3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Place channel in trip.	12 hours
	OR		
	A.2	Place associated trip system in trip.	12 hours
B. One or more Functions with one or more required channels inoperable in both trip systems.	B.1	Place channel in one trip system in trip.	6 hours
	OR		
	B.2	Place one trip system in trip.	6 hours
C. One or more Functions with RPS trip capability not maintained.	C.1	Restore RPS trip capability.	1 hour

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Enter the Condition referenced in Table 3.3.1.1-1 for the channel.	Immediately
E. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	E.1 Reduce THERMAL POWER to < 30% RTP.	4 hours
F. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	F.1 Be in MODE 2.	6 hours
G. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	G.1 Be in MODE 3.	12 hours
H. As required by Required Action D.1 and referenced in Table 3.3.1.1-1.	H.1 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately

SURVEILLANCE REQUIREMENTS

----------NOTES----------

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.1.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.1.2	----------NOTE---------- Not required to be performed until 12 hours after THERMAL POWER $\geq$ 25% RTP. ---------- Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is $\leq$ 2% RTP plus any gain adjustment required by LCO 3.4.1, "Recirculation Loops Operating" while operating at $\geq$ 25% RTP.	7 days
SR 3.3.1.1.3	----------NOTE---------- Not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL FUNCTIONAL TEST.	7 days
SR 3.3.1.1.4	Perform a functional test of each RPS channel test switch.	7 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.5	Verify the source range monitor (SRM) and intermediate range monitor (IRM) channels overlap.	Prior to withdrawing SRMs from the fully inserted position
SR 3.3.1.1.6	----------NOTE---------- Only required to be met during entry into MODE 2 from MODE 1. ---------- Verify the IRM and APRM channels overlap.	7 days
SR 3.3.1.1.7	Adjust the channel to conform to a calibrated flow signal.	31 days
SR 3.3.1.1.8	Calibrate the local power range monitors.	1000 MWD/T average core exposure
SR 3.3.1.1.9	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.1.1.10	----------NOTES---------- 1. Neutron detectors and recirculation loop flow transmitters are excluded. 2. For Function 2.a, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL CALIBRATION.	184 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.1.11	Perform CHANNEL FUNCTIONAL TEST.	18 months
SR 3.3.1.1.12	----------NOTES---------- 1. Neutron detectors are excluded. 2. For Function 1, not required to be performed when entering MODE 2 from MODE 1 until 12 hours after entering MODE 2. ---------- Perform CHANNEL CALIBRATION.	18 months
SR 3.3.1.1.13	Perform LOGIC SYSTEM FUNCTIONAL TEST.	18 months
SR 3.3.1.1.14	Verify Turbine Stop Valve — Closure and Turbine Control Valve Fast Closure, Trip Oil Pressure — Low Functions are not bypassed when THERMAL POWER is $\geq$ 30% RTP.	18 months
SR 3.3.1.1.15	----------NOTE---------- Neutron detectors are excluded. ---------- Verify the RPS RESPONSE TIME is within limits.	18 months

Table 3.3.1.1-1 (page 1 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Intermediate Range Monitors					
a. Neutron Flux — High	2	3	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.5 SR 3.3.1.1.6 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
	5(a)	3	H	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
b. Inop	2	3	G	SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.13	
	5(a)	3	H	SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.13	
2. Average Power Range Monitors					
a. Neutron Flux — High (Startup)	2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.3 SR 3.3.1.1.4 SR 3.3.1.1.6 SR 3.3.1.1.8 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.15	
b. Neutron Flux-High (Flow Biased)	1	2	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.4 SR 3.3.1.1.7 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	

(continued)

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(b) [0.66 W + 71.5% - 0.66 ΔW] RTP when reset for single loop operation per LCO 3.4.1, "Recirculation Loops Operating."

Table 3.3.1.1-1 (page 2 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Average Power Range Monitors (continued)					
c. Neutron Flux —High (Fixed)	1	2	F	SR 3.3.1.1.1 SR 3.3.1.1.2 SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.10 SR 3.3.1.1.13 SR 3.3.1.1.15	
d. Downscale	1	2	F	SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.13	
e. Inop	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.13	
3. Reactor Vessel Pressure —High	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
4. Reactor Vessel Water Level —Low (Level 3)	1,2	2	G	SR 3.3.1.1.1 SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
5. Main Steam Isolation Valve —Closure	1	4	F	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
6. Drywell Pressure —High	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	

(continued)

Table 3.3.1.1-1 (page 3 of 3)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
7. Scram Discharge Volume Water Level —High					
a. Level Transmitter	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
	5(a)	2	H	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
b. Level Switch	1,2	2	G	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
	5(a)	2	H	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.15	
8. Turbine Stop Valve —Closure	≥ 30% RTP	2	E	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	
9. Turbine Control Valve Fast Closure, DEH Trip Oil Pressure —Low	≥ 30% RTP	2	E	SR 3.3.1.1.4 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	
10. Reactor Mode Switch — Shutdown Position	1,2	1	G	SR 3.3.1.1.11 SR 3.3.1.1.13	
	5(a)	1	H	SR 3.3.1.1.11 SR 3.3.1.1.13	
11. Manual Scram	1,2	1	G	SR 3.3.1.1.9 SR 3.3.1.1.13	
	5(a)	1	H	SR 3.3.1.1.9 SR 3.3.1.1.13	

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

3.3 INSTRUMENTATION

3.3.1.2 Source Range Monitor (SRM) Instrumentation

LCO 3.3.1.2 The SRM instrumentation in Table 3.3.1.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.2-1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required SRMs inoperable in MODE 2 with intermediate range monitors (IRMs) on Range 2 or below.	A.1 Restore required SRMs to OPERABLE status.	4 hours
B. Three required SRMs inoperable in MODE 2 with IRMs on Range 2 or below.	B.1 Suspend control rod withdrawal.	Immediately
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or more required SRMs inoperable in MODE 3 or 4.	D.1 Fully insert all insertable control rods. AND D.2 Place reactor mode switch in the shutdown position.	1 hour 1 hour
E. One or more required SRMs inoperable in MODE 5.	E.1 Suspend CORE ALTERATIONS except for control rod insertion. AND E.2 Initiate action to fully insert all insertable control rods in core cells containing one or more fuel assemblies.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

----------NOTE----------
Refer to Table 3.3.1.2-1 to determine which SRs apply for each applicable MODE or other specified condition.

	SURVEILLANCE	FREQUENCY
SR 3.3.1.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.1.2.2	----------NOTES---------- 1. Only required to be met during CORE ALTERATIONS. 2. One SRM may be used to satisfy more than one of the following. --- Verify an OPERABLE SRM detector is located in: a. The fueled region; b. The core quadrant where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region; and c. A core quadrant adjacent to where CORE ALTERATIONS are being performed, when the associated SRM is included in the fueled region.	12 hours
SR 3.3.1.2.3	Perform CHANNEL CHECK.	24 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.2.4	----------NOTE---------- Not required to be met with less than or equal to four fuel assemblies adjacent to the SRM and no other fuel assemblies in the associated core quadrant. ---------- Verify count rate is $\geq$ 3.0 cps with a signal to noise ratio $\geq$ 2:1.	12 hours during CORE ALTERATIONS AND 24 hours
SR 3.3.1.2.5	Perform CHANNEL FUNCTIONAL TEST and determination of signal to noise ratio.	7 days
SR 3.3.1.2.6	----------NOTE---------- Not required to be performed until 12 hours after IRMs on Range 2 or below. ---------- Perform CHANNEL FUNCTIONAL TEST and determination of signal to noise ratio.	31 days
SR 3.3.1.2.7	----------NOTES---------- 1. Neutron detectors are excluded. 2. Not required to be performed until 12 hours after IRMs on Range 2 or below. ---------- Perform CHANNEL CALIBRATION.	18 months

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.1 ECCS — Operating

LCO 3.5.1 Each ECCS injection/spray subsystem and the Automatic Depressurization System (ADS) function of six safety/relief valves shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3, except high pressure coolant injection (HPCI) and ADS valves are not required to be OPERABLE with reactor steam dome pressure ≤ 150 psig.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One low pressure ECCS injection/spray subsystem inoperable. OR One LPCI pump in both LPCI subsystems inoperable.	A.1 Restore low pressure ECCS injection/spray subsystem(s) to operable status.	7 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	12 hours 36 hours
C. HPCI System inoperable.	C.1 Verify by administrative means RCIC System is OPERABLE. AND C.2 Restore HPCI System to OPERABLE status.	1 hour 14 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. HPCI System inoperable. AND Condition A entered.	D.1 Restore HPCI System to OPERABLE status. OR D.2 Restore low pressure ECCS injection/spray subsystem to OPERABLE status.	72 hours 72 hours
E. One ADS valve inoperable.	E.1 Restore ADS valve to OPERABLE status.	14 days
F. One ADS valve inoperable. AND Condition A entered.	F.1 Restore ADS valve to OPERABLE status. OR F.2 Restore low pressure ECCS injection/spray subsystem to OPERABLE status.	72 hours 72 hours
G. Required Action and associated Completion Time of Condition C, D, E, or F not met. OR Two or more ADS valves inoperable.	G.1 Be in MODE 3. AND G.2 Reduce reactor steam dome pressure to $\leq$ 150 psig.	12 hours 36 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
H. Two or more low pressure ECCS injection/spray subsystems inoperable for reasons other than condition A. OR HPCI System and one or more ADS valves inoperable.	H.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.1.1	Verify, for each ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.1.2	----------NOTE---------- Low pressure coolant injection (LPCI) subsystems may be considered OPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than the shutdown cooling permissive pressure in MODE 3, if capable of being manually realigned and not otherwise inoperable. ---------- Verify each ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.5.1.3	Verify ADS pneumatic supply header pressure is $\geq$ 88 psig.	31 days
SR 3.5.1.4	Verify the RHR System cross tie shutoff valve is closed.	31 days
SR 3.5.1.5	----------NOTE---------- Not required to be performed if performed within the previous 31 days. ---------- Verify each recirculation pump discharge valve cycles through one complete cycle of full travel or is de-energized in the closed position.	Once each startup prior to exceeding 25% RTP

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.1.6	Verify the following ECCS pumps develop the specified flow rate against a system head corresponding to the specified reactor pressure. SYSTEM / FLOW RATE / NO. OF PUMPS / SYSTEM HEAD CORRESPONDING TO A REACTOR PRESSURE OF Core Spray: ≥ 4720 gpm / 1 / ≥ 113 psig LPCI: ≥ 15,000 gpm / 2 / ≥ 20 psig	In accordance with the Inservice Testing Program
SR 3.5.1.7	----------NOTE---------- Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. ---------- Verify, with reactor pressure ≤ 1020 and ≥ 920 psig, the HPCI pump can develop a flow rate ≥ 4250 gpm against a system head corresponding to reactor pressure.	92 days
SR 3.5.1.8	----------NOTE---------- Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. ---------- Verify, with reactor pressure ≤ 165 psig, the HPCI pump can develop a flow rate ≥ 4250 gpm against a system head corresponding to reactor pressure.	18 months

(continued)

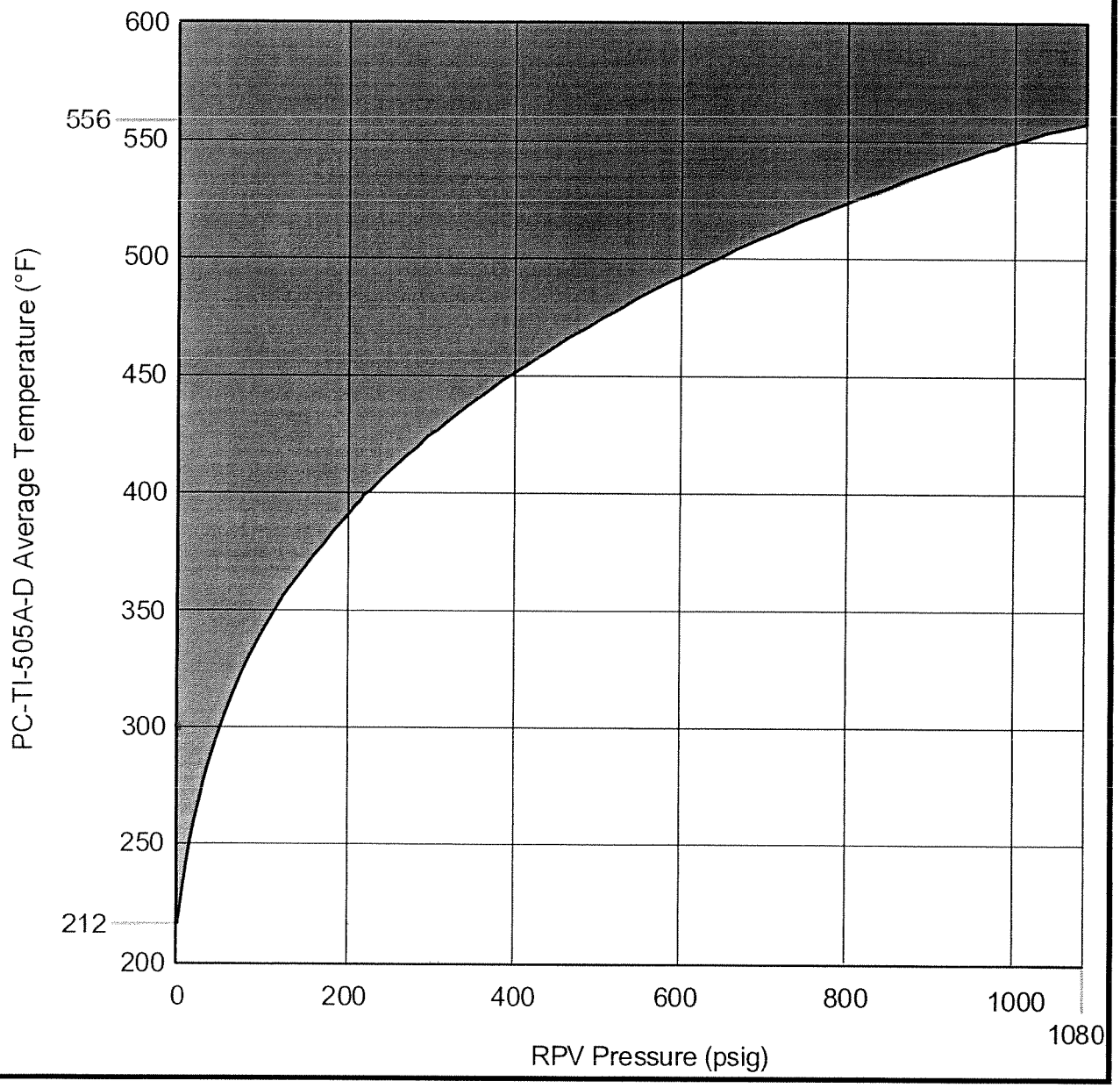
SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.5.1.9 ----------TEMPORARY NOTE---------- The next required performance of this SR for the Core Spray Subsystems A and B may be delayed until the current cycle refueling outage, but no later than February 2, 2005. This temporary note expires upon startup from that refueling outage. ----------NOTES---------- 1. For HPCI only, not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. 2. Vessel injection/spray may be excluded. ---------- Verify each ECCS injection/spray subsystem actuates on an actual or simulated automatic initiation signal.	18 months
SR 3.5.1.10 ----------NOTE---------- Valve actuation may be excluded. ---------- Verify the ADS actuates on an actual or simulated automatic initiation signal.	18 months
SR 3.5.1.11 ----------NOTE---------- Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. ---------- Verify each ADS valve opens when manually actuated.	18 months

1

RPV SATURATIION TEMPERATURE

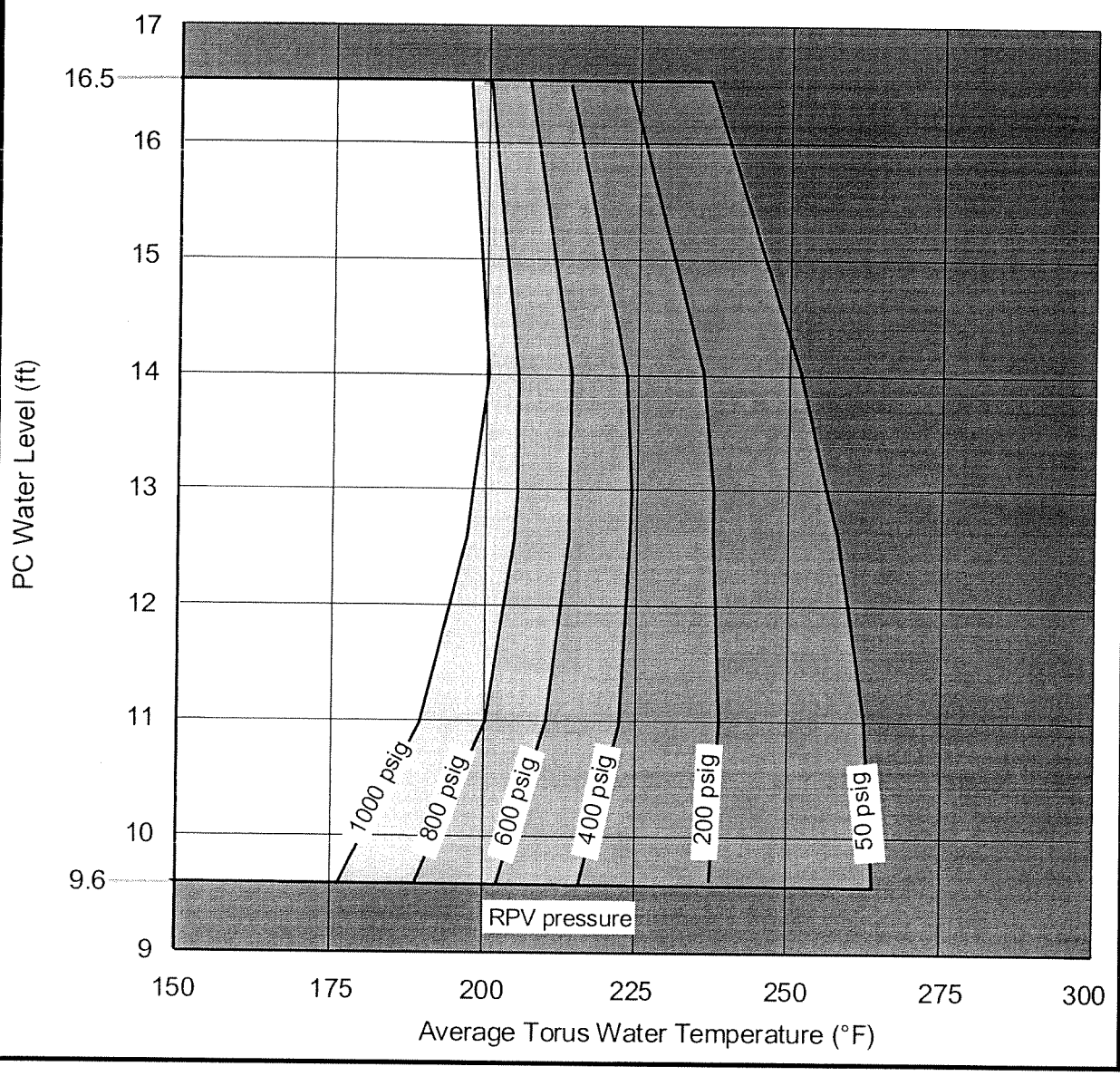
(GRAP01)



7

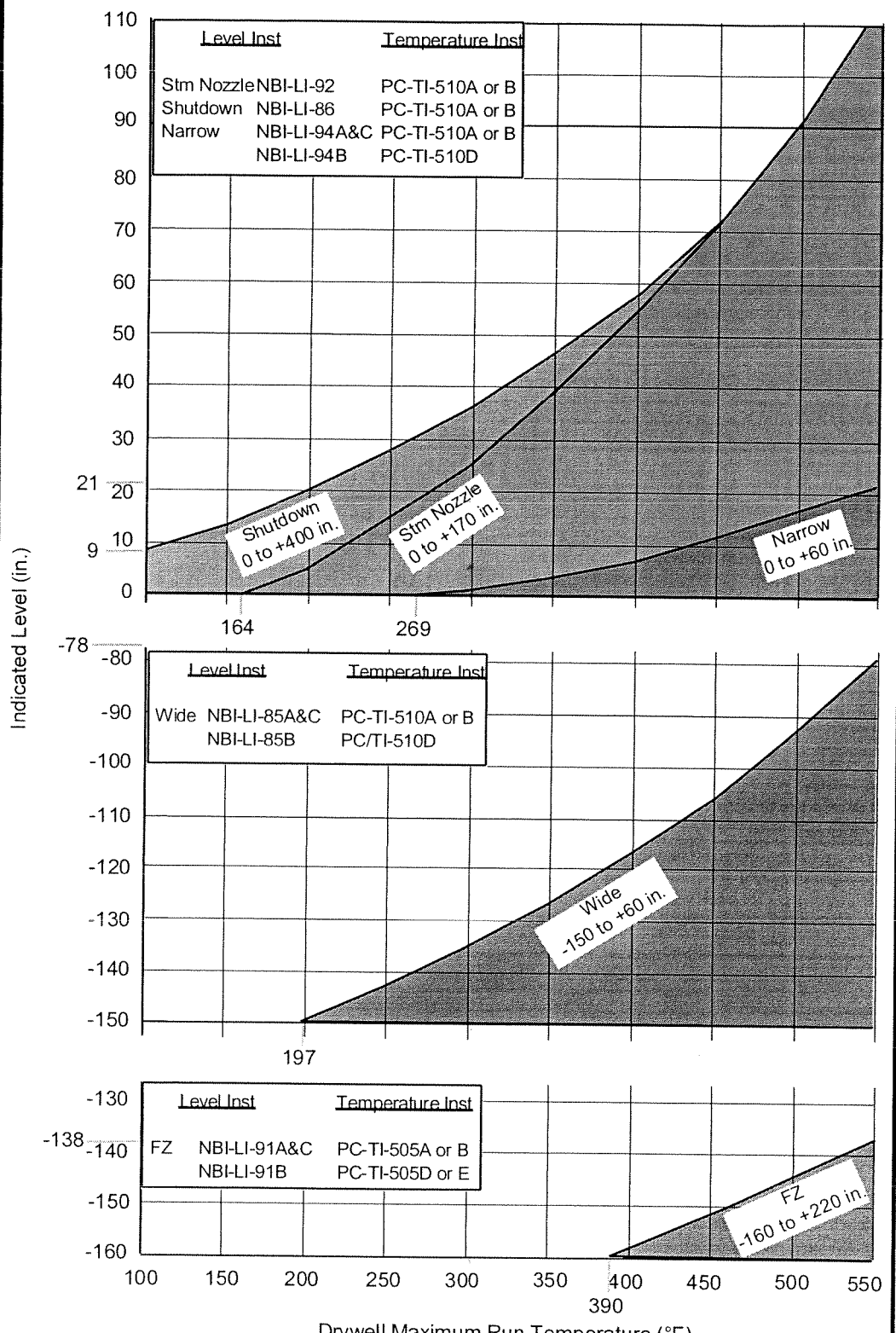
HEAT CAPACITY TEMPERATURE LIMIT

(GRAP07)



15

MINIMUM INDICATED LEVELS
(GRAP15A, B, C, D, E)



CNS OPERATIONS MANUAL GENERAL OPERATING PROCEDURE 2.1.20.2 CYCLE SPECIFIC FUEL TRANSFER AND ALTERNATE COOLING GUIDELINE	USE: REFERENCE ⊛ EFFECTIVE: 3/29/05 APPROVAL: ITR-RDM OWNER: OSG SUPV DEPARTMENT: OPS

REVISION VERIFICATION:
(initial use + every 7 days)

REV.	DATE	CHANGES
8	1/8/02	Follow up change to allow temporary procedure to expire.
9	see above	Added NOTE clarifying SFP temperature curves above 150°F.

1. PURPOSE

This procedure provides the guidance necessary for Operations and other applicable personnel to make fuel movement decisions, and configuration decisions regarding various decay heat removal systems/methods.

2. GUIDELINE FOR FUEL OFFLOAD TIME LIMITATIONS

NOTE - Referenced Excel graphs are located in r:\cnsprocs\misc\calculations\rfo*xx* directory, where *xx* is the current refueling outage.

2.1 This section provides guidance to determine maximum number of fuel bundles that may be off loaded as a function of time after reactor shutdown. These transfer rate limitations are derived from technical information provided by the latest revision of NEDC 00-0105 and are based on:

2.1.1 Time after reactor shutdown.

2.1.2 REC supply temperature.

2.1.3 FPC pump and heat exchanger configuration.

2.1.4 Desired maximum SFP temperature.

2.2 Establish Case 1 or Case 2 FPC lineup per Procedure 2.2.32 and select appropriate graph set(s) from B-RFO*xx*.xls.

2.2.1 Case 1 is both FPC pumps and heat exchangers in service.

2.2.2 Case 2 is one FPC pump and both heat exchangers in service.

2.3 Ensure fuel is <u>not</u> moved prior to 67 hours after shutdown.

2.4 Using B-RFO*xx*.xls, select desired maximum SFP temperature graph based on FPC configuration. Default is 125°F for Case 1 and 140°F for Case 2.

2.5 Determine REC supply temperature.

2.6 Referring to graph selected in Step 2.4, select REC temperature curve. If REC supply temperature is between curves, select the more conservative (next highest) REC supply temperature curve. If REC supply temperature is below given curves, select next highest curve shown.

2.7 Determine number of fuel bundles to be transferred to SFP.

2.8 Based on number of fuel bundles to be off loaded and REC supply temperature curve, determine minimum amount of time after reactor shutdown required prior to off loading bundles to SFP.

2.9 Monitor REC supply temperature. If REC supply temperature changes, ensure REC supply temperature curve being used is appropriate and reperform above steps, as necessary.

3. GUIDELINE FOR ALTERNATE REACTOR CAVITY AND SFP COOLING

<u>NOTE</u> - Referenced Excel graphs are located in r:\cnsprocs\misc\calculations\rfo*xx* directory, where *xx* is the current refueling outage.

3.1 This section provides guidance to determine minimum amount of time that must elapse after reactor shutdown before various FPC configurations combined with other heat removal methods may replace RHR-SDC. These limitations are derived from technical information provided by the latest revision of NEDC 00-0105 and are based on:

3.1.1 Time after reactor shutdown.

3.1.2 REC heat exchanger outlet temperature is equivalent to REC Cold Leg Temperature used in the latest revision of NEDC 00-0105.

3.1.3 FPC pump and heat exchanger configuration.

3.1.4 Desired maximum SFP temperature.

3.1.5 RWCU operating status.

3.1.6 SFP gates removed.

3.2 The C-RFO*xx*.xls graphs are derived from calculations that assume one reactor recirculation pump is operating at minimum flow. This is <u>not</u> mandatory for C-RFO*xx*.xls to be valid and usable.

3.3 Ensure SFP gates are removed. If SFP gates are to be installed, place RWCU in alternate heat removal configuration per Procedure 2.2.66.

3.4 If Reactor Recirc available, operate a single RR pump on minimum flow per Procedure 2.2.68.1.

3.5 Establish Case 1 or Case 2 FPC lineup per Procedure 2.2.32 and select appropriate graph set from C-RFO*xx*.xls.

3.5.1 Case 1 is both FPC pumps and heat exchangers in service.

3.5.2 Case 2 is one FPC pump and both heat exchangers in service.

3.6 If available, RWCU may be placed in alternate heat removal lineup per Procedure 2.2.66, and select appropriate graph from C-RFO*xx*.xls based on RWCU assist.

3.7 Determine REC cold leg temperature (REC heat exchanger outlet temperature).

<u>NOTE</u> - Maximum SFP design temperature is 150°F. SFP temperature curves above 150°F, when provided, are for information only and are not to be selected.

3.8 Using selected C-RFO*xx*.xls graph, select desired maximum SFP temperature curve. Default is 125°F to provide maximum margin to design temperature.

3.9 Using C-RFO*xx*.xls graph, determine minimum time after reactor shutdown limit based on REC cold leg temperature (REC heat exchanger outlet temperature) and selected maximum SFP temperature curve.

3.9.1 Minimum time after reactor shutdown limit is minimum time before FPC and/or RWCU can remove sufficient decay heat from reactor and SFP to maintain SFP temperature below selected maximum SFP temperature.

3.10 Monitor REC heat exchanger outlet temperature. If REC heat exchanger outlet temperature changes, reperform above steps, as necessary, to determine new minimum time after reactor shutdown limit.

3.11 If selected SFP temperature limit is exceeded, but before SFP temperature reaches 150°F, restore RHR-SDC to service per Procedure 2.2.69.2.

4. GUIDELINE FOR ALTERNATE SFP COOLING

NOTE - Referenced Excel graphs are located in r:\cnsprocs\misc\calculations\rfo*xx* directory, where *xx* is the current refueling outage.

4.1 This section provides guidance to determine minimum amount of time that must elapse after reactor shutdown before a single RHR Subsystem operating and crosstied to FPC may replace FPC cooling. These limitations are derived from technical information provided by the latest revision of NEDC 00-0105 and are based on:

4.1.1 Time after reactor shutdown.

4.1.2 SW temperature.

4.1.3 Desired maximum SFP temperature.

4.1.4 RHR Subsystem B operating is SDC.

4.1.5 RHR intertie flow rate ≥ 1000 gpm.

4.1.6 SFP gates removed.

4.2 Graphs contained in D-RFO*xx*.xls are derived from calculations that assumed no FPC pump is operating (worst case). If a FPC pump is available, operating it will not invalidate D-RFO*xx*.xls.

4.3 Ensure SFP gates are removed. If SFP gates are to be installed, D-RFO*xx*.xls is not valid and RWCU should be placed in alternate heat removal configuration per Procedure 2.2.66.

4.4 If FPC pump available, then operate a FPC pump per this procedure to assist SFP circulation.

4.5 Ensure RHR-SDC Subsystem B operating and aligned for FPC intertie per Procedure 2.2.69.2.

4.6 Ensure RHR to FPC intertie flow rate ~ 1000 gpm.

NOTE - Maximum SFP design temperature is 150°F. SFP temperature curves above 150°F, when provided, are for information only and are not to be selected.

4.7 Using D-RFO*xx*.xls, select maximum SFP temperature graph. Default is 125°F to provide maximum margin to design temperature.

4.8 Determine SW temperature.

4.9 Using graph selected in Step 4.7, select appropriate SW temperature curve. If SW temperature is between curves, select more conservative (next highest) SW temperature curve.

4.10 Determine number of fuel bundles in SFP.

4.11 Using selected graph from D-RFO*xx*.xls, determine minimum time after reactor shutdown limit based on SW temperature and number of fuel bundles off loaded into SFP.

4.11.1 Minimum time after reactor shutdown limit is time that must elapse before RHR-FPC crosstie can remove sufficient decay heat from SFP to maintain SFP temperature below selected maximum SFP temperature.

4.12 Monitor SW temperature. If SW temperature changes, re-perform above steps, as necessary, to determine new minimum time after reactor shutdown limit.

4.13 If selected SFP temperature limit is exceeded, stop transfer of irradiated fuel bundles to SFP. Before SFP temperature reaches 150°F, restore FPC to service per Procedure 2.2.32.

5. GUIDELINE FOR ALTERNATE COOLING - SFP GATES INSTALLED

NOTE - Referenced Excel graphs are located in r:\cnsprocs\misc\calculations\rfo*xx* directory, where *xx* is the current refueling outage.

5.1 This section provides guidance to determine minimum amount of time that must elapse after reactor shutdown before RWCU can replace RHR-SDC with SFP gates installed. These limitations are derived from technical information provided by the latest revision of NEDC 00-0105, Backup Time Limitations-RWCU Only & Refueling Gate Installed, and are based on:

5.1.1 Time after shutdown.

5.1.2 REC heat exchanger outlet temperature is equivalent to REC Cold Leg Temperature used in the latest revision of NEDC 00-0105.

5.1.3 Desired maximum refueling cavity temperature.

5.1.4 SFP gates installed (i.e., no FPC assistance).

5.2 The C-RFO*xx*.xls graph, Backup Time Limitations-RWCU Only (Gate Installed & Refueling Completed) Bounding Case, is derived from calculations that assumed one reactor recirculation pump is operating at minimum flow (worst case). This is not mandatory and the subject graph is valid irrespective of whether or not a reactor recirculation pump is running. This graph calculates only reactor cavity temperature and disregards SFP conditions. It assumes RWCU is only available decay heat removal method for 548 irradiated bundles in the reactor vessel.

5.3 Place RWCU in Alternate Heat Removal lineup per Procedure 2.2.66.

5.4 If Reactor Recirc available, operate a single RR pump on minimum flow per Procedure 2.2.68.1.

5.5 Using C-RFO*xx*.xls, Backup Time Limitations-RWCU Only (Gate Installed & Refueling Completed) Bounding Case graph [Case 5, Bounding], as technical reference, perform following:

5.5.1 Select desired maximum refueling cavity temperature curve. Default is 160°F to maximize time to boil.

5.5.2 Determine REC cold leg temperature (REC heat exchanger outlet temperature).

5.5.3 Based on REC heat exchanger outlet temperature (REC cold leg temperature) and selected maximum refueling cavity temperature curve, determine minimum time after shutdown limit.

5.5.3.1 The minimum amount of time after reactor shutdown is time that must elapse before RWCU can remove sufficient amount of decay from the reactor to maintain refueling cavity temperature below selected maximum refueling cavity temperature limit.

5.6 Monitor REC heat exchanger outlet temperature. If REC heat exchanger outlet temperature changes, reperform above steps, as necessary, to determine new minimum time after shutdown limit.

5.7 If selected cavity temperature limit is exceeded, restore RHR-SDC to service immediately per Procedure 2.2.69.2.

6. RECORDS

6.1 No quality records are generated by this procedure.

1. DISCUSSION

1.1 Procedure provides access to cycle specific calculational results associated with fuel off load rates, alternate reactor cavity and spent fuel pool cooling, and alternate fuel pool cooling. It considers variables such as time after reactor shutdown, REC and SW temperatures, as well as various configurations of FPC with and without RWCU assist.

1.2 Fuel Movement Time Limitations, Backup Time Limitations, and RHR Intertie Time Limitations graphs are maintained on the r: drive by the TSG Supervisor at r:\cnsprocs\misc\calculations\rfo*xx*\B-RFO*xx*.xls, C-RFO*xx*.xls, and D-RFO*xx*.xls, respectively, where *xx* will be the current refueling outage. The spreadsheet equations are password protected and the data is validated by Design Engineering prior to procedure performance.

2. REFERENCES

2.1 PROCEDURES

2.1.1 System Operating Procedure 2.2.32, Fuel Pool Cooling and Demineralizer System.

2.1.2 System Operating Procedure 2.2.66, Reactor Water Cleanup.

2.1.3 System Operating Procedure 2.2.68.1, Reactor Recirculation System Operations.

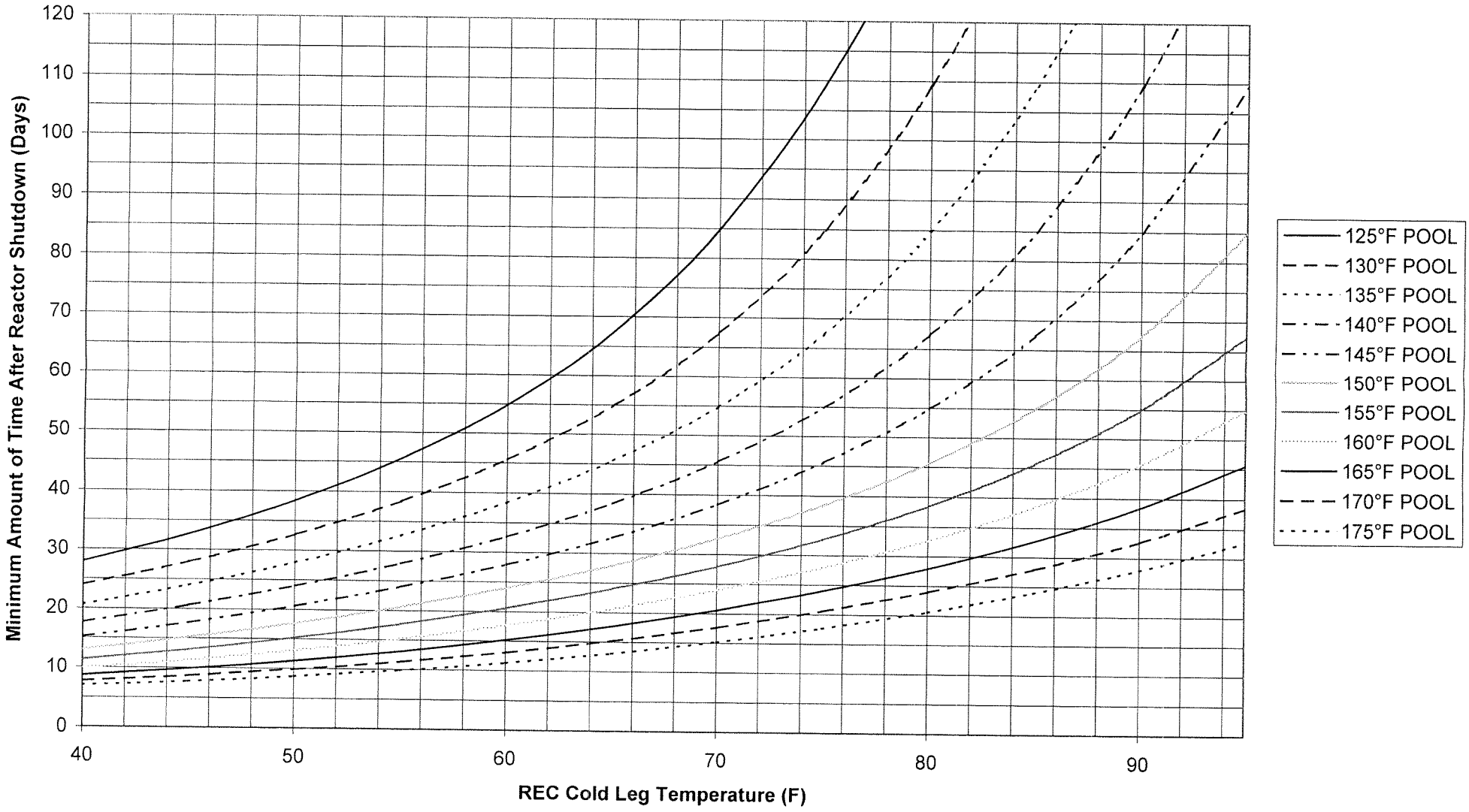
2.1.4 System Operating Procedure 2.2.69.2, RHR System Shutdown Operations.

2.2 MISCELLANEOUS

2.2.1 CED 2001-0007.

2.2.2 NEDC 00-0105 (latest revision), Fuel Pool Decay Heat Loads/Alternate Decay Heat Removal Time Limitations.

Backup Time Limitations- 2 FPC Pumps & 2 FPC Heat Exchangers



Backup Time Limitations- 1 FPC Pump & 2 FPC Heat Exchangers