

Facility:	Davis-Besse	Scenario No.:	1	Op Test No.:	
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: _____					
<ul style="list-style-type: none"> <li>• 100% power, 400 EFPD</li> </ul>					
<ul style="list-style-type: none"> <li>• High Pressure Injection Pump 2 is out of service</li> </ul>					
<ul style="list-style-type: none"> <li>• HIS SP 16, Turbine Throttle Pressure, selected to PT SP16B (NNI-Y)</li> </ul>					
<p><b>Turnover:</b> The crew will assume the watch with the plant at 100% power with core age at 400 EFPD. The Plant Risk level will be YELLOW due to High Pressure Injection Pump 2 out of service for maintenance. Following turnover the Crew will take action to place TPCW Pump 1 in service and remove TPCW Pump 3 from service for maintenance.</p>					
Event No.	Malf. No.	Event Type*	Event Description		
1		N - BOP	Swap Turbine Plant Cooling Water Pumps		
2	HU 21A	C - RO TS - SRO	RCP 1-1 loss of oil to upper bearing		
3		R - RO	Power reduction prior to stopping RCP 1-1		
4	SFDVG	C - BOP	MFPT 2 high vibration		
5	LI62L	C - RO TS - SRO	Stuck Control Rod at ≈75% power		
6	HH43	M - All	Reactor Coolant System leak - 2500 gpm		
7	L6LE	C - RO	SFAS Module L231 fails to trip		
8	L1T2N	I - BOP	SG 2 level transmitter fails above setpoint		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

**DAVIS-BESSE 2008 NRC EXAM SIMULATOR SCENARIO 1 GENERAL DESCRIPTION**

The crew will assume control with power holding at 100% power.

The Lead Evaluator will cue the Crew to swap of the Turbine Plant Cooling Water Pumps in accordance with DB-OP-06263, Turbine Plant Cooling Water System.

The Lead Evaluator will cue the oil leak on RCP 1-1 thrust bearing. The oil leak will cause a low oil level computer alarm and an increase in bearing temperatures. The crew should respond to alarm 6-1-A, in accordance with DB-OP-02006, Reactor Coolant Pump Alarm Panel 6 Annunciators, and then enter DB-OP-02515, Reactor Coolant Pump And Motor Abnormal Operation. DB-OP-02515 will require the crew to reduce power to  $\leq 72\%$  using DB-OP-02504, Rapid Shutdown, and then stop the affected RCP. The SRO should enter the proper Tech Spec after the RCP is stopped.

After the RCP is stopped the Lead Evaluator will cue the increase in MFPT 2 vibrations. The Crew should respond using DB-OP-2010, Feedwater Alarm Panel Annunciators. The vibrations will increase to the point that a trip of MFPT 2 is required. The plant will automatically runback to  $\approx 55\%$  power when the MFPT is tripped.

During the plant runback, a Control Rod will stick. The crew should respond to alarm 5-2-E, CRD ASYM-METRIC ROD, in accordance with DB-OP-02516, CRD Malfunctions. The SRO should enter Tech Spec 3.1.3.1. The crew should reduce power in accordance with DB-OP-02504, RAPID SHUTDOWN.

During the power reduction the Lead Evaluator will cue the RCS leak. This will lower Pressurizer level and the crew should trip the reactor when 100" is reached in accordance with DB-OP-02522, Small RCS Leaks. The crew will transition to DB-OP-02000, RPS, SFAS, SFRCS Trip, or SG Tube Rupture when the reactor trips.

RCS pressure will lower and a loss of subcooling margin will occur. The crew will trip all running RCPs and route to DB-OP-02000, Section 5.0, Lack Of Adequate Subcooling Margin. The RCS leak is large enough to cause an SFAS actuation.

The failure of a SFAS module will prevent Component Cooling Water Pump 1 from operating and SG 1 level will not control at the higher SG level setpoint. The crew should start CCW Pump 1 and manually control level at the higher level or manually select the HIGH setpoint for SG 1 level.

The failure of the SG 2 level transmitter will cause a loss of level in SG 2. Manual control of the SG 2 level control valve is required to maintain proper level in the SG.

The Lead Evaluator can terminate the scenario when all high level activities have been completed and the evaluators agree the crew can be properly evaluated.

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**Event Description:** After turnover is complete the crew will refer to section 3.2 of DB-OP-06263, Turbine Plant Cooling Water System, to start TPCW Pump 1 and stop TPCW Pump 3 due to increasing vibrations on TPCW Pump 3.

Time	Position	Applicant's Actions or Behavior
	BOP	Verify the TPCW System is in service by checking that TPCW Pump 2 and TPCW Pump 3 are running
	BOP	Verify the prestart checklist is complete for TPCW Pump 1
	BOP	Start TPCW Pump 1 using HIS 627
	BOP	Stop TPCW Pump 3 using HIS 629
	BOP	Direct an Equipment Operator to check the oil level on the motor for TPCW Pump 1
		After TPCW Pump 3 is started direct the Simulator Operator to insert <b>Event Line 2</b> for an RCP 1-1 oil leak

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**Event Description:** After the TPCW Pumps have been swapped an oil leak will develop on Reactor Coolant Pump 1-1 requiring a power reduction to  $\approx 72\%$  power in order to stop the pump. Tech Specs for operable RCS loops and RPS setpoints will be applicable

Time	Position	Applicant's Actions or Behavior
	Crew	Recognize an oil leak on RCP 1-1 <ul style="list-style-type: none"> <li>• Computer point for RCP 1-1 Thrust Bearing oil level, L791</li> <li>• 6-1-A 1-1 MOTOR VIB HI</li> </ul>
	RO	Attempt to reset annunciator 6-1-A
	SRO	Implement DB-OP-02515, RCP and Motor Abnormal
	SRO	Direct load reduction to 72% power per DB-OP-02504 Rapid Shutdown
	SRO	Notify the Load Dispatcher
	RO	Perform Rapid Shutdown actions <ul style="list-style-type: none"> <li>• Set Rate of Change as directed by the SRO</li> <li>• Verify the MIN LIMIT is set to 180 MWE</li> <li>• Lower power using the DECREASE pushbutton</li> </ul> OR <ul style="list-style-type: none"> <li>• Place the SG/Reactor Demand</li> <li>• Lower power using the toggle switch</li> </ul>
	RO	Monitor Rod insertion limits using the Reactor Operator Guidance sheet or Tech Spec 3.1.3.6
	RO	Maintain Imbalance using APSRs

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Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Perform Rapid Shutdown actions <ul style="list-style-type: none"> <li>• Notify Chemistry to monitor polishers and sample the RCS</li> <li>• At 90%, remove the AFPT Main Steam Minimum flow lines from service</li> <li>• When condensate flow is &lt;7.0 MPPH then stop one Condensate pump</li> </ul>
	SRO	When power has decreased to $\approx 72\%$ return to DB-OP-02515
	RO	When power has decreased to $\approx 72\%$ stop RCP 1-1 <ul style="list-style-type: none"> <li>• Run oil lift pump as necessary</li> </ul>
	BOP	Verify proper feedwater re-ratio <ul style="list-style-type: none"> <li>• SG 2 flow should be <math>\approx 2.4</math> times the SG 1 flowrate</li> </ul>
	RO	Verify Tave control on the Reactor Coolant Loop 2
	SRO	Refer to Tech Spec 3.2.5 for RCS flow <ul style="list-style-type: none"> <li>• May refer to DB-OP-03006, Attachment 1 to check RCS flow using computer point F744</li> </ul>
	SRO	Refer to Tech Spec 3.4.1.1 for RPS trip setpoints <ul style="list-style-type: none"> <li>• Contact I&amp;C to verify <math>\phi/\Delta\phi</math>/Flow trips and adjust High Flux trips</li> </ul>
	SRO	Refer to Tech Spec 3.4.4 if Pressurizer level exceeds 228 inches

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Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Reset ICS Input and ICS Transfer Annunciators at the SASS panel <ul style="list-style-type: none"> <li>• Depress the alarm reset pushbutton for each parameter in alarm</li> </ul>
	RO	As required, add boric acid to the Makeup Tank using the Batch Controller in accordance with the Reactor Operator Guidance sheet
		After the Tech Specs are reviewed, direct the Simulator Operator to insert <b>Event Line 4</b> to increase vibrations on Main Feed Pump Turbine 2

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**Event Description:** Following the power reduction for stopping the RCP, the vibrations on MFPT 2 will increase. The increase in vibrations will require MFPT 2 to be manually tripped causing an automatic runback to ~55% power.

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize high MFPT 2 vibrations <ul style="list-style-type: none"> <li>• 10-3-B MFP 2 OR BFP 2 BEARING VIB HI</li> <li>• Computer Point V651, MFP, MFPT, GEAR, OR BFP 2 BRG VIB</li> </ul>
	BOP	Refer to DB-OP-2010, Feedwater Alarm Panel Annunciators
	BOP	Direct an Equipment Operator to monitor MFPT 2 vibrations locally
	BOP	Check vibration reading on ZJR 2538, Main Turbine and MFP Turbines Bearing Vibration and Eccentricity
	BOP	Check vibration levels are above the second computer alarm setpoint of 5.0 Mills
	BOP	Trip MFPT 2 using HS 798
	SRO	Refer to DB-OP-06401, ICS Operating Procedure
	CREW	Verify a proper ICS runback to ~55% power occurs
	RO	Verify RC 2, Pressurizer Spray Valve, is in automatic and closed
	RO	Perform an NI Power/Heat Balance Power comparison
		<b>Event Line 5</b> for the stuck rod will automatically insert when power is less than 60%

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**Event Description:** During the plant runback, Control Rod 7-4 will become stuck when power goes below  $\approx 60\%$  power. The stuck rod will require a Shutdown Margin determination, implementation of Tech Specs and a plant shutdown.

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a stuck/misaligned Control Rod <ul style="list-style-type: none"> <li>• 5-1-E CRD LCO</li> <li>• 5-2-E CRD ASYMMETRIC ROD</li> <li>• Control Rod 7-4 misaligned with Rod Group 7</li> </ul>
	SRO	Implement DB-OP-02516, CRD Malfunctions beginning at step 4.5.1
	RO	Check Reactor power is > 5%
	RO	Check only one Control Rod is misaligned
	SRO	Refer to NOP-OP-1004, Reactivity Management <ul style="list-style-type: none"> <li>• Notify Operations Management</li> <li>• Notify the Shift Manager</li> </ul>
	SRO	Request I&C investigate the misaligned Control Rod
	CREW	Determine Control Rod is stuck
	SRO	Refer to Tech Spec 3.1.3.1



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**Event Description:** An RCS leak leads to a Reactor trip, automatic SFAS actuation and a loss of adequate subcooling margin. An SFAS malfunction prevents CCW Pump 1 from automatically starting and providing cooling water to the only operable HPI Pump and prevents AFW from automatically raising SG 1 level to the 124 inch setpoint. Following the Reactor trip, Steam Generator 2 level transmitter fails causing a failure of automatic AFW level control that require manual control of SG 2 level.

Time	Position	Applicant's Actions or Behavior
	CREW	Identify symptoms of RCS leak inside Containment <ul style="list-style-type: none"> <li>• Normal sump level rising</li> <li>• Radiation levels rising</li> <li>• MU flow rising</li> <li>• MU tank level dropping</li> </ul>
	SRO	Route to DB-OP-02522, Small RCS Leaks
	RO	Determine Pressurizer level is NOT being maintained
	RO	Isolate Letdown
	RO	Monitor Pressurizer level and Makeup tank level
	RO	Start the standby Makeup pump
	RO	When Pressurizer level falls below 100" then trip the Reactor

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Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Perform DB-OP-02000 Immediate Actions <ul style="list-style-type: none"> <li>• Manually trip the reactor</li> <li>• Verify power decreasing in the intermediate range</li> <li>• Manually trip the turbine</li> </ul>
	SRO	Implement DB-OP-02000, RPS, SFAS, SFRCS Trip, or SG Tube Rupture
	SRO	Verify Immediate Actions
	CREW	Check for Specific Rules implementation
	RO	Implement Specific Rule 2 - Loss of Subcooling Margin <ul style="list-style-type: none"> <li>• Time SCM lost _____</li> <li>• *Trip all RCPs</li> <li>• Time RCPs are tripped _____</li> </ul>
	BOP	Recognize neither SG is feeding up to the proper level <ul style="list-style-type: none"> <li>• *Manually control AF 6452 to feed SG 1 to the proper level OR select HIGH on HIS 6453</li> <li>• *Manually control AF 6451 to feed SG 2 to the proper level</li> </ul>
	RO	Implement Specific Rule 6 <ul style="list-style-type: none"> <li>- Recognize CCW Pump 1 did not automatically start</li> <li>• *Manually start CCW Pump 1</li> </ul>
	RO	Check for Symptom direction <ul style="list-style-type: none"> <li>• Recognize Loss of Subcooling Margin</li> </ul>

\* Critical Task

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Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	SRO	Implement DB-OP-02000, Section 5
	RO	*Verify all RCPs are tripped  Time RCPs are tripped _____
	RO	Implement Attachment 8, Place MU/HPI/LPI in Service <ul style="list-style-type: none"> <li>• Set Pressurizer Level Controller to 100 inches</li> <li>• Lock MU Pump suctions on the BWST</li> <li>• Start/Verify running the second MU Pump</li> <li>• *Start/Verify running the standby CCW Pump</li> <li>• Recognize only HPI Pump 1 running</li> <li>• Verify open HP 2A, HP 2B, HP 2C and HP 2D</li> <li>• Start both LPI Pumps</li> <li>• Open DH 64 and DH 63</li> </ul>
	RO	Implement Attachment 11 for HPI flow balancing <ul style="list-style-type: none"> <li>• Close MU 6421</li> <li>• Verify HP 2C and HP 2D are open</li> <li>• Compare HPI flow through each injection line to Figure 3 and verify flow is in the acceptable range</li> <li>• Open MU 6421</li> </ul>
	RO	Verify proper SFAS actuation <ul style="list-style-type: none"> <li>• Close CV 5070 using HIS 5070</li> <li>• Close CV 5071 using HIS 5071</li> <li>• Close CV 5072 using HIS 5072</li> <li>• Close CV 5073 using HIS 5073</li> <li>• Close CV 5074 using HIS 5074</li> <li>• Select HIGH on HIS 6453</li> </ul>
	BOP	Verify proper SFRCS actuation

\* Critical Task

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Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Verify proper SG level control
	BOP	Realign AFW if an SFRCS low pressure trip occurs so that each AFW Pump feeds its own SG
	RO	Check for LPI flow
	CREW	Check for Overcooling
	RO	Isolate possible RCS leaks per Attachment 19 <ul style="list-style-type: none"> <li>• RC 11, PORV Block Valve</li> <li>• RC 2, Spray Valve</li> <li>• RC 10, Spray Block Valve</li> <li>• RCS High Point Vents</li> <li>• Pressurizer Sample Valves</li> <li>• RCS Sample Valves</li> </ul>
	CREW	Check for ICC Conditions
	CREW	Monitor for adequate Subcooling Margin
		Termination Criteria <ul style="list-style-type: none"> <li>• SG levels at the proper setpoint</li> <li>• HPI and Makeup are maintaining core cooling</li> </ul>
		Site Area Emergency based on EAL 2.A.4 for an RCS leak larger than High Pressure Injection system capacity

## CRITICAL TASK JUSTIFICATION

Trip all RCPs within 2 minutes of a loss of subcooling margin

SSig - Failure to do so could lead to uncovering the core if stopped later

Cue - SCM less than 20°, Procedural guidance

MPI - RCP switches to OFF

OPF - RCPs green lights on, zero amps

KSA Number: 011-EA1.03 (4.0/4.0) Ability to operate and monitor the securing of the RCPs

Manually start a CCW Pump

SSig - Failure to do so could lead to loss of cooling to the only available HPI Pump

Cue - CCW Pump 1 not running, Procedural Guidance

MPI - CCW Pump 1 switch to START

OPF - CCW Pump 1 RED light on

KSA Number: 008-A4.08 (3.1/2.8) Ability to manually operate CCW Pump Control Switch from the Control Room

Manually control AFW flow to feed at least one SG

SSig - Provide for auxiliary feedwater for core cooling via the SGs when subcooling margin is regained

Cue - Procedural direction

MPI - Target rock controllers in MANUAL and throttled open

OPF - Flow to at least one SG, SG(s) level(s) increasing

KSA Number: 061-A2.05 (3.1/3.4) Ability to predict the impact of an automatic control malfunction for AFW

## SCENARIO ATTRIBUTES

Total Malfunctions	7
Malfunctions after EOP Entry	2
Abnormal Events	3
Major Transients	1
EOPs	1
EOP Contingencies	2 (Specific Rule 4, Specific Rule 6)
Scenario Runtime	75 minutes
EOP runtime	30 minutes
Crew Critical Tasks	3
Technical Specifications Exercised	2

**CUE SHEET****Event 1 - Swap TPCW Pumps**

Role play as an Equipment Operator to inspect TPCW Pump 1. Report oil level is visible in the bullseye on the motor

**Event 2 and 3 - RCP Oil Leak and Power Reduction**

Role play as the System Dispatcher to acknowledge the power reduction

Role play as Chemistry to support the power reduction

Role play as I&C for verifying  $\phi/\Delta\phi$ /flow trips and resetting High Flux trips

**Event 4 - MFPT 2 High Vibrations**

Role play as an Equipment Operator to monitor local vibrations on MFPT 2

**Event 5 - Stuck Control Rod**

Role play as Operations Management for Reactivity Management notifications

Role play as I&C for investigating the potential misaligned rod

Role play as Reactor Engineering to provide assistance for the stuck rod

Role play as the System Dispatcher to acknowledge the power reduction

**Event 6, 7, and 8 - RCS Leak, Reactor Trip and AFW Level Control Malfunctions**

**Simulator Setup Instructions**

1. Verify the following:
  - a. Previous data on Yokogawa recorders is cleared
  - b. Chart recorders are rolled forward
  - c. Applicable procedures are wiped cleaned
  - d. Used Alarm Typer paper is removed
  - e. Computer alarms are cleared/acknowledged
2. Initialize at 100% power
3. Equipment Status:
  - a. Hang License Requirement Sheet on the status board
  - b. Tag out HPI Pump 2 Switch
  - c. Turn on the HPI blue status
  - d. Hang Protected Train 1 signs
  - e. Select SP16B for Turbine Throttle Pressure input
  - f. Reset SASS annunciators as required
4. Set Up Batch File
  - a. Initial Setup
    - Rackout the breaker for HPI Pump 2  
IRF BFP2A RACKOUT
    - Fail SFAS Channel 1 Output Module L231  
IMF L6LE
    - Fail SP16A low to put SP16B in service  
IMF L1T2N 0.0

## b. Triggers

- Reactor power < 60% activates the stuck rod

TRGSET 5 "RATPW<59.0"

- Reactor power < 5% activates the SG 2 Startup Level transmitter (SP9A3) failing to ≈140"

TRGSET 8 "RATPW<5.0"

## c. Events

Event 1 - Swap TPCW pumps

Event 2 - RCP 1-1 loss of upper bearing oil

IMF HU21A (2) 0.85 00:03:00

Event 3 - Power Reduction

Event 4 - MFPT 2 vibrations

IMF SFDVG (4) 1.0 00:06:00 0.0

Event 5 - Stuck Rod 7-4 at ≈60% power

IMF LI62L (5)

Event 6 - 2500 gpm RCS leak

IMF HH43 (6) 0.0028 00:05:00 0.0

Event 7 - SFAS Modules L231 fail to trip

Event 8 - Reactor power < 5% triggers SG 2 Startup Level transmitter (SP9A3) failing to ≈140"

IMF L1TH20 (8) 0.55 00:00:20 0.17

Facility:	Davis-Besse	Scenario No.:	2	Op Test No.:	
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: _____					
60% power, 400 EFPD					
<ul style="list-style-type: none"> <li>• 3 Reactor Coolant Pumps running, RCP 1-1 not running</li> </ul>					
<ul style="list-style-type: none"> <li>• Decay Heat Pump 1 is out of service</li> </ul>					
<ul style="list-style-type: none"> <li>• HIS SP 16, Turbine Throttle Pressure, selected to PT SP16B (NNI-Y)</li> </ul>					
<p>Turnover: The crew will assume the watch with the plant at 60% power with core age at 400 EFPD. Three RCPs are running. RCP 1-1 was stopped due to low oil level in the lower bearing reservoir. Senior Management is currently deciding when to begin a plant shutdown to repair RCP 1-1. The Plant Risk level will be YELLOW due to Low Pressure Injection Pump 1 out of service for maintenance on the motor bearings. Following turnover the Crew will take action to transfer Gland Steam from Main Steam to Auxiliary Steam in order allow packing adjustment on GS 2384, Seal Steam Supply Valve</p>					
Event No.	Malf. No.	Event Type*	Event Description		
1		N - BOP	Transfer Gland Steam from Main Steam to Auxiliary Steam		
2	SFEJA	TS – SRO	The crew will be notified that Auxiliary Feedwater Pump 1 has no Governor oil		
3	H170	C – RO	Pressurizer level control valve (MU 32) fails to operate in auto		
4	LI53B	R – RO TS – SRO	Control Rod drop		
5	NP19D	I – BOP	Loss of NNI-Y DC		
6	PLZZ	M – All	Loss of Offsite AC		
7	G529B	C – RO	Emergency Diesel Generator 1 fails to auto start		
8	SFERE	C - BOP	AFW Pump 2 governor valve closes		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

**DAVIS-BESSE 2008 NRC EXAM SIMULATOR SCENARIO 2 GENERAL DESCRIPTION**

The crew will assume control with power at 60% power and 3 Reactor Coolant Pumps in operation.

After turnover is complete the Lead Evaluator will direct the crew to transfer Gland Steam from Main Steam to Auxiliary Steam.

The Lead Evaluator will cue the Auxiliary Feedwater Pump 1 governor oil problem. The crew should review T.S. 3.7.1.2 and declare AFW 1 inoperable. This will put the plant in a 72 hour Action Statement.

The Lead Evaluator will cue the MU 32 failure to operate in automatic due to a blown fuse. Annunciator 14-2-E, ICS/NNI FUSE BLOWN on MSR/ICS Alarm Panel 14 Annunciators will alarm. The crew should refer to DB-OP-02014 and identify the blown fuse is preventing MU 32 from responding in automatic. The crew should take the MU 32 to HAND and control Pressurizer level by adjusting Makeup system flow manually.

The Lead Evaluator will cue the dropped rod. The crew should enter DB-OP-02516, CRD Malfunctions. The SRO should enter Tech Spec 3.1.3.1. The Tech Spec Limit with a dropped rod and 3 RCPs running is 45% power ( $\approx 320$  MWE). The crew should reduce power in accordance with DB-OP-02504, Rapid Shutdown.

The Lead Evaluator will cue the Loss of NNI-Y DC power during control rod recovery. Annunciator 14-1-E, NNI-Y 24 VDC BUS TRIP, on MSR/ICS Alarm Panel 14 Annunciators will alarm. The crew should enter DB-OP-2532, Loss of NNI/ICS Power. The crew should recognize a minor transient is in progress due to the mid-scale failure of Turbine Throttle Pressure by transferring the Turbine to MANUAL and transferring the SG/Rx Demand Station to HAND, and lowering the Turbine load.

The Lead Evaluator will cue the Loss of Offsite AC power. The crew will enter DB-OP-02000, RPS, SFAS, SFRCS Trip, or SG Tube Rupture, when the reactor trips. Emergency Diesel Generator (EDG) 1 will fail to auto start. EDG 1 should be started manually.

The AFPT 2 governor valve will fail closed when AFW Pump 2 receives a start signal. The crew will route to Attachment 6 of DB-OP-02000 to re-power D2 Bus. The crew should energize non-essential electrical bus D2 from the Station Blackout Diesel Generator or one of the EDGs and align the Motor Driven Feedwater Pump to feed at least one of the Steam Generators. The crew may implement Attachment 4 of DB-OP-02000 to begin aligning Makeup and HPI for core cooling.

The Lead Evaluator can terminate the scenario when all high level activities have been completed and the evaluators agree the crew can be properly evaluated.

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

**Event Description:** Following turnover the Crew will transfer Gland steam from the Main Steam system to the Auxiliary Steam System in accordance with section 3.6 of DB-OP-06205, Turbine Generator And Main Feedwater Pump Turbine Gland Steam And Turbine Drains

Time	Position	Applicant's Actions or Behavior
	BOP	Verify the 235 psig Aux Steam Header is in service
	BOP	Open AS1934, Aux Steam Supply to 5# Condensate Tank 1-1 Control Valve, for 1 minute and then close AS 1934
	BOP	Throttle open GS 2385, Steam Seal Feed Bypass, to control Gland Steam pressure at ≈4.5 psig using HIS 2385
	BOP	Close GS 2384, Seal Steam Supply Valve using HIS 2384
	BOP	Open GS 2380, Aux Steam Supply Steam Seal Valve, using HIS 2380
	BOP	Close GS 2385 using HIS 2385
	BOP	Verify Steam Seal Header pressure is between 2.5 to 4.5 psig
		After the Gland Steam System supply is transferred to the Auxiliary Steam System direct the Simulator Operator to enter <b>Event Line 2</b> and to call the Control Room to report the oil sight glass on the AFPT 1 governor is broken and the oil has leaked out of the governor

<p><b>Op-Test No.:</b> _____ <b>Scenario No.:</b> <u>  2  </u> <b>Event No.:</b> <u>  2  </u> <b>Page</b> <u>  1  </u> <b>of</b> <u>  1  </u></p> <p><b>Event Description:</b> An Equipment Operator will report that AFPT 1 Governor oil sightglass is broken and the oil has leaked out. The SRO should declare AFPT 1 inoperable and enter the AFW Tech Spec</p>		
Time	Position	Applicant's Actions or Behavior
	SRO	Determine AFW Pump 1 is inoperable
	SRO	Refer to Tech Spec 3.7.1.2
	SRO	Notify Operations Management of the unplanned entry into Tech Specs
	SRO	May contact the Work Week Manager to determine any changes in the risk level
	CREW	May contact an Equipment Operator/Field Supervisor to close the AFPT 1 Trip Throttle Valve
		After the AFW Tech Spec is entered, direct the Simulator Operator to enter <b>Event Line 3</b> to fail the automatic response of MU 32

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

**Event Description:** The NNI fuse that powers the automatic control for MU 32 will blow causing MU 32 to fail closed while the HAND/AUTO station is in automatic. The Crew will either control MU 32 in manual or place the alternate Makeup injection line in service

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a blown fuse to MU 32 controller <ul style="list-style-type: none"> <li>• 14-2-E ICS/NNI FUSE BLOWN</li> <li>• Pressurizer level decreasing with MU 32 closed</li> <li>• Computer Alarm (Q718) NNI FUSE</li> </ul>
	BOP	Refer to DB-OP-02014, MSR/ICS Alarm Panel 14 Annunciators
	BOP	Check the blown fuse indicators in the top of the front and back of the NNI Cabinets
		NNI cabinets are not modeled on the simulator. The <b>Shift Manager</b> will inform the Operator that the blown fuse indicator is lit for Fuse 1 in NNI Cabinet 5759B. The fuse is labeled RC-LIC14
	RO	Place MU 32 in MANUAL and maintain desired Pressurizer level OR Place the Makeup System alternate injection line in service <ul style="list-style-type: none"> <li>• Close MU 6422, Makeup Train 2 To RCS Isolation</li> <li>• Open MU 6421, Makeup Train 1 To RCS Isolation</li> <li>• Throttle open MU 6419, Makeup Train 1 Injection, to maintain desired Pressurizer level</li> <li>• Direct an Equipment Operator to open MU 6423B, Makeup Train 1 Flow Controller Bypass</li> </ul>
		After Pressurizer level is restored, direct the Simulator Operator to enter <b>Event Line 4</b> to drop Control Rod 5-8.

Op-Test No.: \_\_\_\_\_ Scenario No.: 2 Event No.: 4 Page 1 of 2

**Event Description:** Control Rod 5-8 will drop requiring a rapid power reduction in accordance with DB-OP-02516, CRD Malfunctions, to comply with Tech Specs.

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a dropped control rod <ul style="list-style-type: none"> <li>• Annunciator 5-1-E, CRD LCO</li> <li>• Annunciator 5-2-E, CRD ASYMETRIC ROD</li> <li>• Control Rod 5-8 Rod Bottom light ON</li> </ul>
	SRO	Implement DB-OP-02516, CRD Malfunctions
	RO	Reduce Reactor power to <45% <ul style="list-style-type: none"> <li>• Reduce ULD MAX LOAD LIMIT to 320 MWE</li> <li>• Set ULD to 30 MWE/ MIN</li> </ul>
	SRO	Refer to DB-OP-02504, Rapid Shutdown
	SRO	Notify the Load Dispatcher of plant shutdown
	SRO	Contact Chemistry to monitor Condensate Polishers and sample the RCS
	RO	Maintain Makeup tank level
	BOP	May remove a Main Feed Pump from service <ul style="list-style-type: none"> <li>• Place the ICS controller in HAND and lower speed to 3950 RPM</li> <li>• Null the transfer volts using the MDT 20 output</li> <li>• Place the MDT 20 control in MANUAL</li> <li>• Lower the MDT 20 to the LOW SPEED STOP</li> <li>• Trip the MFPT</li> <li>• Verify the Discharge NRV is closed</li> </ul>

Op-Test No.: \_\_\_\_\_ Scenario No.:  2  Event No.:  4  Page  2  of  2 

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Manually control Pressurizer level
	RO	Stabilize power at < 45% <ul style="list-style-type: none"> <li>Adjust the ULD MAX LOAD LIMIT as directed</li> <li>Adjust the ULD RATE OF CHANGE as directed</li> </ul>
	SRO	Refer to NG-DB-00230, Reactivity Management
	SRO	Contact Reactor Engineering
	RO	Contact Work Week Manager/I&C to investigate
	SRO	Refer to DB-OP-02516 Attachment 3 to determine Tech Spec applicability <ul style="list-style-type: none"> <li>Tech Spec. 3.1.3.1 for the dropped rod</li> </ul>
		After power is stabilized and Tech Specs are reviewed direct the Simulator Operator to enter <b>Event Line 5</b> for the loss of NNI-Y DC power

Op-Test No.: _____ Scenario No.: <u>  2  </u> Event No.: <u>  5  </u> Page <u>  1  </u> of <u>  1  </u>		
<p><b>Event Description:</b> A loss of NNI-Y DC power will cause Turbine Throttle Pressure to fail midscale since the controlling signal is powered from NNI-Y. The Crew will be required to manually control the Main Turbine to maintain Throttle Pressure</p>		
Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a loss of NNI-Y DC Power <ul style="list-style-type: none"> <li>• 14-1-E NNI-Y 24 VDC BUS TRIP</li> <li>• Loss of Y-DC NNI Power Indicating Light on Control Room Panel C5722</li> </ul>
	SRO	Implement DB-OP-02532, Loss of NNI/ICS Power, section 4.4
	RO	Monitor Makeup Tank level using NNI-X powered indication and manually transfer Makeup Pump suction valves as required
	CREW	Recognize a midscale failure of Turbine Throttle Pressure <ul style="list-style-type: none"> <li>• Recorder SP 16 and Group 61 indicates 900 PSI</li> <li>• Steam Generator and Turbine Header pressures decreasing</li> </ul>
	BOP	Place the EHC Control Panel in MANUAL
	RO	Place the SG/Rx Demand Station in HAND
	BOP	Adjust Turbine load using the INCREASE and/or DECREASE pushbuttons to restore Turbine Throttle Pressure as directed by the SRO
		After the Turbine Throttle Pressure is restored, direct the Simulator Operator to insert <b>Event Line 6</b> for the loss of offsite power Note: <b>Event Line 6</b> will automatically activate if the Reactor is tripped

Op-Test No.: \_\_\_\_\_ Scenario No.: 2 Event No.: 6,7,8 Page 1 of 7

**Event Description:** A loss of offsite electrical power causes a Reactor trip and a loss of all RCPs. The loss of the RCPs causes a SFRCS actuation. AFPT 1 will start and overspeed trip due to the loss of governor oil. AFPT 2 fails to start requiring the use of the MDFP. D2 Bus will have to be reenergized to provide power to D2 Bus. EDG 1 fails to automatically start but can be started manually from the Control Room

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a loss of offsite power and Reactor trip
	RO	Perform DB-OP-02000 Immediate Actions <ul style="list-style-type: none"> <li>• Manually trip the reactor</li> <li>• Verify power decreasing in the intermediate range</li> <li>• Manually trip the turbine</li> </ul>
	SRO	Route to DB-OP-02000, Section 3
	SRO	Verify immediate actions
	CREW	Implement Specific Rules
	RO/BOP	*Use Attachment 6 of DB-OP-02000 to re-power D2 Bus - From the SBODG <ul style="list-style-type: none"> <li>• Open ABDD2</li> <li>• Verify AD 110 is open</li> <li>• Start the SBODG by pressing START at the SBODG Control Panel C5740</li> <li>• Check SBODG speed approximately 900 RPM</li> <li>• Verify AD213 is closed</li> <li>• Close AD 301 to energize Bus D2</li> <li>• Verify Bus D2 energized</li> <li>• Verify AD2DF7 is closed</li> <li>• Verify BDF7 is closed</li> </ul>

\*Critical Task

Op-Test No.: \_\_\_\_\_ Scenario No.:  2  Event No.:  6,7,8  Page  2  of  7

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO/BOP	<p>*Use Attachment 6 of DB-OP-02000 to re-power D2 Bus</p> <ul style="list-style-type: none"> <li>- From EDG 2                             <ul style="list-style-type: none"> <li>• Verify AD301, SBODG BKR is open</li> <li>• Verify AD205, XFMR BDF6 is open</li> <li>• Verify AD206, CLNG WTR PMP 2 is open</li> <li>• Verify AD201, STA AIR CMPSR 2 is open or lock out</li> <li>• Verify AD202, CLNG TWR MU PMP 2 is open</li> <li>• Verify AD204, HTR DRN PMP 2 is open</li> <li>• Verify AD207, CNDS PMP 2 is open</li> <li>• Verify AD210, MOTOR DRIVEN FEED PUMP is open</li> <li>• Open ABDD2, HIS 6228, ABDD2</li> <li>• Place D1 SYNC SELECT to BKR to D2</li> <li>• Close AD110, HIS 6233, AD110</li> <li>• Verify D2 is energized</li> <li>• Place D1 SYNC SELECT in the OFF</li> <li>• Close AD2DF7</li> <li>• Verify BDF7 is closed</li> </ul> </li> <li>- From EDG 1                             <ul style="list-style-type: none"> <li>• Verify AD301, SBODG BKR is open</li> <li>• Verify ABDD2, BUS TIE XFMR BD is open</li> <li>• Verify AD205, XFMR BDF6 is open</li> <li>• Verify AD206, CLNG WTR PMP 2 is open</li> <li>• Verify AD201, STA AIR CMPSR 2 is open or lock out</li> <li>• Verify AD202, CLNG TWR MU PMP 2 is open</li> <li>• Verify AD204, HTR DRN PMP 2 is open</li> <li>• Verify AD207, CNDS PMP 2 is open</li> <li>• Verify AD210, MOTOR DRIVEN FEED PUMP is open</li> <li>• Verify AD110 is open, HIS 6233, AD110</li> <li>• Verify HBBD is open, HIS 6214, HBBD</li> <li>• Verify AC110 is open, HIS 6223, AC110</li> <li>• Place the C1 SYNC SELECT Switch to BKR TO XBD</li> <li>• Close ABDC1, HIS 6220, ABDC1</li> <li>• Place the C1 SYNC SELECT Switch to OFF</li> <li>• Close ABDD2, HIS 6228, ABDD2</li> <li>• Verify D2 is energized</li> <li>• Close AD2DF7</li> <li>• Verify BDF7 is closed</li> </ul> </li> </ul>

\*Critical Task

Op-Test No.: \_\_\_\_\_ Scenario No.:   2   Event No.:   6,7,8   Page   3   of   7  

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	*Use Attachment 5 of DB-OP-02000 to start the MDFP <ul style="list-style-type: none"> <li>- Enable BOTH MDFP Discharge Valves               <ul style="list-style-type: none"> <li>• HIS 6460</li> <li>• HIS 6459</li> </ul> </li> <li>- Close BOTH MDFP Discharge Valves               <ul style="list-style-type: none"> <li>• LIC 6460</li> <li>• LIC 6459</li> </ul> </li> <li>- Start the MDFP</li> <li>- Establish feedwater flow to both Steam Generators at less than 1000 gpm indicated flow on the MDFP Flow Indicator FI 5876</li> </ul>
	BOP	Verify proper SG level control at 49" using Specific Rule 4, Steam Generator Control
	BOP	Direct an Equipment Operator to locally shift MDFP recirculation to the CST
	BOP	Control SG pressures by place the Atmospheric Vent Valves in manual using Attachment 3 <ul style="list-style-type: none"> <li>• Recognize lowering Instrument Air pressure</li> <li>• Start the EIAC</li> <li>• Place the AVV Hand/Auto Stations in HAND</li> <li>• Reduce the AVV demands to zero</li> <li>• Press the AVV BLOCK pushbuttons</li> <li>• Press AUTO on the AVV Hand Indicating Switches</li> </ul>
	BOP	Control Steam Generator Pressure as required from the Hand/Auto stations to maintain RCS Tave constant or slightly lowering using both AVVs

\*Critical Task

Op-Test No.: \_\_\_\_\_ Scenario No.: 2 Event No.: 6,7,8 Page 4 of 7

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Implement Specific Rule 6 <ul style="list-style-type: none"> <li>• Verify MU Pump 1 breaker is open</li> <li>• Manually start EDG 1</li> <li>• Verify C1 Bus is energized</li> <li>• Verify CCW Pump 1 is running</li> <li>• Verify Service Water Pump 1 is running</li> </ul>
	RO	Per Specific Rule 4 start both Makeup Pumps if no feedwater flow exists
	CREW	Per Specific Rule 4 monitor RCS temperature for 600°F (600°F is a trigger to route to Attachment 4 to initiate MU/HPI cooling. Should have MDFP flow prior to this temperature)
	SRO	Implement Attachment 4 if RCS temperature reaches 600°F
	RO	Implement Attachment 8, Place MU/HPI/LPI in Service (from Attachment 4) <ul style="list-style-type: none"> <li>• Set Pressurizer Level Controller to 100 inches</li> <li>• Lock MU Pump suctions on the BWST</li> <li>• Start/Verify running the second MU Pump</li> <li>• Start/Verify running the standby CCW Pump</li> <li>• Start both HPI Pumps</li> <li>• Open HP 2A, HP 2B, HP 2C and HP 2D</li> <li>• Start both LPI Pumps</li> <li>• Open DH 64 and DH 63</li> </ul>
	RO	Turn off all Pressurizer Heaters (from Attachment 4)

Op-Test No.: \_\_\_\_\_ Scenario No.: 2 Event No.: 6,7,8 Page 5 of 7

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Align both MU injection lines (from Attachment 4) <ul style="list-style-type: none"> <li>• Close MU 6409</li> <li>• Open MU 6420</li> <li>• Open MU 6421</li> <li>• Open MU 6419</li> <li>• Verify open MU 6422</li> <li>• Close MU 6407</li> <li>• Close MU 6406</li> </ul>
	RO	Verify open RC 11 (from Attachment 4)
	RO	Lock open the PORV (from Attachment 4)
	SRO	After the BOP has started the MDFP and initiated flow to the SGs, route to section 4 for Supplementary Actions
	CREW	Check for symptom direction
	RO	Check for all Group 1-7 Control Rods fully inserted

Op-Test No.: \_\_\_\_\_ Scenario No.: 2 Event No.: 6,7,8 Page 6 of 7

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Perform Attachment 1, Primary Inventory Control Actions
	BOP	Perform Attachment 2, Steam Generator Inventory and Pressure Control Actions
	BOP	Check for NNI Power available
	RO	Monitor Makeup Tank level using the NNI-X powered level indicator
	BOP	Check for ICS Power available
	BOP	Check for Instrument Air available
	RO	Check SFAS has not actuated
	BOP	Verify proper SFRCS actuation for the trip parameters present using Table 1

Op-Test No.: \_\_\_\_\_ Scenario No.:  2  Event No.:  6,7,8  Page  7  of  7

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	CREW	Check for: <ul style="list-style-type: none"> <li>• Adequate subcooling margin</li> <li>• Proper primary to secondary heat transfer</li> <li>• SG Tube Rupture</li> </ul>
		Termination criteria <ul style="list-style-type: none"> <li>• MDFP supplying AFW to both SGs</li> <li>• Pressurizer level being manually controlled at the proper level</li> </ul>
		Unusual Event per EAL 4.A.1 for loss of offsite power

CRITICAL TASK JUSTIFICATION

Re-power D2 Bus

SSig - Failure to do so will cause a loss of all feedwater

Cue - Loss of normal power to D2 Bus, Procedural guidance

MPI - D2 Bus powered from SBODG OR D2 Bus powered from D1 Bus OR D2 Bus powered from C1 Bus

OPF - D2 Bus Voltage indicates  $\approx 4160$  Volts

KSA Number: 064-A4.06 (3.9/3.9) Ability to manually start and load EDG from the Control Room

Feed at least one SG using the MDFP

SSig - Failure to do so will cause a loss of all feedwater

Cue - Aux Feedwater Pumps not running, Procedural Guidance

MPI - MFFP switch to START, MDFP discharge valve(s) open

OPF - Flow to the SG(s), SG level(s) increasing

KSA Number: 056-AA1.10 (4.3/4.3) Ability to operate Aux/Emergency Feedwater Pumps during a loss of offsite power

## SCENARIO ATTRIBUTES

Total Malfunctions	7
Malfunctions after EOP Entry	3
Abnormal Events	3
Major Transients	1
EOPs	1
EOP Contingencies	2 (Attachment 6 and Attachment 5 of DB- OP-02000)
Scenario Runtime	75 minutes
EOP runtime	30 minutes
Crew Critical Tasks	2
Technical Specifications Exercised	2

**CUE SHEET****Event 1 - Transfer Gland Steam from Main Steam to Aux Steam****Event 2 - Loss of oil in AFPT 1 governor**

Role play as an Equipment Operator to call the Control Room to report the oil sight glass on the AFPT 1 governor is broken and the oil has leaked out of the governor

Role play as Maintenance to investigate the broken sightglass on the AFPT 1 governor

If requested, role play as the Work Week Manager to report risk level has increased to Orange

If requested, role play as an Equipment Operator/Field Supervisor to close the AFPT 1 Trip Throttle Valve

**Event 3 - MU 32 blown fuse**

Role play as I&C for investigating/replacing the blown fuse

**Event 4 - Dropped Control Rod**

Role play as Operations Management for Reactivity Management notifications

Role play as an Equipment Operator/I&C for investigating the dropped rod

Role play as the System Dispatcher to acknowledge the power reduction

**Event 5 - Loss of NNI-Y DC**

Role play as I&C for investigating loss of NNI-Y DC

**Event 6, 7 and 8 - Loss of offsite power, Reactor trip, failure of EDG 1 to automatically start and loss of both AFW Pumps**

Role play as an Equipment Operator to investigate the loss of both AFW Pumps. Report AFPT 1 tripped on overspeed due to no Governor control oil and AFPT 2 governor valve is stuck closed

**Simulator Setup Instructions**

## 1. Verify the following:

- a. Previous data on Yokogawa recorders is cleared
- b. Chart recorders are rolled forward
- c. Applicable procedures are wiped cleaned
- d. Used Alarm Typer paper is removed
- e. Computer alarms are cleared/acknowledged

## 2. Initialize at 60% power

## 3. Equipment Status:

- a. Hang License Requirement Sheet on the status board for LPI Train 1 and RCP 1-1
- b. Tag out LPI Pump 1
- c. Turn on the LPI blue status
- d. Hang Protected Train 2 signs
- e. Select SP16B for Turbine Throttle Pressure input
- f. Reset SASS annunciators as required

## 4. Set Up Batch File

## a. Initial Setup

- Rackout the breaker for LPI Pump 1

IRF BDP1A RACKOUT

- EDG 1 fails to automatically start

IRF G529B

- RCP 1-1-1 seal 1 leak

IMF HN09 0.4

- RCP 1-1-1 seal 2 leak

IMF HN08 0.0017

- Fail SP16A low to put SP16B in service

IMF L1T2N 0.0

b. Triggers

- Reactor power < 5% activates the loss of offsite power

TRGSET 6 "RATPW<5.0"

- AFPT 2 Gov Valve closes when AFPT 2 steam admission valve opens

TRGSET 8 "SXA5889B>0.2"

c. Events

Event 1 - Transfer GS from Main Steam to Auxiliary Steam

Event 2 - Loss of oil from AFPT 1 governor

IMF SFEJA (2)

Event 3 - Blown fuse causes MU32 to fail to control in automatic

IRF H170 (3) TRUE

Event 4 - Rod 5-8 drops, location M-5

IMF LI53B (4)

Event 5 - Loss of NNI Y DC

IMF NP19D (5) TRUE

Event 6 - Loss of offsite power

IMF PLZZ (6)

Event 7 - EDG 1 fails to automatically start

Event 8 - AFPT 2 Gov Valve closes when the AFP starts

IMF SFERE (8) TRUE

Facility:	Davis-Besse	Scenario No.:	3	Op Test No.:	
Examiners:	_____	Operators:	_____		
	_____		_____		
	_____		_____		
Initial Conditions: _____					
<ul style="list-style-type: none"> <li>• 50% power, 400 EFPD</li> </ul>					
<ul style="list-style-type: none"> <li>• Emergency Diesel Generator 1 out of service</li> </ul>					
<ul style="list-style-type: none"> <li>• MFPT 1 on the Turning Gear</li> </ul>					
<ul style="list-style-type: none"> <li>• HIS SP 16, Turbine Throttle Pressure, selected to PT SP16B (NNI-Y)</li> </ul>					
<p>Turnover: The crew will assume the watch with the plant at 50% power with core age at 400 EFPD. Emergency Diesel Generator 1 is out of service for maintenance. The Plant Risk level will be YELLOW. MFPT 2 is on line and MFPT 1 is on the turning gear. Following turnover the Crew will take action to perform the Turbine-Generator Backup Overspeed Trip Circuit Test</p>					
Event No.	Malf. No.	Event Type*	Event Description		
1		N – BOP	Perform TG Backup Overspeed Test, DB-SS-04154		
2	B2M1N	C – RO TS – SRO	Make-Up Pump 1 trips		
3	BV24B	C – RO	MU 1903 fails closed		
4	HH50	R – RO TS - SRO	SG 1 tube leak and plant shutdown		
5	UF09A UF08A UF11A UF06A	C – BOP	Turbine Vibration		
6	HH50	M – All	SG 1 Tube Rupture and Reactor trip		
7	SFDPC	M - All	Loss of Main Feedwater		
8	F30AB F30AC	C -BOP	SFRCS Channel 1 fails to actuate		
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor					

**DAVIS-BESSE 2008 NRC EXAM SIMULATOR SCENARIO 3 GENERAL DESCRIPTION**

The crew will assume control with power at 50% power. Following turnover the crew will perform DB-SS-04154, Turbine-Generator Backup Overspeed Trip Circuit Test

Following the completion of DB-SS-04154 the Lead Evaluator will cue the loss of the running Makeup Pump. The crew will respond to annunciator 6-6-C, SEAL INJ TOTAL FLOW, in accordance with DB-OP-02006, Reactor Coolant Pump Alarm Panel 6 Annunciators, and enter DB-OP-02512, Loss Of RCS Makeup and DB-OP-02515, Reactor Coolant Pump And Motor Abnormal Operations. The crew should close MU19, Seal Injection Flow Control Valve, and start the standby Makeup Pump. The crew should restore Pressurizer level and RCP Seal Injection flow. The SRO should evaluate the loss of the Makeup Pump and determine Tech Spec 3.1.2.4 applies.

Following the start of the standby Makeup Pump the Lead Evaluator will cue the inadvertent closure of MU1903, Letdown Demin Inlet. The crew will respond to annunciator 2-2-A, LETDOWN PRESS HI, in accordance with DB-OP-02002, Letdown/Makeup Alarm Panel 2 Annunciators. The crew should isolate Letdown to stop an interfacing system LOCA. An Equipment Operator will call up and identify that MU1903 had been inadvertently closed. Letdown will be re-established in accordance with DB-OP-06006, Makeup And Purification System

After Letdown flow is re-established the Lead Evaluator will cue the Steam Generator 1 Tube Leak. The crew should respond to annunciator 12-1-A, MN STM LINE 1 RAD HI, in accordance with DB-OP-02531, Steam Generator Tube Leak. The crew will evaluate the SG leakage and determine the leak rate is in excess of T.S. 3.4.6.2 and start a rapid shutdown.

During the power reduction Main Turbine bearing vibration levels will increase to the point annunciator 15-2-E T-G BEARING VIB HI will alarm. The crew will respond in accordance with DB-OP-02015, Turbine Alarm Panel Annunciators and manually trip the Main Turbine.

After the Main Turbine is tripped the Lead Evaluator will cue the increase in SG tube leakage. This leak size will be larger than Makeup capacity. The crew will enter DB-OP-02000, RPS SFAS, SFRCS Trip, or SG Tube Rupture and trip the reactor.

After the reactor trip, the Main Feedwater Pump 2 speed will coast down leading to a loss of all Main Feedwater. SFRCS Channel 1 will not actuate either automatically or manually requiring the crew to start AFW Pump 1 and reposition SFRCS Channel 1 actuated valves.

The Lead Evaluator can terminate the scenario when all high level activities have been completed and the evaluators agree the crew can be properly evaluated.

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

**Event Description:** Following turnover the crew will perform the Backup Overspeed trip test for the Main Turbine in accordance with DB-SS-04154, Turbine-Generator Backup Overspeed Trip Circuit Test

Time	Position	Applicant's Actions or Behavior
	BOP	Place HIS MP111A, Backup Overspeed Trip Test Switch, in TEST position
	BOP	Depress and hold the Backup Overspeed Trip - Push To Test pushbutton located on the EHC Monitor Panel (C5757B)
	BOP	Check that the Backup Overspeed Trip - Push To Test lamp comes on
	BOP	Release the Backup Overspeed Trip - Push To Test pushbutton
	BOP	Check that the Backup Overspeed Trip - Push To Test lamp goes off
	BOP	Place HIS MP111A, Backup Overspeed Trip Test Switch, in NORMAL position
	BOP	Notify the Shift Manager this procedure is complete
		After the Backup Overspeed Trip Test is complete direct the Simulator Operator to insert <b>Event Line 2</b> to trip Makeup Pump 1

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

**Event Description:** Makeup Pump 1 trips causing a loss of RCS Makeup and RCP Seal Injection. The Reactor Operator should isolate Letdown and start the standby Makeup Pump. The SRO should implement DB-OP-02512, Loss of RCS Makeup and enter the applicable Tech Spec.

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a loss of the running Makeup Pump <ul style="list-style-type: none"> <li>• 6-5-C SEAL INJ FLOW LO</li> <li>• 6-6-C SEAL INJ TOTAL FLOW</li> <li>• Zero Makeup flow</li> <li>• Makeup Pump red light OFF</li> </ul>
	SRO	Implement DB-OP-02512, Loss of RCS Makeup
	RO	Verify Components Cooling Water supply to the RCPs
	RO	Monitor Pressurizer level
	RO	Close MU 2B to isolate Letdown
	RO	Isolate Seal Injection by closing MU 19
	RO	Isolate normal Makeup by closing MU 32
	SRO	Refer to DB-OP-02515, Reactor Coolant Pump and Motor Abnormal Operation, section 4.2

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

Event Description:

Time	Position	Applicant's Actions or Behavior
	RO	*Start the standby Makeup Pump 2
	RO	Restore Seal Injection flow as follows <ul style="list-style-type: none"> <li>• Over ≈2 minutes open MU 19 to a setpoint of 12-15 gpm</li> <li>• After 10 minutes increase total Seal Injection flow to ≈20 to 25 gpm</li> <li>• After another 10 minutes adjust total Seal Injection flow to the normal range</li> <li>• Return MU 19 to AUTO</li> </ul>
	RO	*Restore Makeup Flow as follows: <ul style="list-style-type: none"> <li>• Slowly raise Makeup flow using MU 32</li> <li>• When Pressurizer level is correct return MU 32 to AUTO</li> </ul>
	RO	Open MU 2B to restore Letdown
	SRO	Refer to Tech Spec 3.1.2.4 (72 Hour LCO)
		After the SRO refers to Tech Specs, direct the Simulator Operator to enter <b>Event Line 3</b> to close MU 1903, Purification Demin 3 Letdown Flow Inlet

\*Critical Task

Op-Test No.: _____ Scenario No.: <u>3</u> Event No.: <u>3</u> Page <u>1</u> of <u>2</u>		
<b>Event Description:</b> MU 1903, Purification Demin 3 Letdown Flow Inlet is inadvertently closed from the local switch and causes a loss of Letdown		
Time	Position	Applicant's Actions or Behavior
	CREW	Recognize a loss of the Letdown flowpath: <ul style="list-style-type: none"> <li>• Zero Letdown flow</li> <li>• 2-2-A LETDOWN PRESS HI</li> </ul>
	RO	Refer to DB-OP-02002, Letdown/Makeup Alarm Panel 2 Annunciators
	RO	*Verify MU 4, Pressure Reducing Valve, is closed (Can also close MU 2B, MU2A or MU 3 to isolate Letdown)
	RO	Verify MU 6, Letdown Flow Control Valve, is closed
	RO	Crew may use guidance in DB-OP-02522, Small RCS Leaks for loss of Letdown flow <ul style="list-style-type: none"> <li>• Set MU 32 setpoint to ≈160 inches</li> <li>• Lower Seal Injection flow to ≈3 gpm per RCP</li> <li>• Request Chemistry to maximize sample rate</li> </ul>
	RO	Check for correct valve lineup in the Letdown line <ul style="list-style-type: none"> <li>• Recognize MU 1903 is closed</li> </ul>
	RO	Re-establish Letdown <ul style="list-style-type: none"> <li>• Re-open MU 1903</li> <li>• Re-open MU 4 (or MU 2B, MU2A or MU 3 if closed instead of MU 4)</li> </ul>
	SRO	If Pressurizer level is > 228 inches, enter Tech Spec 3.4.4

\*Critical Task



Op-Test No.: \_\_\_\_\_ Scenario No.: 3 Event No.: 4&5 Page 1 of 4

**Event Description:** A tube leak of  $\approx 75$  gpm in SG 1 will require a plant shutdown. During the power reduction vibrations will increase on the Main Turbine requiring the Main Turbine to be manually tripped

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize indications of a SG tube leak <ul style="list-style-type: none"> <li>• 9-4-A VAC SYS DISCH RAD HI</li> <li>• 12-1-A MN STM LINE 1 RAD HI</li> <li>• Increasing Makeup flow</li> </ul>
	SRO	Route to DB-OP-02531, Steam Generator Tube Leak
	RO	Monitor Pressurizer level
	CREW	Determine SG 1 has the tube leak
	RO	Calculate a leak rate
	SRO	Direct Chemistry to perform Attachment 2
	SRO	Direct Radiation Protection to perform Attachment 3
	SRO	Direct an Equipment Operator/Field Supervisor to perform Attachment 4
	SRO	Direct a plant shutdown
	SRO	Notify the SCC Load Dispatcher of plant shutdown

Op-Test No.: \_\_\_\_\_ Scenario No.: 3 Event No.: 4&5 Page 2 of 4

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	RO	Begin plant shutdown <ul style="list-style-type: none"> <li>• Set RATE OF CHANGE</li> <li>• Set MIN LIMIT - MW to 180 MWE</li> <li>• Depress DECREASE</li> </ul>
	SRO	Contact Chemistry to monitor Condensate Polishers and sample the RCS
	SRO	As time permits: <ul style="list-style-type: none"> <li>• Direct a Reactor Operator to transfer station electrical loads</li> <li>• Direct an Equipment Operator to realign the MDFP to the MFW mode</li> <li>• Direct an Equipment Operator to fire the Aux Boiler</li> </ul>
	RO	Maintain Makeup tank level (May transfer MU Pump suctions to the BWST)
	SRO	Refer to TS 3.4.6.2.c
		<b>Event Line 5</b> will automatically activate to begin increasing Turbine Vibrations when Reactor power goes below 40%
	CREW	Recognize increasing vibrations on the Main Turbine <ul style="list-style-type: none"> <li>• 15-2-E T-G BEARING VIB HI</li> <li>• High vibration on any Turbine or Generator Bearing at ZJR 2538, Main Turbine &amp; MFP Turbines-Bearing Vibration &amp; Eccentricity</li> </ul>
	BOP	Refer to DB-OP-02015, Turbine Alarm Panel Annunciators

Op-Test No.: \_\_\_\_\_ Scenario No.: 3 Event No.: 4&5 Page 3 of 4

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Verify bearing vibration location and intensity at ZJR 2538
	BOP	When vibration intensity is greater than 12 mils for any bearing, then trip the Main Turbine
	SRO	Refer to DB-OP-02500, Turbine Trip
	BOP	Check Turbine Stop Valves and Turbine Control Valves are closed
	BOP	Check Feedwater is controlling on Low Level Limits
	BOP	Check SG pressures controlling at ≈870 psig
	BOP	Verify ACB 34560 and ABS 34561 are open
	BOP	Verify power is not flowing on the Main Generator
	BOP	Verify the Generator Field Breaker and the Exciter Field Breaker are open
	BOP	Verify MS 199 and MS 314 are closed
	RO	Check proper RCS response <ul style="list-style-type: none"> <li>• RCS pressure</li> <li>• RCS temperature</li> <li>• Pressurizer level</li> </ul>



Op-Test No.: \_\_\_\_\_ Scenario No.: 3 Event No.: 6.7.8 Page 1 of 4

**Event Description:** The tube leak in SG 1 will increase in size and require entry into DB-OP-02000 for a SG Tube Rupture. Since the plant is on Low Level Limits, the Crew should trip the Reactor. Following the Reactor trip the running MFPT speed will decrease to the point that an SFRCS actuation should occur. SFRCS Channel 1 fails to actuate requiring the Crew to manually reposition the SFRCS actuated valves

Time	Position	Applicant's Actions or Behavior
	CREW	Recognize increase in leak rate <ul style="list-style-type: none"> <li>• Makeup flow increasing</li> <li>• Pressurizer level decreasing</li> </ul>
	SRO	Route back to section 4.1 of DB-OP-02531
	RO	Close MU 2B to isolate Letdown
	RO	Recognize PZR level still dropping
	SRO	Go to section 8 of DB-OP-02000, RPS SFAS, SFRCS Trip, or SG Tube Rupture
	RO	Implement Attachment 8, Place MU/HPI/LPI in Service <ul style="list-style-type: none"> <li>• Set Pressurizer Level Controller to 100 inches</li> <li>• Lock MU Pump suctions on the BWST</li> <li>• Start/Verify running the standby CCW Pump</li> <li>• Start/Verify running both HPI Pumps</li> <li>• Verify open HP 2A, HP 2B, HP 2C and HP 2D</li> <li>• Start both LPI Pumps</li> <li>• Open DH 64 and DH 63</li> </ul>
	RO	Trip the reactor when Pressurizer level drops to 100 inches or lower

Op-Test No.: _____ Scenario No.: <u>3</u> Event No.: <u>6.7.8</u> Page <u>2</u> of <u>4</u>		
Event Description: Continued		
Time	Position	Applicant's Actions or Behavior
	RO	Perform DB-OP-02000 Immediate Actions <ul style="list-style-type: none"> <li>Manually trip the reactor</li> <li>Verify power decreasing in the intermediate range</li> <li>Manually trip the turbine</li> </ul>
	SRO	Verify immediate actions
	CREW	Check for Specific Rule implementation
	BOP	Recognize AFPT 1 did not automatically start <ul style="list-style-type: none"> <li>Implement Specific Rule 4</li> </ul>
	BOP	Align Auxiliary Feedwater to SG 1 using Table 1 for guidance <ul style="list-style-type: none"> <li>Open MS 5889A to start AFPT 1</li> </ul> OR <ul style="list-style-type: none"> <li>Start the Motor Driven Feedwater Pump <ul style="list-style-type: none"> <li>Enable both MDFP Discharge Valves</li> <li>Close both MDFP Discharge Valves</li> <li>Start the MDFP</li> <li>Feed SG 1</li> </ul> </li> </ul>
	BOP	Realign the following valves for a SFRCS Actuation using Table 1 for guidance <ul style="list-style-type: none"> <li>Close FW 612</li> <li>Close ICS 11B</li> <li>Close MS 394</li> <li>Open MS 106</li> <li>Open MS 5889A</li> </ul>

Op-Test No.: \_\_\_\_\_ Scenario No.:  3  Event No.:  6.7.8  Page  3  of  4

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Maintain RCS pressure constant or slightly decreasing using the Atmospheric Vent Valves
	CREW	Check for Symptom direction <ul style="list-style-type: none"> <li>• Recognize SG 1 tube rupture</li> </ul>
	SRO	Route to Section 8
	RO	Verify Attachment 8 is complete
	RO	Set Pressurizer Level Controller to 100 inches
	SRO	Verify the following attachments from DB-OP-02531 are in progress: <ul style="list-style-type: none"> <li>• Attachment 2, Chemistry Responsibilities</li> <li>• Attachment 3, Radiation Protection Responsibilities</li> <li>• Attachment 4, Control of Secondary Contamination</li> </ul>

Op-Test No.: \_\_\_\_\_ Scenario No.: 3 Event No.: 6,7,8 Page 4 of 4

Event Description: Continued

Time	Position	Applicant's Actions or Behavior
	BOP	Direct an Equipment Operator/Field Supervisor to place the Auxiliary Boiler in service
	RO	Turn off all Pressurizer heaters
	RO	Begin spraying the Pressurizer to lower RCS pressure
	RO	Block SFAS low RCS pressure trips
	RO	Control MU/HPI to maintain Pressurizer level 80 to 120 inches
	BOP	Begin a RCS cooldown using the Atmospheric Vent Valves
	RO	Termination Criteria <ul style="list-style-type: none"> <li>• HPI maintaining Pressurizer level</li> <li>• RCS cooldown in progress using both SGs</li> </ul>
	RO	Alert based on EAL 2.A.2 for an RCS leak greater than 50 gpm

## CRITICAL TASK JUSTIFICATION

Start the standby Makeup Pump and restore Makeup flow

SSig - Prevent loss of RCS inventory control

Cue - Procedural direction

MPI - Makeup Pump 2 hand switch to START

OPF - Makeup Pump 2 RED light lit

KSA Number: 004-A4.08 (3.8/3.4) Ability to manually operate the Makeup Pumps

Isolate the Letdown line

SSig - Loss of RCS inventory/pressure outside of Containment

Cue - Letdown high pressure, Procedural direction

MPI - MU 4 CLOSE pushbutton depressed

OR

MU 2B CLOSE pushbutton depressed

OR

MU 3 CLOSE pushbutton depressed

OR

MU 2A CLOSE pushbutton depressed

OPF - MU 4 green light on

OR

MU 2B green light on

OR

MU 3 green light on

OR

MU 2A green light on

KSA Number: 004-A4.06 (3.6/3.1) Ability to manually operate the Letdown isolation and flow control valves

## SCENARIO ATTRIBUTES

Total Malfunctions	6
Malfunctions after EOP Entry	2
Abnormal Events	4
Major Transients	1
EOPs	1
EOP Contingencies	1 (Specific Rule 4)
Scenario Runtime	75 minutes
EOP runtime	30 minutes
Crew Critical Tasks	2
Technical Specifications Exercised	2

**CUE SHEET****Event 1 - Turbine-Generator Backup Overspeed Trip Circuit Test****Event 2 - Makeup Pump 1 trips**

Role Play as an Equipment Operator to report a 50/51A target, Alarm-Time and Instantaneous Overcurrent on BKR AC105 is showing

Role play as the Work Week Manager/Electrical Maintenance to begin trouble shooting AC105

**Event 3 - MU 1903, Purification Demin 3 Letdown Flow Inlet is inadvertently closed**

After MU 1903 is closed, role play as an Equipment Operator to report the local CLOSE pushbutton (NV 19030) was inadvertently depressed

**Event 4 & 5 - SG 1 tube leak of  $\approx 75$  gpm and high vibrations on the Main Turbine**

Role play as Chemistry to perform Attachment 2 of DB-OP-02531

Role play as Radiation Protection to perform Attachment 3 of DB-OP-02531

Role play as an Equipment Operator/Field Supervisor to perform Attachment 4 of DB-OP-02531

Role play as the System Dispatcher to acknowledge the power reduction

**Event 6, 7 & 8 - SGTR, Reactor Trip and Loss of Main Feedwater**

Simulator Setup Instructions

## 1. Verify the following:

- a. Previous data on Yokogawa recorders is cleared
- b. Chart recorders are rolled forward
- c. Applicable procedures are wiped cleaned
- d. Used Alarm Typer paper is removed
- e. Computer alarms are cleared/acknowledged

## 2. Initialize at 50% power

- a. Verify MFPT 2 running
- b. Verify MFPT 1 on the Turning Gear

## 3. Equipment Status:

- a. Hang License Requirement Sheet on the status board

EDG 1: TS 3.8.1.1.b, fuel oil and lube oil filter replacement,  
DB-SC-03023 due (current time + 6 hours) DB-SC-03071 due (current  
time + 22 hours). Restore by (current time + 7 days)

- b. Tag out AC 101, EDG 1 output breaker
- c. Turn on the EDG blue status
- d. Hang Protected Train 2 signs
- e. Select SP16B for Turbine Throttle Pressure input
- f. Reset SASS annunciators as required

## 4. Set Up Batch File

- a. Initial Setup

- Remove EDG 1 from service.

Close DA44

IRF GD44 close

Close DA 30

IRF GD43 close

Rack out AC 101

IRF G535A 3.0

- Fail SFRCS Channe1 automatic and manual actuation

IMF F30AB

IMF F30AC

- Fail SP16A low to put SP16B in service

IMF L1T2N 0.0

#### b. Triggers

- Reactor power < 40% activates the turbine vibrations

TRGSET 5 "RATPW<40.0"

- Reactor power < 10% activates the MFPT 2 loss of speed

TRGSET 6 "RATPW<10.0"

- MU 4 green light on

TRGSET 9 "B20MU04g==1"

#### c. Events

Event 1 - Main Turbine Backup Overspeed Trip test

Event 2 - Fail Makeup Pump 1 breaker open

IMF B2M1N (2) TRUE

Event 3 - MU1903 Demin 3 Inlet closes

IRF BV24B (3) CLOSE

Event 4 - SG 1 tube leak

IMF HH50 (4) 0.015 00:01:00

Event 5 - Main Turbine high vibrations

IMF UF09A (5) 1.0 60 0.1

IMF UF08A (5) 1.0 90 0.1

IMF UF11A (5) 1.0 120 0.1

IMF UF06A (5) 1.0 150 0.1

Event 6 - MFPT 2 speed lowers

IMF SFDPC (6) TRUE

Event 7 - Increase size of SG 1 tube leak

Use CAEP File Line 2

Event 8 - SFRCS Ch 1 fails to actuate automatically or manually

Event 9 - Bleed Letdown system pressure

IRF BM77 (9) 0.0

IRF BMS1B (9) 1

d. CAEP File

- Clear failure on MU 1903

IRF BM77 1.0 |04:00:00|2

IRF BMS1B 0.0 |04:00:00|3

- Raise SG 1 leak rate to 0.09 after reactor trip

CAEP Line 2 -MMF HH50 0.09|04:00:00|2