (24 hr clock)</u></p> <p>Shutdown <u>Unit 3</u> Operational (Date) _____ (Time) _____ (24 hr clock)</p> <p>Shutdown</p>	
2.	<p>The Emergency Classification is: A. Unusual Event * B. Alert C. Site Area Emergency</p> <p><u>D. General Emergency</u> E. Emergency Terminated</p> <p>This Emergency Classification declared on: <u>TODAY</u> at <u>Time of Declaration</u> *</p> <p>(Date) (Time 24 hr clock)</p>	
3.	<p>EAL#: <u>4.1.5</u> Loss of primary coolant inside containment with containment pressure or sump level response not consistent with LOCA conditions</p> <p>* AND Any Indication of fuel clad damage, Table 4.2</p>	
4.	<p>Release of Radioactive Materials due to the Classified Event:</p> <p>A. No Release B. Release BELOW Federal limits To Atmosphere To Water</p> <p>* <u>C. Release ABOVE Federal limits</u> <u>To Atmosphere</u> * To Water D. Unmonitored release requiring evaluation</p>	
5.	Wind Speed: <u>7</u> Meters/Sec at elevation 10 meters	
6.	Wind Direction: (From) <u>270</u> Degrees at elevation 10 meters	
7.	Stability Class: A B <u>C</u> D E F G	
8.	<p>The following Protective Actions are recommended to be implemented as soon as practicable:</p> <p>A. NO NEED for PROTECTIVE ACTIONS outside the site boundary</p> <p>* <u>B. EVACUATE and IMPLEMENT the KI PLAN for the following Sectors</u></p> <p>C. SHELTER-IN-PLACE and IMPLEMENT the KI PLAN for the following Sectors</p> <p><u>All remaining Areas MONITOR the EMERGENCY ALERT SYSTEM</u></p> <p><u>2 miles around 5-miles downwind</u> 5 miles around 10-miles downwind Entire EPZ</p> <p>In the following Sectors: 1 2 3 <u>4</u> <u>5</u> <u>6</u> * <u>7</u> 8 9 10 11 12 13 14 15 16</p> <p>NOTE: OFFSITE AUTHORITIES SHOULD CONSIDER SHELTER-IN-PLACE + TAKE KI IF EVACUATION IS NOT FEASIBLE</p>	
9.	Reported by - Communicator: _____ Telephone # _____ (Communicator's Name)	
10.	Emergency Director Approval: <u>Signature</u> Date/Time: _____ (Director's Name)	

ANSWER KEY

* Indicates Critical Items.

VERIFICATION OF COMPLETION

Job Performance Measure No.

Examinee's Name:

Date Performed:

Facility Evaluator:

Number of Attempts:

Time to complete:

Question Documentation:

Question:

Response:

Result: SAT or UNSAT

Examiner's signature and date: _____

Initial Conditions:

- The unit was operating at 100% power.
- An event occurred 5 minutes ago.
- RCS Pressure rapidly decreased to approximately 40 psig
- VC Pressure peaked at 27 psig
- The unit tripped
- All safety equipment started as designed
- Approximately 5 minutes after the event the following conditions exist:
 - RCS Temperature 265°F
 - RCS Pressure 25 psig
 - Containment Pressure 3 psig and lowering
 - Containment Radiation 19 R/hr
 - Wind Speed 7 meters per second @ 10 meters
 - Wind Direction 270 degrees @ 10 meters
 - Stability Class C
- Unit 3 is at 100% Power

Initiating Cue: The Shift Manager has become ill. You are the CRS and you must perform the duties of the Emergency Director until a replacement SM can arrive on site.

This is a **Time Critical** Job Performance Measure

You must Classify the event and Complete the NYS Part 1 form.

Inform the examiner when you have classified the event.

Inform the examiner when you have completed the Part 1 form.

Facility: <u>IPEC UNIT 2</u>		Date of Exam: <u>2-14-2012</u>		Exam Level: RO <input checked="" type="checkbox"/> SRO <input checked="" type="checkbox"/>	
Item Description	Initials				
	a	b	c		
1. Clean answer sheets copied before grading	<u>DMJ</u>	<u>SD</u>			
2. Answer key changes and question deletions justified and documented	<u>DMJ</u>	<u>SD</u>			
3. Applicants' scores checked for addition errors (reviewers spot check > 25% of examinations)	<u>DMJ</u>	<u>SD</u>			
4. Grading for all borderline cases (80 ±2% overall and 70 or 80, as applicable, ±4% on the SRO-only) reviewed in detail	<u>DMJ</u>	<u>SD</u>			
5. All other failing examinations checked to ensure that grades are justified	<u>NA</u>	<u>N/A</u>			
6. Performance on missed questions checked for training deficiencies and wording problems; evaluate validity of questions missed by half or more of the applicants	<u>DMJ</u>	<u>SD</u>			
Printed Name/Signature		Date			
a. Grader	<u>Tim Jenkins <i>Tim Jenkins</i></u>	<u>2-16-2012</u>			
b. Facility Reviewer(*)	<u>Stephen Davis <i>Stephen Davis</i></u>	<u>2-16-2012</u>			
c. NRC Chief Examiner (*)	_____	_____			
d. NRC Supervisor (*)	_____	_____			
(*) The facility reviewer's signature is not applicable for examinations graded by the NRC; two independent NRC reviews are required.					