

Facility: Hope Creek**Scenario No.:** 1**Op Test No.:** 1**Examiners:** _____**Candidates:** _____ LSRO

_____ LSRO

Objectives: Evaluate applicants' response to a dropped irradiated fuel bundle. Discuss the effects of fuel damage caused by the dropped bundle. Demonstrate ability to determine ECG classification for damage to irradiated fuel.

Initial Conditions: Operational Condition 5, core offload in progress

Turnover: You are the Refueling SRO. A fuel bundle is being raised from the reactor core on the Main Fuel Grapple.

Event No.	Malf. No.	Event Type*	Event Description	Evaluator Guide
1	N/A	C	The fuel bundle bail handle fails and drops free of the grapple	Recognize the need to suspend refueling operations and evacuate the Refueling Floor IAW HC.OP-AB.ZZ-0101. Ensures all personnel leave the Refuel Floor
2	NA	M	The fuel bundle lands on the reactor core and is severely damaged Large bubbles are coming off the bundle Siren sounds on the Refuel Floor	Notifies the Control Room of the dropped bundle and damage to the fuel bundle. Notifies Radiation Protection. Discuss fission product transport to ventilation system. Discuss Radiation Monitoring System response <ul style="list-style-type: none"> - Area radiation Monitors - Ventilation Duct monitors Discuss resulting automatic actions from Refuel Floor High Radiation 2.0×10^{-3} uCi/cc <ul style="list-style-type: none"> - RBVS Dampers isolate - FRVS Vent Fan and Recirc Fans Auto Start

3	N/A	M	<p>You have safely entered the Control Room. The STA reports total plant vent release rate is $4.15\text{E}+03$ uCi/sec Noble Gas.</p> <p>What ECG classification is required due to the event?</p>	<p>Offsite release rate is below UE level.</p> <p>Alert per section 6.4.2.a of the ECG.</p>
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* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

pro'at

APPROVED:

[Signature]
Operations Manager

3/16/98

Date

CATEGORY II

IRRADIATED FUEL DAMAGE

1.0 **SYMPTOMS**

1.1 **Alarms**

- A. REFUELING FL AIRBORNE ACTIVITY HI
- B. R B AIRBORNE ACTIVITY HI
- C. RADIATION MONITORING ALARM/TRBL
- D. NEW FUEL CRITICALITY RAD HI

2.0 **AUTOMATIC ACTIONS**

- 2.1 Reactor Building Ventilation System Isolation on the following:

Reactor Building Exh Hi Rad (1.0×10^{-3} uci/cc)
Refuel Floor Exh Hi Rad (2.0×10^{-3} uci/cc)

- 2.2 Filtration, Recirculation and Ventilation System (FRVS) automatic start.

3.0 **IMMEDIATE OPERATOR ACTIONS**

- 3.1 **SUSPEND** all refueling operations.
- 3.2 **ENSURE** all appropriate automatic actions are complete.

4.0 **SUBSEQUENT OPERATOR ACTIONS**

- 4.1 **ENSURE** all appropriate immediate operator actions are complete. _____
- 4.2 **EVACUATE** all unnecessary personnel from the Reactor Building. _____
- 4.3 **ENSURE** that secondary containment is in effect. _____
- 4.4 **DIRECT** the Radiation Protection Department to take air samples
AND control access to the reactor building and refuel floor, if necessary. _____
- 4.5 **DETERMINE** the FRVS release rate
AND **ACTIVATE** the appropriate emergency plan. _____

5.0 **DISCUSSION**

- 5.1 A damaged fuel assembly attached to the fuel handling grapple should be set down in the fuel pool storage area
OR isolated in the defective fuel storage container if a high area radiation condition does not exist.
- 5.2 A failure of fuel cladding during refueling operations will release gaseous fission products to the reactor building. The severity of this accident will depend upon the exposure history of the fuel bundles.
- 5.3 Operation of the spent fuel pool cooling system, with irradiated fuel damage, can result in increased radiation levels in the spent fuel pool cooling piping.

Facility: Hope Creek

Scenario No.: 2

Op Test No.: 1

Examiners: _____

Candidates: _____ LSRO

_____ LSRO

Objectives: To evaluate the applicants' ability to implement alternate core circulation and decay heat removal methods, evaluate ability to use T.S requirements for decay heat removal and forced circulation with low water level. Evaluate use of AB-0142 to determine time to reach 200 degrees F and discuss manual operation of a MOV.

Initial Conditions: Operational condition 5, 7 days after shutdown for refueling outage. Reactor head is removed. RPV water level is 1 foot below head flange. B RHR Pump is in Shutdown Cooling. RCS temperature is 120 degrees F

Turnover: You are the Refueling SRO, preparing to fill the reactor cavity.

Event No.	Malf. No.	Event Type*	Event Description	Evaluator Guide
1	1	I	Failure of Reactor pressure transmitter upscale (BB-PT-N078A). I&C reports the transmitter will take at least 4 hours to replace.	Discuss upscale failure of one RPV Pressure failure causes RHR BC-HV-F009 on common SDC suction line to isolate. Notifies Maintenance or WIN Team to repair with SAP notification.
2	2	M	Loss of all RHR Shutdown cooling.	Recognize SDC Tech Spec 3.9.11.2 LCO is not met. Discuss actions IAW HC.OP-AB.ZZ-0142 to establish alternate method of decay heat removal and alternate circulation within one hour. Determines time to 200 deg F at approximately 1.75 hours from AB-0142 Figure 1 Determines Secondary Containment integrity will be needed within 2 hours.
3		M	Implement alternate core circulation/ implement alternate decay heat removal contingencies.	Determines need to fill and vent SDC suction line. Discuss manual operation of SDC suction valve HV-F009 MOV. If SDC cannot be established, determines need to establish forced circulation with a Reactor Recirc Pump.

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

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HC.OP-AB.ZZ-0142(Q)

APPROVED: 

Operations Manager

2/28/00
Date

CATEGORY II

LOSS OF SHUTDOWN COOLING

1.0 SYMPTOMS

1.1 Alarms

- A. RHR LOOP A TROUBLE
- B. RHR LOOP B TROUBLE
- C. RHR HX CLG WTR OUTLET TEMP HI

1.2 Increasing Reactor coolant temperature/pressure

1.3 Decreasing or stopped Reactor coolant flow

1.4 Reduced or stopped RHR Shutdown Cooling flow to the Jet Pumps

2.0 AUTOMATIC ACTIONS

2.1 None

3.0 IMMEDIATE OPERATOR ACTIONS

3.1 None

4.0 SUBSEQUENT OPERATOR ACTIONS**NOTE 4.0**

The following Operating procedures provide additional alternate decay heat removal methods:

- HC.OP-IO.ZZ-0004(Q) - Shutdown From Rated Power to Cold Shutdown
- HC.OP-IO.ZZ-0005(Q) - Cold Shutdown to Refueling
- HC.OP-IO.ZZ-0009(Q) - Refueling Operation
- HC.OP-SO.BC-0002(Q) - Decay Heat Removal Operation

4.1 IF at any time RHR Shutdown Cooling CAN BE established,
THEN EXIT this procedure
AND RETURN to the applicable Integrated Operating procedure:

- HC.OP-IO.ZZ-0004(Q) - Shutdown From Rated Power to Cold Shutdown
- HC.OP-IO.ZZ-0005(Q) - Cold Shutdown to Refueling
- HC.OP-IO.ZZ-0009(Q) - Refueling Operation
- HC.OP-SO.BC-0002(Q) - Decay Heat Removal Operation

4.2 IF initial RCS temperature was < 200°F
AND operation above 200°F is anticipated,
THEN CONSIDER the need to establish primary and secondary containment integrity. (See Figure 1 for time to 200°F.)

4.3 IF the Shutdown Cooling suction line was isolated,
THEN PRIOR to establishing the suction flowpath from the vessel,
FILL & VENT the suction line IAW HC.OP-SO.BC-0002(Q). [CD-891D]

4.4 INITIATE corrective action to re-establish RHR Shutdown Cooling capability, including manual operation of any valves to re-establish the required flowpath. [CD-065X]

4.5 IF RHR Shutdown Cooling cannot be established,
THEN ENSURE forced circulation in the core utilizing Reactor Recirculation Pump(s).

CAUTION 4.6

Main Steam Line flooding occurs at 118 inches.

Main Steam Isolation Valves require closing at 90 inches.

4.6 IF forced circulation can not be established
THEN: [CD-693A, CD-178A, CD-973B]

- **MAINTAIN** RPV level at ≥ 80 inches, Reactor Level Shutdown Range, using temperature compensated indication, (Vessel Level Instrumentation Temperature Compensation Curves may be required), to allow for natural circulation.
- **MONITOR** Vessel metal temperatures above AND below the water level, AND Reactor Coolant System Temperature/Pressure Data to ensure the TS Cooldown limits are not exceeded.
- **UTILIZE** Reactor Water Cleanup in maximum cooling.

NOTE 4.7

Alternate method of decay heat removal will depend on the amount of decay heat and current plant conditions.

4.7 **ESTABLISH** alternate method of decay heat removal. Methods include:
[CD-973B, CD-100A, CD-076B]

- A. RWCU System, maximizing RACS to the Non-Regenerative Heat Exchangers. (Attachment 1) [CD-900E]
- B. Condensate Transfer System via the ECCS injection lines. (Attachment 1)
- C. Vessel Head Spray, to withdraw energy from the RPV, this will promote RPV mixing when water level is ≥ 80 ". (Attachment 1)
- D. Maximize Fuel Pool Cooling when the Vessel Head is removed with the Reactor Cavity flooded. (Attachment 1)

Continued Next Page

4.7 (Continued)

- E. Alternate Shutdown Cooling using C to A RHR Cross-tie.
(Attachment 2)
- F. Alternate Shutdown Cooling using D to B RHR Cross-tie.
(Attachment 3)

CAUTION 4.8

**Alternate Shutdown Cooling IAW Step 4.8 shall only be used
when all other alternatives (listed in step 4.7) have been exhausted. [CD-950B]**

- 4.8 IF monitored temperatures AND pressures cannot be maintained OR reduced,
THEN INITIATE Alternate Shutdown Cooling as follows:
(Also, REFER to discussion step 5.7 for indications of entering OP CON 3).
[CD-973B, CD-110E]
- 4.8.1 **INITIATE** Suppression Pool Cooling.
- 4.8.2 **ENSURE** the RPV Head Vents, MSIVs, Main Steam Line Drain valves,
and the HPCI and RCIC Isolation Valves are closed.
- 4.8.3 **PLACE** the Control Switch for two SRVs in the OPEN position.
- 4.8.4 **SLOWLY RAISE** RPV water level to establish a flow path through the
open SRVs back to the Suppression Pool with the available water sources
capable of injecting to the RPV.
- 4.8.5 **TERMINATE AND PREVENT** all injection into the RPV
except from CRD.
- 4.8.6 **START** one Core Spray Subsystem OR one LPCI Pump with suction
from the Suppression Pool.
- 4.8.7 **INCREASE** Core Spray OR LPCI injection into the RPV to maximum.
- 4.8.8 IF RPV pressure does not stabilize at least 50 psig above Suppression
Chamber pressure,
THEN START another Core Spray Subsystem OR LPCI Pump.

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- 4.8.9 IF RPV pressure does not stabilize below 140 psig,
THEN OPEN another SRV.
- 4.8.10 IF the cooldown rate exceeds 100°F/hr,
THEN REDUCE Core Spray OR LPCI injection into the RPV
UNTIL the cooldown decreases below 100°F/hr
OR RPV pressure decreases to within 50 psig of Suppression Chamber
pressure, whichever occurs first. (HC.OP-AB.ZZ-0155(Q) may be
used to control RHR/CS flow rate.)
- 4.8.11 **CONTROL** Suppression Pool temperature to maintain RPV water
temperature above 79°F.
- 4.8.12 **PROCEED** to cold shutdown IAW HC.OP-IO.ZZ-0004(Q), Shutdown
From Rated Power To Cold Shutdown.

5.0 **DISCUSSION**

- 5.1 IF plant conditions allow,
THEN preference should be given to remaining in Hot Stby
UNTIL normal RHR S/D CLG. is restored.
- 5.2 IF an alternate means of decay heat removal is not immediately available
THEN preparations should be made for operation above 200°F.
- 5.3 Monitoring the vessel skin temperature when decay heat is not being removed in the
normal mode may indicate the approximate RPV water temperature
AND provide indication of RPV thermal stratification.

- 5.4 **REFER** to T/S 3.4.9.1 AND 3.4.9.2 for Limiting condition for operation, Hot Shutdown and Cold Shutdown, also Event Classification Guide Section 8, Loss of Decay Heat Removal.

T/S 3.4.9.2 - ACTION a. states that with less than the required RHR Shutdown Cooling mode loops OPERABLE, within one hour and at least once per 24 hours thereafter, demonstrate the operability of at least one alternate method capable of decay heat removal for each inoperable shutdown cooling mode loop. This action calls for the demonstration of operability of at least one alternate decay heat removal method. This demonstration may be made using any of the following forms:

1. Placing the alternate system or method in service to verify adequacy.

OR

2. System Engineering has performed tests/calculations verifying that the Alternate Decay Heat Removal method is sufficient to remove decay heat.

OR

3. A SORC approved, condition-specific, engineering analysis, supporting the adequacy of the proposed alternate method may be utilized to comply with the T/S.

- 5.5 Indications of reduced shutdown cooling flow may include the following:

- RHR flow indication is less than normal.
- RHR flow indication is normal but there are other indications of bypass flow (ex. - Reactor Recirculation Loop flow indicating flow; both Reactor Recirculation suction and discharge valves open simultaneously).

- 5.6 The RHR System discharge manual cross-tie lines should not be used for Shutdown Cooling, Suppression Pool Cooling or Suppression Pool Spray and should only be used as an alternate decay heat removal (ADHR). [CD-609G]

5.7 The following parameters should be used if there is uncertainty as to whether the plant has entered operational condition 3 or as additional indications for monitoring purposes. IF the following indications are indicative of an operational condition change THEN ENSURE the appropriate reports are initiated:

- An increase in steam dome pressure could be indicative that boiling, to some degree, is occurring in the Reactor Core. This parameter should be monitored using the redundant Reactor pressure indications given in Table 5.7, particularly those with the lowest ranges such as MSIV sealing or the HPCI and RCIC trip units.
- An increase in Reactor Head Vent temperature could be indicative of the onset or verification of the presence of boiling in the vessel. This temperature is monitored by TE-N064 (when BB-HV-F001 and BB-HV-F002 are open), and can be read on the Control Room recorder B21-TRR614 - point 24, Reactor Head Vent.
- An unexplained increase in Drywell leakage could be indicative of the presence of steam flow out of the vessel head and into the Drywell. This parameter is monitored at RMS and includes primarily the Drywell Equipment Drain flow, however, steaming into the Equipment Drain Sump could also be indicated by total Drywell leakage and Drywell Cooler condensate flow, therefore, all of these points should be monitored for unexplained increases.

TABLE 5.7 REDUNDANT REACTOR VESSEL PRESSURE INDICATIONS		
NOMENCLATURE	RANGE	DESCRIPTION
CONTROL ROOM PANEL 10-C650		
PI-5824A	0 - 50	MSIV SEALING
PI-5824B	0 - 50	MSIV SEALING
PI-R605-C32	0 - 1200	REACTOR PRESSURE
PR-R623A-B21	0 - 1500	PAMS
PR-R623B-B21	0 - 1500	PAMS
PI-3684A	0 - 1500	PAMS
PI-3684B	0 - 1500	PAMS
LOWER RELAY ROOM PANEL 10-C617		
IFDPISL-N658A-E41	0 - 200	HPCI TRIP UNIT
IFDPISL-N658E-E41	0 - 200	HPCI TRIP UNIT
LOWER RELAY ROOM PANEL 10-C641		
IFDPISL-N658C-E41	0 - 200	HPCI TRIP UNIT
IFDPISL-N658G-E41	0 - 200	HPCI TRIP UNIT
LOWER RELAY ROOM PANEL 10-C618		
IFCPISL-N658B-E51	0 - 200	RCIC TRIP UNIT
IFCPISL-N658F-E51	0 - 200	RCIC TRIP UNIT
LOWER RELAY ROOM PANEL 10-C631		
IFCPISL-N658D-E51	0 - 200	RCIC TRIP UNIT
IFCPISL-N658H-E51	0 - 200	RCIC TRIP UNIT

5.8 This procedure satisfies the following commitments: _____

CD-950B	GE AID 68
CD-973B	GE SIL 357
CD-178A	NRC 81-11
CD-065X	FSAR SECT. 5.4.7.1.5
CD-693A	INPO SOER 82-02
CD-100A	NRC BULL 80-12
CD-110E	GE SIL 425
CD-900E	INPO SOER 07-87
CD-076B	INPO SOER 63-82
CD-609G	DCP 4EC3411
PR 960927120	
PR 970602179	
PR 980511195	

**ATTACHMENT 1
ALTERNATE FLOW PATH DETAILS**

1.0 **RWCU**

1.1 **ENSURE** RWCU System is operating IAW HC.OP-SO.BG-0001(Q), Reactor Water Cleanup System Operation. _____

1.2 **FULLY OPEN** 1-ED-V035 RWCU NRHX RACS Rtn Plug. (Rm 4504E) _____

2.0 **CONDENSATE TRANSFER SYSTEM**

2.1 **ENSURE** Condensate Transfer System is operating IAW HC.OP-SO.AP-0001(Q), Condensate Storage and Transfer System Operation. _____

2.2 **ENSURE** RWCU System is operating IAW HC.OP-SO.BG-0001(Q). _____

2.3 **OPEN** one or more of the following valves to establish CST flow to the RPV: _____

- 1AP-V041 CS Xfr to A Core Spray Dsch (Rm. 4331)
- 1AP-V062 CS Xfr to B Core Spray Dsch Isl'n (Rm. 4322B)
- 1AP-V044 CS Xfr to A RHR Pmp Dsch Isl'n (Rm. 4328)
- 1AP-V047 CS Xfr to C RHR Pmp Dsch Isl'n (Rm. 4328)
- 1AP-V056 CS Xfr to B RHR Pmp Dsch Isl'n (Rm 4322B)
- 1AP-V059 CS Xfr to D RHR Pmp Dsch Isl'n (Rm. 4322B)
- 1AP-V038 CS Xfr to HPCI Dsch Isl'n V (Rm. 4331)
- 1AP-V052 CS Xfr to RCIC Dsch Isl'n Vlv (Rm. 4315)

2.4 **THROTTLE OPEN** the appropriate ECCS INJ. VALVES to establish flow to the RPV. _____

2.5 **CONTROL** RPV level utilizing RWCU blow down. _____

**ATTACHMENT 1
ALTERNATE FLOW PATH DETAILS**

3.0. **RHR HEAD SPRAY**

UTILIZE RHR Head Spray IAW HC.OP-SO.BC-0002(Q) - Decay Heat Removal
Operation.

4.0 **FUEL POOL COOLING**

4.1 **ENSURE** FPC System is in operation IAW HC.OP-SO.EC-0001(Q), Fuel Pool
Cooling and Cleanup System Operation.

4.2 **ENSURE** SACS valves to FPC Hx's are fully open.

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

NOTE 1.0

Operation of the C to A Cross-Tie is restricted to conditions when reactor coolant temperature is < 300°F (67 psia). [PR 970602179, PR 960927120]

1.0 Establishing Alternate Shutdown Cooling Using the C to A Cross-tie
[CD-609G]

- 1.1 **ENSURE** the AP System is available providing keepfill for all A Loop ECCS Systems required for operability. (1-AP-V041, CS Xfr to A Core Spray Dsch (Rm. 4331) _____
- 1.2 **ENSURE** that the Jockey Pump CP228 is secured AND tagged IAW NC.NA-AP.ZZ-0015(Q); Safety Tagging Program. (Breaker 52-232074) _____
- 1.3 **CLOSE** 1BC-V203 ECCS Jock Pmp C Suct Vlv (Rm. 4114C)
AND TAG IAW NC.NA-AP.ZZ-0015(Q). _____
- 1.4 **CLOSE** the following valves: _____
 - HV-F004A RHR PMP A SUPP POOL SUCT MOV
 - HV-F004C RHR PMP C SUPP POOL SUCT MOV
- 1.5 **TAG** the following IAW NC.NA-AP.ZZ-0015(Q): _____
 - HV-F004A RHR PMP A SUPP POOL SUCT MOV (52-212031)
 - HV-F004C RHR PMP C SUPP POOL SUCT MOV (52-232031)

CAUTION 1.6

Manual or automatic opening of HV-F007 A(C) RHR PMP A(C) MIN FL MOV will drain the Reactor Vessel to the Suppression Pool.

- 1.6 **ENSURE** the following valves are closed: _____
 - HV-F007A RHR PMP A MIN FL VLV _____
 - HV-F007C RHR PMP C MIN FL VLV. _____

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

- 1.7 **VERIFY** the following LPCI Injection Valves are closed,
THEN DE-ENERGIZE AND TAG their power sources to ensure these valves
do not open if a LPCI signal is received during cross-tie operating mode:
- HV-F017A RHR LOOP A LPCI INJ MOV (52-212052)
 - HV-F017C RHR LOOP C LPCI INJ MOV (52-232052)
- 1.8 **CLOSE AND TAG** the following valves:
- HV-F010A RHR LOOP C TEST RET MOV (52-232044)
 - HV-F024A RHR LOOP A TEST RET MOV (52-212192)
 - HV-F021A RHR LOOP A SPRAY ISLN MOV (52-451062)
 - HV-F027A RHR LOOP A SUPP CHAMBER SPRAY HDR
ISLN MOV (52-212083)
- 1.9 **FULLY OPEN** 1BC-V133 RHR Pmp C Suct Frm Recir Loop B (Rm 4227E)
AND TAG in the open position IAW NC.NA-AP.ZZ-0015(Q).
- 1.10 **ENSURE** F077 RECIRC LOOP B TO RHR SUP MAN VLV is open.
- 1.11 IF the Shutdown Cooling suction line was isolated,
THEN PERFORM a fill and vent IAW HC.OP-SO.BC-0002(Q) - Decay Heat
Removal Operation.
- 1.12 **ENSURE** the following valves are open:
- HV-F008 SHUTDOWN COOLING OUTBD ISLN MOV
 - HV-F009 SHUTDOWN COOLING INBD ISLN MOV.
- 1.13 UNLOCK AND OPEN 1BC-V571 RHR Cross-Tie Isolation Valve for C Loop
BC-HV-11673. (Rm 4114A)
- 1.14 **OPEN** the following valves
UNTIL a solid stream of water issues,
THEN CLOSE (Local):
- 1BC-V578 AND 1BC-V579 RHR Vent Valves (Rm. 4113A)
 - 1BC-V580 AND 1BC-V581 RHR Vent Valves (Rm. 4114A)

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

1.15 **OPEN** 1BC-V570 RHR Cross-Tie Isolation Valve for A Loop (Rm. 4113A)

NOTE 1.16

- A. The interlock override will allow C RHR Pump to operate when the pump is aligned to the alternate suction from the RPV, when and if required.
- B. In the cross-tie mode, C RHR Pump will not be automatically protected against the loss of suction from the RPV.

1.16 **OBTAIN** key for the 1-BC-HS-11496 Keylock Switch from Work Control key cabinet.

1.17 At Panel 10C641 perform the following:

- A. **INSERT** the key in the 1-BC-HS-11496 Keylock Switch.
- B. **OVERRIDE** the HV-F004C Valve/Pump C Interlock using the 1-BC-HS-11496 Keylock Switch.
- C. **LOG** in NSS Log the position of the Keylock Switch.

1.18 IF during the cross-tie operation mode, the HV-F008 or HV-F009 close (e.g., on RPV Low Level 3 signal),
THEN IMMEDIATELY STOP the C RHR Pump and take corrective action.

1.19 IF HV-F015A RHR LOOP A RET TO RECIRC LOOP A ISLN MOV does not open immediately to establish flow,
THEN SECURE the RHR Pump.

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

CAUTION 1.20

Manual or automatic opening of HV-F007A(C) RHR PMP A(C) MIN FL MOV will drain the Reactor Vessel to the Suppression Pool.

- 1.20 **START RHR PUMP CP202**
AND IMMEDIATELY THROTTLE OPEN HV-F015A RHR LOOP A RET
TO RECIRC LOOP A ISLN MOV
UNTIL FI-R603C LOOP C FLOW indicates 3000 gpm. _____
- **OBSERVE AI-6358C PUMP C MOT AMPS.** _____
 - **MAINTAIN flow of 3000 gpm for at least 10 minutes.** _____
- 1.21 **OPEN HV-F015A RHR LOOP A RET TO RECIRC LOOP A ISLN MOV**
UNTIL FI-R603C LOOP C FLOW indicates 10,000 gpm. _____

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

2.0 Securing Alternate Shutdown Cooling When C to A Cross-tie was used.

- 2.1 **CLOSE** HV-F015A RHR LOOP A RET TO RECIRC LOOP A ISLN MOV. _____
- 2.2 WHEN the HV-F015A RHR LOOP A RET TO RECIRC LOOP A ISLN MOV
is closed,
THEN STOP the C RHR Pump CP202. _____
- 2.3 **REMOVE** 1-BC-HS-11496 Keylock Switch from the OVERRIDE position. _____
- A. **REMOVE** the key from 1-BC-HS-11496 Keylock Switch
 AND RETURN the key to the Work Control key cabinet. _____
- B. **LOG** in NSS Log the position of the keylock switch. _____
- 2.4 **CLOSE** 1BC-V570 RHR Cross-Tie Isolation Valve for A Loop (Rm. 4113A). _____
- 2.5 **CLOSE AND LOCK** 1BC-V571 RHR Cross-Tie Isolation Valve for C Loop
BC-HV-11673. (Rm 4114A) _____
- 2.6 **RELEASE** tags from 1BC-V203 ECCS Jock Pmp C Suct Vlv (Rm. 4114C)
AND OPEN valve. _____
- 2.7 **RELEASE** tags from Jockey Pump CP228. _____
- 2.8 **RELEASE** tags from 1BC-V133 RHR Pmp C Suc Frm Recir Loop B
(Rm 4227E) _____
- 2.9 **CLOSE AND LOCK** 1BC-V133 RHR Pmp C Suc Frm Recir Loop B
(Rm 4227E) _____
- 2.10 **CLOSE** the following valves: _____
- HV-F008 SHUTDOWN COOLING OUTBD ISLN MOV _____
 - HV-F009 SHUTDOWN COOLING INBD ISLN MOV _____

ATTACHMENT 2
ALTERNATE SHUTDOWN COOLING USING C TO A CROSS-TIE

- 2.11 **RELEASE** the tags from the following valves: _____
- HV-F017A RHR LOOP A LPCI INJ MOV _____
 - HV-F017C RHR LOOP C LPCI INJ MOV _____
 - HV-F010A RHR LOOP C TEST RET MOV _____
 - HV-F024A RHR LOOP A TEST RET MOV _____
 - HV-F021A RHR LOOP A SPRAY ISLN MOV _____
 - HV-F027A RHR LOOP A SUPP CHAMBER SPRAY HDR ISLN MOV _____
- 2.12 **RELEASE** tags from HV-F004A AND HV-F004C RHR PMP SUPP POOL
SUCT MOVs. _____
- 2.13 **ALIGN** system as plant conditions require. _____

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

NOTE 1.0

Operation of the D to B Cross-Tie is restricted to conditions when reactor coolant temperature is < 300°F (67 psia). [PR 970602179, PR 960927120]

1.0 Establishing Alternate Shutdown Cooling Using the D to B Cross-tie
[CD-609G]

- 1.1 **ENSURE** the AP System is available providing keepfill for all B Loop ECCS Systems required for operability. (1-AP-V062 CS Xfr to B Core Spray Dsch Isln [Rm. 4322B])
- 1.2 **ENSURE** that the Jockey Pump DP228 is secured AND tagged IAW NC.NA-AP.ZZ-0015(Q); Safety Tagging Program. (Breaker 52-242074)
- 1.3 **CLOSE** 1BC-V261 ECCS Jockey Pump D Suction Valve AND TAG IAW NC.NA-AP.ZZ-0015(Q).
- 1.4 **CLOSE** the following valves:
 - HV-F004B RHR PMP B SUPP POOL SUCT MOV
 - HV-F004D RHR PMP D SUPP POOL SUCT MOV
- 1.5 **TAG** the following IAW NC.NA-AP.ZZ-0015(Q):
 - HV-F004B RHR PMP B SUPP POOL SUCT MOV Breaker 52-222031
 - HV-F004D RHR PMP D SUPP POOL SUCT MOV Breaker 52-242031

CAUTION 1.6

Manual or automatic opening of HV-F007B(D) RHR PMP B(D) MIN FL MOV will drain the Reactor Vessel to the Suppression Pool.

- 1.6 **ENSURE** the following valves are closed:
 - HV-F007B RHR PUMP B MIN FLOW VLV
 - HV-F007D RHR PUMP D MIN FLOW VLV.

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

- 1.7 **VERIFY** the following LPCI Injection Valves are closed,
THEN DE-ENERGIZE AND TAG their power sources to ensure these valves do not open if a LPCI signal is received during cross-tie operating mode: _____
- HV-F017B RHR LOOP B LPCI INJ MOV (52-222052) _____
 - HV-F017D RHR LOOP D LPCI INJ MOV (52-242052) _____
- 1.8 **CLOSE AND TAG** the following valves: _____
- HV-F010B RHR LOOP D TEST RET MOV (52-242044) _____
 - HV-F024B RHR LOOP B TEST RET MOV (52-222063) _____
 - HV-F021B RHR LOOP B SPRAY ISLN MOV (52-222062) _____
 - HV-F027B RHR LOOP B SUPP CHAMBER SPRAY HDR ISLN MOV (52-222083) _____
- 1.9 **FULLY OPEN** 1BC-V043 RHR Pmp D Suc Frm Recir Loop B (Rm. 4227D; Az 150 above catwalk)
AND TAG in the open position IAW NC.NA-AP.ZZ-0015(Q). _____
- 1.10 **ENSURE** F077 RECIRC LOOP B TO RHR SUP MAN VLV is open. _____
- 1.11 **IF** the Shutdown Cooling suction line was isolated,
THEN PERFORM a fill **AND** vent IAW HC.OP-SO.BC-0002(Q) - Decay Heat Removal Operation. _____
- 1.12 **ENSURE** the following valves are open: _____
- HV-F008 SHUTDOWN COOLING OUTBD ISLN MOV _____
 - HV-F009 SHUTDOWN COOLING INBD ISLN MOV. _____
- 1.13 **UNLOCK AND OPEN** 1BC-V601 RHR Crosstie Iso Vlv B LOOP BC-HV-11680 MOV (Rm. 4107A) _____

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

- 1.14 **OPEN** the following valves
UNTIL a solid stream of water issues,
THEN CLOSE (Local). _____
- 1BC-V610 AND 1BC-V611 RHR B&D Loop X-Tie Vent Vlvs
(Rm. 4107A) _____
 - 1BC-V608 AND 1BC-V609 RHR B&D Loop X-Tie Vent Vlvs
(Rm. 4107A) _____
- 1.15 CRACK OPEN 1BC-V600 RHR X-Tie Iso Vlv Loops B&D. (Rm. 4107A) _____
- 1.16 **OPEN** 1BC-V608 AND 1BC-V609 RHR B&D Loop X-Tie Vent Vlvs
UNTIL a solid stream of water issues,
THEN CLOSE (Rm. 4107A) _____
- 1.17 **OPEN** 1BC-V600 RHR X-Tie Iso Vlv Loops B&D. (Rm. 4107A) _____

NOTE 1.18

- A. The interlock override will allow D RHR Pump to operate when the pump is aligned to the alternate suction from the RPV, when and if required.
- B. In the cross-tie mode, D RHR Pump will not be automatically protected against the loss of suction from the RPV.

- 1.18 **OBTAIN** key to the 1-BC-HS-11682 Keylock Switch from Work Control key cabinet. _____
- 1.19 **PERFORM** the following at Panel 10C640: _____
- A. **INSERT** the key in the 1-BC-HS-11682 Keylock Switch. _____
 - B. **OVERRIDE** the HV-F004D Valve/Pump D Interlock using the 1-BC-HS-11682 Keylock Switch. _____
 - C. **LOG** in NSS Log the position of the Keylock Switch. _____

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

- 1.20 IF during the cross-tie operation mode, the HV-F008 or HV-F009 close (e.g., on RPV Low Level 3 signal),
THEN IMMEDIATELY STOP the D RHR Pump and take corrective action. _____
- 1.21 IF HV-F015B RHR LOOP B RET TO RECIRC LOOP B ISLN MOV does not open immediately to establish flow,
THEN SECURE the RHR Pump. _____

CAUTION 1.22

Manual or automatic opening of HV-F007B(D) RHR PMP B(D) MIN FL MOV will drain the Reactor Vessel to the Suppression Pool.

- 1.22 **START RHR PUMP DP202**
AND IMMEDIATELY THROTTLE OPEN HV-F015B RHR LOOP B RET TO RECIRC LOOP B ISLN MOV
UNTIL FI-R603D LOOP D FLOW indicates 3000 GPM. _____
- **OBSERVE AI-6358D PUMP D MOT AMPS.** _____
 - **MAINTAIN flow of 3000 gpm for at least 10 minutes.** _____
- 1.23 **OPEN HV-F015B RHR LOOP B RET TO RECIRC LOOP B ISLN MOV**
UNTIL FI-R603D LOOP D FLOW indicates 10,000 gpm. _____

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

2.0 Securing Alternate Shutdown Cooling When D to B Cross-tie was used.

- 2.1 **CLOSE** HV-F015B RHR LOOP B RET TO RECIRC LOOP B ISLN MOV. _____
- 2.2 WHEN the HV-F015B RHR LOOP B RET TO RECIRC LOOP B ISLN MOV
is closed,
THEN STOP the D RHR Pump DP202. _____
- 2.3 **REMOVE** 1-BC-HS-11682 Keylock Switch from the OVERRIDE position. _____
- A. **REMOVE** the key from 1-BC-HS-11682 Keylock Switch
 AND RETURN to the Work Control key cabinet. _____
- B. **LOG** in NSS Log the position of the Keylock Switch. _____
- 2.4 **CLOSE** 1BC-V600 RHR X-Tie Iso Vlv Loops B&D. (Rm. 4107A) _____
- 2.5 **CLOSE AND LOCK** 1BC-V601 RHR Crosstie Iso Vlv B LOOP BC-HV-11680
MOV (Rm. 4107A) _____
- 2.6 **RELEASE** tags from 1BC-V261 ECCS Jockey Pmp D Suct Vlv (Rm. 4107D)
AND OPEN valve. _____
- 2.7 **RELEASE** tags from Jockey Pump DP228. _____
- 2.8 **RELEASE** tags from 1BC-V043 RHR Pmp D Suc Frm Recir Loop B.
(Rm. 4227D; Az 150 above catwalk) _____
- 2.9 **CLOSE AND LOCK** 1BC-V043 RHR Pmp D Suc Frm Recir Loop B.
(Rm. 4227D; Az 150 above catwalk) _____
- 2.10 **CLOSE** the following valves: _____
- HV-F008 SHUTDOWN COOLING OUTBD ISLN MOV
 - HV-F009 SHUTDOWN COOLING INBD ISLN MOV

ATTACHMENT 3
ALTERNATE SHUTDOWN COOLING USING D TO B CROSS-TIE

2.11 **RELEASE** the tags from the following valves:

- HV-F017B RHR LOOP B LPCI INJ MOV
- HV-F017D RHR LOOP D LPCI INJ MOV
- HV-F010B RHR LOOP D TEST RET MOV
- HV-F024B RHR LOOP B TEST RET MOV
- HV-F021B RHR LOOP B SPRAY ISLN MOV
- HV-F027B RHR LOOP B SUPP CHAMBER SPRAY HDR ISLN
MOV

2.12 **RELEASE** tags from HV-F004B
AND HV-F004D RHR PMP SUPP POOL SUCT MOV.

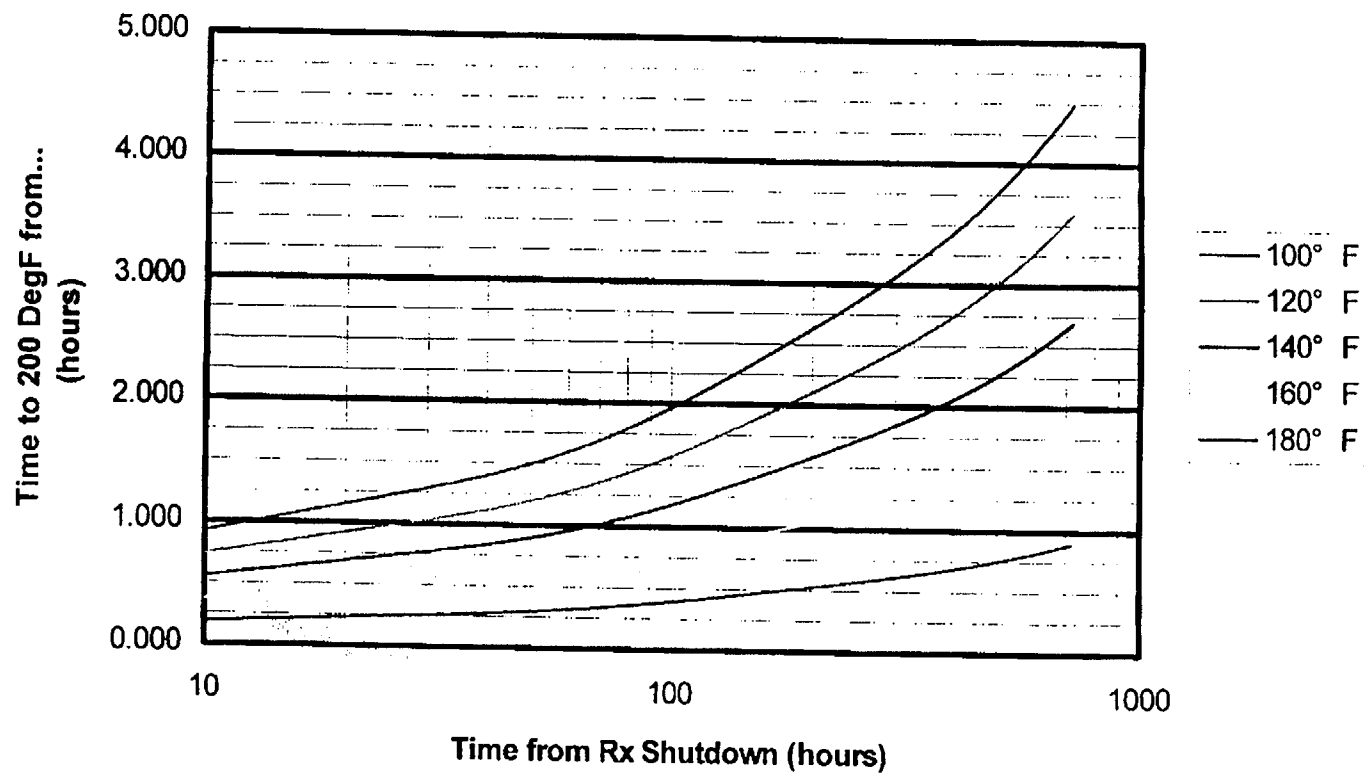
2.13 **ALIGN** system as plant conditions require.

PSEG Internal Use Only

HC.OP-AB.ZZ-0142(Q)

Figure 1

**Total Loss of Heat Removal from Rx Vessel
1000 EFPD of Operations**



REFUELING OPERATIONS

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.11.2 Two shutdown cooling mode loops of the residual heat removal (RHR) system shall be OPERABLE and at least one loop shall be in operation,* with each loop consisting of:

- a. One OPERABLE RHR pump, and
- b. One OPERABLE RHR heat exchanger.

APPLICABILITY: OPERATIONAL CONDITION 5, when irradiated fuel is in the reactor vessel and the water level is less than 22 feet 2 inches above the top of the reactor pressure vessel flange and heat losses to ambient** are not sufficient to maintain OPERATIONAL CONDITION 5.

ACTION:

- a. With less than the above required shutdown cooling mode loops of the RHR system OPERABLE, within one hour and at least once per 24 hours thereafter, demonstrate the OPERABILITY of at least one alternate method capable of decay heat removal for each inoperable RHR shutdown cooling mode loop.
- b. With no RHR shutdown cooling mode loop in operation, within one hour establish reactor coolant circulation by an alternate method and monitor reactor coolant temperature at least once per hour.

SURVEILLANCE REQUIREMENTS

4.9.11.2 At least one shutdown cooling mode loop of the residual heat removal system or alternate method shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

*The shutdown cooling pump may be removed from operation for up to 2 hours per 8-hour period.

**Ambient losses must be such that no increase in reactor vessel water temperature will occur (even though REFUELING conditions are being maintained).