CRYSTAL RIVER 50-302/2000-301
SEPTEMBER 25 - 29, 2000

INITIAL SUBMITTAL DOCUMENT

- INITIAL OUTLINE SUBMITTAL
- OPERATING TEST
SIMULATOR SCENARIOS
- ADMINISTRATIVE JPMS/QUESTIONS
- SIMULATOR JPMS
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INITIAL SUBMITTAL

CRYSTAL RIVER 50-302/2000-301
SEPTEMBER 25 - 29, 2000

INITIAL OUTLINE SUBMITTAL

PWR SRO Examination Outline Worksheet

Based on NUREG-1021 Form ES-401-3 Pg 26 of 45 Rev.8

		K/A Category Points Rev 1											
Tier	**Group**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**A1**	**A2**	**A3**	**A4**	**G**	**Point Total**
Tier 1 Plant Evolutions	1	4	1	6				3	8			2	**24**
	2	0	2	1				3	7			3	**16**
	3	0	0	0				0	3			0	**3**
	Tier Totals	4	3	7				6	18			5	**43**
Tier 2 Plant Systems	1	2	2	2	2	1	1	2	4	1	0	2	**19**
	2	4	0	1	1	1	1	0	4	1	1	3	**17**
	3	0	0	1	0	0	0	0	1	0	2	0	**4**
	Tier Totals	6	2	4	3	2	2	2	9	2	3	5	**40**
Tier 3 Generic		**Cat1**	**Cat2**	**Cat3**	**Cat4**								
		4	3	4	6								**17**

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000001 Continuous Rod Withdrawal / I	1						AK1.14 Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Interaction of ICS control stations as well as purpose, function, and modes of operation of ICS.	3.7	1
000003 Dropped Control Rod / I	1						AK1.07 Knowledge of the operational implications of the following concepts as the apply to Dropped Control Rod: Effect of dropped rod on insertion limits and SDM.	3.9	1
000005 Inoperable/Stuck Control Rod / I									
000011 Large Break LOCA / III									
000015/17 RCP Malfunctions / IV			1				AK3.03 Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction	4.0	1
E09 Natural Circ. / IV	1				1		EK1.2 Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Cooldown): Normal, Abnormal and emergency operating procedures associated with Natural Circulation Cooldown. **EA2.1 Ability to determine and interpret the following as they apply to the (Natural Circulation Cooldown). Facility conditions and selection of appropriate procedures during abnormal emergency operations. (Note 2)**	4.0 4.2	2

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000024 Emergency Boration / I				1			AA1.17 Ability to operate and / or monitor the following as they apply to the Emergency Boration: Emergency Borate Control Valve and indicators.	3.9	1
000026 Loss of Component Cooling Water / VIII					2		**AA2.05 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The normal values for CCW header flow rate and the flow rates to the components cooled by the CCWS. (Note 2)** AA2.01 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: Location of a leak in the CCWS	2.5 3.5	2
000029 Anticipated Transient w/o Scram / I			1				EK3.01 Knowledge of the reasons for the following responses as they apply to the ATWS: Verifying a reactor trip; methods	4.5	1
000040 (E05) Steam Line Rupture - Excessive Heat Transfer / IV						1	G2.4.48 Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	3.8	1
CE/A11; W/E08 RCS Overcooling - PTS / IV									
000051 Loss of Condenser Vacuum / IV			1				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum.	3.1	1

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000055 Station Blackout / VI					1	1	**EA2.03 Ability to determine or interpret the following as they apply to a Station Blackout: Actions necessary to restore power. (Note 1)** G2.4.35 Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.	4.7 3.5	2
000057 Loss of Vital AC Elec. Inst. Bus / VI				1			AA1.01 Ability to operate and/or monitor the following as they apply to the Loss of Vital AC Instrument Bus: Manual inverter swapping.	3.7	1
000059 Accidental Liquid RadWaste Rel. / IX			1				**AK3.02 Knowledge of the reasons for the following responses as they apply to the accidental Liquid Radwaste Release: Implementation of the E-plan.****	4.5	1
000062 Loss of Nuclear Service Water / IV									
000067 Plant Fire On-site / IX			1		1		AA2.12 Ability to determine and interpret the following as they apply to the Plant Fire on site: Location of vital equipment within fire zone. **AK3.04 Knowledge of the reasons for the following responses as they apply to the Plant Fire On Site: Actions contained in EOP for plant fire on site.****	3.9 4.1	2

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Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000068 (A06) Control Room Evac. / VIII					2		**AA2.1 Ability to determine and interpret the following as they apply to the (Shutdown Outside Control Room): Facility conditions and selection of appropriate procedures during abnormal and emergency operations. (Note 2)** AA2.2 Ability to determine and interpret the following as they apply to the (Shutdown Outside Control Room): Adherence to appropriate procedures and operation within the limitations in the facilities license and amendments.	4.2 4.2	2
000069 Loss of CTMT Integrity / V		1					AK2.03 Knowledge of the interrelations between the Loss of Containment Integrity and the following: Personnel access hatch and emergency access hatch.	2.9	1
000074 Inad. Core Cooling / IV			1				EK3.08 Knowledge of the reasons for the following responses as they apply to the inadequate Core Cooling: Securing RCPs.	4.2	1
E03 Inadequate Subcooling Margin / IV				1			EA1.1 Ability to operate and / or monitor the following as they apply to the (Inadequate Subcooling Margin) Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.8	1
000076 High Reactor Coolant Activity / IX					1		**AA2.02 Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: Corrective actions required for high fission product activity in RCS. (Note 2)**	3.4	1

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Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
A02&A03 Loss of NNI-X/Y / VII	1						AK1.3 Knowledge of the operational implications of the following concepts as they apply to the (Loss of NNI-X): Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of NNI-X).	3.8	1
K/A Category Totals:	4	1	6	3	8	2	Group Point Total =	24	

Note 1 - Random generator chose a category which has no SRO K/As with importance 2.5 or greater. Chose a different category to obtain a K/A with importance greater than 2.5.

NOTE 2 New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10CFR 55.43 IAW Draft of NUREG 1021.

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000007 (E02&E10) Reactor Trip - Stabilization - Recovery / I					1		**EA2.2 Ability to determine and interpret the following as they apply to the (Vital System Status Verification): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (Note 3)**	3.8	1
A01 Plant Runback / I		1					AK2.1 Knowledge of the interrelations between the (Plant Runback) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.5	1
A04 Turbine Trip / IV									
000008 Pressurizer Vapor Space Accident / III									
000009 Small Break LOCA / III		1					EK2.03 Knowledge of the interrelations between the small break LOCA and the following: S/Gs	3.3	1
E08 LOCA Cooldown - Depress. / IV						1	G2.1.28 Knowledge of the purpose and function of major system components and controls.	3.3	1
000022 Loss of Reactor Coolant Makeup / II									
000025 Loss of RHR System / IV					1	1	AA2.06 Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Existence of proper RHR overpressure protection. G2.1.20 Ability to execute procedure steps. **(Note 2)**	3.4 4.2	2
000027 Pressurizer Pressure Control System Malfunction / III						1	G2.2.22 Knowledge of limiting conditions for operations and safety limits.	4.1	1

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000032 Loss of Source Range NI / VII					1		AA2.04 Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: Satisfactory source range/intermediate range overlap.	3.5	1
000033 Loss of Intermediate Range NI / VII					1		**AA2.10 Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Tech-spec limits if both Intermediate Range channels have failed. (Note 1)**	3.8	1
000037 Steam Generator Tube Leak / III			1				AK3.07 Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: Actions contained in EOP for S/G tube leak.	4.4	1
000038 Steam Generator Tube Rupture / III					1		**EA2.02 Ability to determine or interpret the following as they apply to a SGTR: Existence of an S/G tube rupture and its potential consequences. (Note 3)**	4.8	1
000054 Loss of Main Feedwater / IV									
E04 Inadequate Heat Transfer - Loss of Secondary Heat Sink / IV				1			EA1.1 Ability to operate and / or monitor the following as they apply to the (Inadequate Heat Transfer): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.2	1
000058 Loss of DC Power / VI				1			AA1.03 Ability to operate and / or monitor the following as they apply to the Loss of DC Power: Vital and battery bus components	3.3	1

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000060 Accidental Gaseous Radwaste Rel. / IX					1		**AA2.03 Ability to determine and interpret the following as they apply to the Accidental Gaseous Radwaste: The steps necessary to isolate a given radioactive gas leak, using P&IDs. (Note 3)**	3.9	1
000061 ARM System Alarms / VII					1		AA2.06 Ability to determine and interpret the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: Required actions if alarm channel is out of service.	4.1	1
000065 Loss of Instrument Air / VIII				1			AA1.02 Ability to operate and / or monitor the following as they apply to the Loss of Instrument Air: Components served by instrument air to minimize drain on system	2.8	1
K/A Category Totals:	0	2	1	3	7	3	Group Point Total =	16	16

NOTE 1: Random generator selected K3 to be replaced with another K3 - Only one K3 remains which deals with EOP guidance for an IR Instrument failure and it is not applicable to CR-3 EOPs - chose A2 as a replacement category.

NOTE 2 - Generic K/A category "CE/09 Functional recovery" chosen by random generator. This is a non-B&W topic. Replace with a Generic K/A category for topic 000025, Loss of RHR System. Basis of topic choice was the overall importance of the new topic.

NOTE 3 New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10CFR 55.43 IAW Draft of NUREG 1021

PWR SRO Examination Outline Rev 1

Emergency and Abnormal Plant Evolutions - Tier1/Group3

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000028 Pressurizer Level Malfunction / II									
000036 (A08) Fuel Handling Accident / VIII									
000056 Loss of Off-site Power / VI									
E13&E14 EOP Rules and Enclosures					1		**EA2.2 Ability to determine and interpret the following as they apply to the (EOP Enclosures): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (Note 1)**	4.0	1
A05 Emergency Diesel Actuation / VI					1		**AA2.1 Ability to determine and interpret the following as they apply to the (Emergency Diesel Actuation): Facility conditions and selection of appropriate procedures during abnormal and emergency operations. (Note 1)**	4.2	1
A07 Flooding / VIII					1		**AA2.2 Ability to determine and interpret the following as they apply to the (Flooding): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (Note 1)**	3.7	1
K/A Category Totals:	0	0	0	0	3	0	Group Point Total =	3	3

NOTE 1 New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10CFR 55.43 IAW Draft of NUREG 1021

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
001 Control Rod Drive		1									1	**K2.02 Knowledge of bus power supplies to the following: One-line diagram of power supply to trip breakers.** (Note 1)** G2.1.32 Ability to explain and apply all system limits and precautions.	3.7 3.8	2
003 Reactor Coolant Pump				1								K4.04 Knowledge of RCPs design features and / or interlocks which provide for the following: Adequate cooling of RCP motor and seals.	3.1	1
004 Chemical and Volume Control							1					A1.06 Ability to predict and / or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including: VCT level	3.2	1
013 Engineered Safety Features Actuation			1									K3.01 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Fuel	4.7	1
014 Rod Position Indication								1				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the RPIS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of offsite power.	3.3	1

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
015 Nuclear Instrumentation					1		1					K5.02 Knowledge of the operational implications of the following concepts as they apply to the NIS: Discriminator/compensation operation. A1.08 Ability to predict and / or monitor changes in parameters to prevent exceeding design limits associated with operating the NIS controls including: Changes in RCS temperature.	2.9 3.4	2
017 In-core Temperature Monitor											1	**<u>G2.4.44 Knowledge of emergency plan protective action recommendations.</u>**	4.0	1
022 Containment Cooling		1						1				K2.01 Knowledge of power supplies to the following: Containment cooling fans. A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of service water	3.1 3.2	2
026 Containment Spray								1				**<u>A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CSS; and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure of Spray Pump</u>.** (Note 2)**	4.2	1
056 Condensate	1											K1.03 Knowledge of the physical connections and / or cause-effect relationships between the Condensate System and the following systems: MFW	2.6	1

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
059 Main Feedwater	1			1								K1.07 Knowledge of the physical connections and / or cause-effect relationships between the MFW and the following systems: ICS K4.16 Knowledge of MFW design feature(s) and/or interlocks which provide for the following: Automatic trips for MFW pumps.	3.2 3.2	2
061 Auxiliary/Emergency Feedwater						1						K6.02 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Pumps	2.7	1
063 DC Electrical Distribution			1									K3.02 Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following: Components using DC control power.	3.7	1
068 Liquid Radwaste								1				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the Liquid Radwaste System; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Failure of automatic isolation.	3.3	1
071 Waste Gas Disposal														
072 Area Radiation Monitoring									1			A3.01 Ability to monitor automatic operation of the ARM system including: Changes in ventilation alignment.	3.1	1
K/A Category Totals:	2	2	2	2	1	1	2	4	1	0	2	Group Point Total =	19	19

NOTE 1: Random generator chose K1 but K2 used to meet Tier 2 requirement for 2 or more topics from each K/A category

NOTE 2: New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10 CFR 55.43, IAW Draft of NUREG 1021

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
002 Reactor Coolant					1							K5.10 Knowledge of the operational implications of the following concepts as they apply to the RCS: Relationship between reactor power and RCS differential temperature	4.1	1
006 Emergency Core Cooling														
010 Pressurizer Pressure Control						1						K6.03 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters.	3.6	1
011 Pressurizer Level Control														
012 Reactor Protection								1				**A2.06 Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Failure of RPS signal to trip the reactor.** (Note 2)**	4.7	1
016 Non-nuclear Instrumentation			1									K3.03 Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: SDS (Steam dump system)	3.1	1
027 Containment Iodine Removal											1	G2.1.28 Knowledge of the purpose and function of major system components and controls.	3.3	1
028 Hydrogen Recombiner and Purge Control								1				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: LOCA condition and related concern over hydrogen.	3.9	1
029 Containment Purge														
033 Spent Fuel Pool Cooling											1	G2.1.32 Ability to explain and apply all system limits and precautions.	3.8	1

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
034 Fuel Handling Equipment										1		**A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the Fuel Handling System; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Dropped fuel element.** (Note 2)**	4.4	1
035 Steam Generator				1								K4.01 Knowledge of S/Gs design features and / or interlocks which provide for the following: S/G level control.	3.8	1
039 Main and Reheat Steam	1											K1.07 Knowledge of the physical connections and / or cause-effect relationships between the MRSS and the following systems: AFW	3.4	1
055 Condenser Air Removal	1											K1.06 Knowledge of the physical connections and / or cause-effect relationships between the CARS and the following systems: PRM system.	2.6	1
062 AC Electrical Distribution	1											K1.02 Knowledge of the physical connections and / or cause-effect relationships between the AC distribution system and the following systems: ED/G	4.4	1
064 Emergency Diesel Generator											1	G2.1.8 Ability to coordinate personnel activities outside the control room.	3.6	1
073 Process Radiation Monitoring														
075 Circulating Water								1				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Safety features and relationship between condenser vacuum, turbine trip and steam dumps.	2.7	1

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
079 Station Air								1				**A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the SAS, station air system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Cross-connection with IAS, Instrument Air System.** (Note 1)**	3.2	1
086 Fire Protection									1			A3.02 Ability to monitor automatic operation of the Fire Protection System including: Actuation of the FPS.	3.3	1
103 Containment	1											K1.02 Knowledge of the physical connections and/or cause-effect relationships between the containment system and the following systems: Containment isolation/containment integrity.	4.1	1
K/A Category Totals:	4	0	1	1	1	1	0	4	1	1	3	Group Point Total =	17	17

NOTE 1: No A3 K/A 2.5 or greater - used A2 to get category greater than 2.5 for SRO

NOTE 2: New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10 CFR 55.43, IAW Draft of NUREG 1021

PWR SRO Examination Outline Rev. 1

Plant Systems - Tier2/Group3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
005 Residual Heat Removal								1				**A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the RHRS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Failure modes for pressure, flow, pump motor amps, motor temperature, and tank level instrumentation.** ** (Note 1)**	2.9	1
007 Pressurizer Relief/Quench Tank										1		A4.10 Ability to manually operate and/or monitor in the control room: Recognition of leaking PORV/code safety.	3.8	1
008 Component Cooling Water			1									K3.01 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: Loads cooled by CCWS.	3.5	1
041 Steam Dump/Turbine Bypass Control										1		A4.08 Ability to manually operate and/or monitor in the control room: Steam Dump Valves.	3.1	1
045 Main Turbine Generator														
076 Service Water														
078 Instrument Air														
K/A Category Totals:	0	0	1	0	0	0	0	1	0	2	0	Group Point Total =	4	4

NOTE 1: New K/A chosen for the same topic to obtain a K/A supporting plant specific SRO objectives and / or 10 CFR 55.43, IAW Draft of NUREG 1021

PWR SRO Examination Outline Rev. 1

Generic Knowledges and Abilities (Form ES-401-5)

Category	KA #	K/A Topic	Imp.	Points
Conduct of Operations	2.1.8	Ability to coordinate personnel activities outside the control room.	3.6	1
	2.1.11	**Knowledge of less than one hour technical specification action statements for systems.** **(Note 1)**	3.8	1
	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0	1
	2.1.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.0	1
	Total Points			**4**
Equipment Control	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	3.5	1
	2.2.13	Knowledge of tagging and clearance procedures	3.8	1
	2.2.22	**Knowledge of limiting conditions for operations and safety limits.**	4.1	1
	Total Points			**3**
Radiation Control	2.3.1	**Knowledge of 10 CFR: 20 and related facility radiation control requirements.** (Note 1)**	3.0	1
	2.3.2	**Knowledge of facitlty ALARA program.** (Note 1)**	2.9	1
	2.3.8	**Knowledge of the process for performing a planned gaseous radioactive release.**	3.2	1
	2.3.9	Knowledge of the process for performing a containment purge.	3.4	1
	Total Points			**4**
Emergency Procedures / Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps.	4.6	1
	2.4.6	**Knowledge of symptom based EOP mitigation strategies.** (Note 1)**	4.0	1
	2.4.9	**Knowledge of low power / shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.** (Note+++ 1)**	3.9	1
	2.4.30	**Knowledge of which events related to system operations/status should be reported to outside agencies.**	3.6	1
	2.4.44	**Knowledge of emergency plan protective action recommendations.**	4.0	1
	2.4.49	**Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.** (Note 1)**	4.0	1
	Total Points			**6**

TIER 3 Category Totals:		**17**

NOTES FROM Rev 0

Replaced 2.2.17 with 2.2.22 to achieve additional 10CFR 55.43 topic coverage.
Replaced 2.4.17 with 2.4.44 to achieve additional 10CFR 55.43 topic coverage

NOTE 1 For Rev 1 of this outline, these K/A's became "SRO Only" to comply with the ES-401 requirement for 10 SRO only K/As in this tier. Requirement is from Draft copy of NUREG 1021

PWR RO Examination Outline Worksheet

		K/A Category Points											
Tier	**Group**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**A1**	**A2**	**A3**	**A4**	**G**	**Point Total**
Tier 1 Plant Evolutions	**1**	2	1	3				3	3			4	**16**
	2	2	2	4				4	3			2	**17**
	3	2	0	0				1	0			0	**3**
	Tier Totals	6	3	7				8	6			6	**36**
Tier 2 Plant Systems	**1**	3	2	1	5	1	2	2	3	1	2	1	**23**
	2	3	0	2	3	1	1	2	2	1	2	3	**20**
	3	1	0	1	0	0	0	0	2	0	3	1	**8**
	Tier Totals	7	2	4	8	2	3	4	7	2	7	5	**51**
Tier 3 Generic		**Cat1**	**Cat2**	**Cat3**	**Cat4**								
		4	2	3	4								**13**

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000005 Inoperable/Stuck Control Rod / I									
000015/17 RCP Malfunctions / IV			1				AK3.03 Knowledge of the reasons for the following responses as they apply to the Reactor Coolant Pump Malfunctions (Loss of RC Flow): Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction	3.7	1
E09 Natural Circ. / IV	1						EK1.2 Knowledge of the operational implications of the following concepts as they apply to the (Natural Circulation Cooldown): Normal, abnormal and emergency operating procedures associated with (Natural Circulation Cooldown) **(Note 1)**	3.7	1
000024 Emergency Boration / I				1			AA1.17 Ability to operate and / or monitor the following as they apply to the Emergency Boration: Emergency Borate Control Valve and indicators.	3.9	1
000026 Loss of Component Cooling Water / VIII					1		AA2.01 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: Location of a leak in the CCWS	2.9	1
000027 Pressurizer Pressure Control System Malfunction / III						1	G2.2.22 Knowledge of limiting conditions for operations and safety limits.	3.4	1
000040 (E05) Steam Line Rupture (Excessive Heat Transfer) / IV						1	G2.4.48 Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.	3.5	1
CE/A11; W/E08 RCS Overcooling - PTS / IV							**(Note 1)**		

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000051 Loss of Condenser Vacuum / IV			1				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Condenser Vacuum: Loss of steam dump capability upon loss of condenser vacuum. **(Note 2)**	2.8	1
000055 Station Blackout						1	G2.4.35 Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.	3.3	1
000057 Loss of Vital AC Elec. Inst. Bus / VI				1			AA1.01 Ability to operate and/or monitor the following as they apply to the Loss of Vital AC Instrument Bus: Manual inverter swapping. **(Note 2)**	3.7	1
000062 Loss of Nuclear Service Water / IV									
000067 Plant Fire On-site / IX					1		AA2.12 Ability to determine and interpret the following as they apply to the Plant Fire on site: Location of vital equipment within fire zone.	2.9	1
000068 (A06) Control Room Evac. / VIII					1		AA2.2 Ability to determine and interpret the following as they apply to the (Shutdown outside Control Room): Adherence to appropriate procedures and operation within the limitations in the facilities license and amendments.	3.7	1
000069 Loss of CTMT Integrity / V		1					AK2.03 Knowledge of the interrelations between the Loss of Containment Integrity and the following: Personnel access hatch and emergency access hatch.	2.8	1
000074 Inad. Core Cooling / IV			1				EK3.08 Knowledge of the reasons for the following responses as they apply to the inadequate Core Cooling: Securing RCPs.	4.1	1

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group1

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
E03 Inadequate Subcooling Margin / IV				1			EA1.1 Ability to operate and / or monitor the following as they apply to the (Inadequate Subcooling Margin) Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.1	1
000076 High Reactor Coolant Activity / IX						1	G2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	1
A02&A03 Loss of NNI-X/Y / VII	1						AK1.3 Knowledge of the operational implications of the following concepts as they apply to the (Loss of NNI-X): Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of NNI-X).	3.8	1
K/A Category Totals:	2	1	3	3	3	4	Group Point Total =	16	16

Note 1 - Random Generator chose a non-B&W PWR topic on RCS overcooling and PTS. Replaced this topic with B&W PWR specific topic E09, Natural Circulation, K1.

Note 2 - Random generator chose a category which has no RO K/As with importance 2.5 or greater. Chose a different category to obtain a K/A with importance greater than 2.5.

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000001 Continuous Rod Withdrawal / I	1						AK1.14 Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Interaction of ICS control stations as well as purpose, function, and modes of operation of ICS.	3.4	1
000003 Dropped Control Rod / I	1						AK1.07 Knowledge of the operational implications of the following concepts as the apply to Dropped Control Rod: Effect of dropped rod on insertion limits and SDM.	3.1	1
000007 (E02&E10) Reactor Trip - Stabilization - Recovery / I				1			EA1.3 Ability to operate and / or monitor the following as they apply to the (Post-Trip Stabilization): Desired operating results during abnormal and emergency situations.	3.5	1
A01 Plant Runback / I		1					AK2.1 Knowledge of the interrelations between the (Plant Runback) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.7	1
A04 Turbine Trip / IV									
000008 Pressurizer Vapor Space Accident / III									
000009 Small Break LOCA / III		1					EK2.03 Knowledge of the interrelations between the small break LOCA and the following: S/Gs	3.0	1
000011 Large Break LOCA / III									
W/E04 LOCA Outside Containment / III							**(Note 1)**		
BW/E08; W/E03 LOCA Cooldown/Depress. / IV						1	G2.1.28 Knowledge of the purpose and function of major system components and controls. **(Note 1)**	3.2	1
W/E11 Loss of Emergency Coolant Recirc. / IV									

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
W/E01 & E02 Rediagnosis & SI Termination / III									
000022 Loss of Reactor Coolant Makeup / II									
000025 Loss of RHR System / IV					1	1	AA2.06 Ability to determine and interpret the following as they apply to the Loss of Residual Heat Removal System: Existence of proper RHR overpressure protection. G2.1.20 Ability to execute procedure steps. **(Note 2)**	3.2 4.3	2
000029 Anticipated Transient w/o Scram / I			1				EK3.01 Knowledge of the reasons for the following responses as they apply to the ATWS: Verifying a reactor trip; methods	4.2	1
000032 Loss of Source Range NI / VII					1		AA2.04 Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: Satisfactory source range/intermediate range overlap	3.1	1
000033 Loss of Intermediate Range NI / VII			1				AK3.01 Knowledge of the reasons for the following responses as they apply to the loss of Intermediate Range Nuclear Instrumentation: Termination of startup following loss of intermediate range instrumentation. **(Note 3)**	3.2	1
000037 Steam Generator Tube Leak / III			1				AK3.07 Knowledge of the reasons for the following responses as they apply to the Steam Generator Tube Leak: Actions contained in EOP for S/G tube leak.	4.2	1
000038 Steam Generator Tube Rupture / III				1			EA1.41 Ability to operate and monitor the following as they apply to a SGTR: Venting of the S/G to the atmosphere.	3.4	1
000054 Loss of Main Feedwater / IV									

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group2

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
E04 Inadequate Heat Transfer - Loss of Secondary Heat Sink / IV				1			EA1.1 Ability to operate and / or monitor the following as they apply to the (Inadequate Heat Transfer): Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.4	1
000058 Loss of DC Power / VI				1			AA1.03 Ability to operate and/or monitor the following as they apply to the Loss of DC Power: Vital and battery bus components **(Note 3)**	3.1	1
000059 Accidental Liquid RadWaste Rel. / IX									
000060 Accidental Gaseous Radwaste Rel. / IX			1				AK3.02 Knowledge of the reasons for the following responses as they apply to the Accidental Gaseous Radwaste Release: Isolation of the auxiliary building ventilation.	3.3	1
000061 ARM System Alarms / VII					1		AA2.06 Ability to determine and interpret the following as they apply to the Area Radiation Monitoring (ARM) System Alarms: Required actions if alarm channel is out of service. **(Note 4)**	3.2	1
W/E 16 High Containment Radiation / IV									
CE/E09 Functional Recovery							**(Note 2)**		
K/A Category Totals:	2	2	4	4	3	2	Group Point Total = 17		17

Note 1 - Generic K/A chosen at random - Non-B&W topic - replaced with Generic K/A for BW/E08 which is a very important procedure dealing with similar evolutions.

Note 2 - Generic K/A category chosen by random generator. Non-B&W topic. Replaced with a Generic K/A category for topic 000025, Loss of RHR System. Basis of topic choice was overall importance of new topic.

Note 3 - Random generator chose a category which has no RO K/As with importance 2.5 or greater. Chose a different category to obtain a K/A with importance greater than 2.5.

Note 4 - Randomly generated K/A was of little operational importance. Higher importance K/A on the same topic chosen.

PWR RO Examination Outline

Emergency and Abnormal Plant Evolutions - Tier1/Group3

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
000028 Pressurizer Level Malfunction / II									
000036 (A08) Fuel Handling Accident / VIII	1						AK1.03 Knowledge of the operational implications of the following concepts as they apply to Fuel Handling Incidents: Indications of approaching criticality	4.0	1
000056 Loss of Off-site Power / VI									
000065 Loss of Instrument Air / VIII				1			AA1.02 Ability to operate and/or monitor the following as they apply to the Loss of Instrument Air: Components served by instrument air to minimize drain on system	2.6	1
E13&E14 EOP Rules and Enclosures	1						EK1.2 Knowledge of the operational implications of the following concepts as they apply to the (EOP Enclosures): Normal, abnormal and emergency operating procedures associated with (EOP Enclosures).	3.6	1
A05 Emergency Diesel Actuation / VI									
A07 Flooding / VIII									
K/A Category Totals:	2	0	0	1	0	0	Group Point Total = 3		3

PWR RO Examination Outline

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
001 Control Rod Drive										1	1	A4.03 Ability to manually operate and / or monitor from the control room: CRDS mode control. G2.1.32 Ability to explain and apply all system limits and precautions.	4.0 3.4	2
003 Reactor Coolant Pump		1		1								K2.01 Knowledge of the bus power supplies for the following: RCPs K4.04 Knowledge of RCPs design features and / or interlocks which provide for the following: Adequate cooling of RCP motor and seals.	3.1 2.8	2
004 Chemical and Volume Control				1			1					K4.03 Knowledge of CVCS design features and / or interlocks which provide for the following: Protection of ion exchangers (high letdown temperature will isolate ion exchangers) A1.06 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CVCS controls including: VCT level	2.8 3.0	2
013 Engineered Safety Features Actuation			1	1								K3.01 Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: Fuel K4.04 Knowledge of ESFAS design features and /or interlocks which provide for the following: Auxiliary feed actuation signal.	4.4 4.3	2

PWR RO Examination Outline

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
015 Nuclear Instrumentation					1		1					K5.02 Knowledge of the operational implications of the following concepts as they apply to the NIS: Discriminator/compensation operation. A1.08 Ability to predict and/or monitor changes in parameters to prevent exceeding design limits associated with operating the NIS controls including: Changes in RCS temperature.	2.7 3.3	2
017 In-core Temperature Monitor						1				1		K6.01 Knowledge of the effect of a loss or malfunction of the following ITM system components: Sensors and detectors. A4.02 Ability to manually operate and/or monitor in the control room: Temperature values used to determine RCS/RCP operation during inadequate core cooling (i.e., if applicable, average of five highest values)	2.7 3.8	2
022 Containment Cooling		1						1				K2.01 Knowledge of power supplies to the following: Containment cooling fans. A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of service water	3.0 2.9	2

PWR RO Examination Outline

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
056 Condensate	1							1				K1.03 Knowledge of the physical connections and/or cause-effect relationships between the Condensate System and the following systems: MFW **(Note 1)** A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of condensate pumps.	2.6 2.6	2
059 Main Feedwater	1			1								K1.07 Knowledge of the physical connections and / or cause-effect relationships between the MFW and the following systems: ICS K4.16 Knowledge of MFW design features and / or interlocks which provide for the following: Automatic trips for MFW pumps.	3.2 3.1	2
061 Auxiliary/Emergency Feedwater						1						K6.02 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: Pumps	2.6	1
068 Liquid Radwaste								1				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the Liquid Radwaste System; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Failure of automatic isolation. **(Note 1)**	3.3	1

PWR RO Examination Outline

Plant Systems - Tier2/Group1

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
071 Waste Gas Disposal				1								K4.04 Knowledge of design features and/or interlocks which provide for the following: Isolation of waste gas release tanks.	2.9	1
072 Area Radiation Monitoring	1								1			K1.03 Knowledge of the physical connections and / or cause-effect relationships between the ARM system and the following systems: Fuel building isolation. **(Note 1)** A3.01 Ability to monitor automatic operation of the ARM system including: Changes in ventilation alignment.	3.6 2.9	2
K/A Category Totals:	3	2	1	5	1	2	2	3	1	2	1	Group Point Total =	23	23

NOTE 1 No randomly generated K/A >2.5. Selected other K/A within the topic >2.5.

PWR RO Examination Outline

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
002 Reactor Coolant					1							K5.10 Knowledge of the operational implications of the following concepts as they apply to the RCS: Relationship between reactor power and RCS differential temperature	3.6	1
006 Emergency Core Cooling				1								K4.09 Knowledge of ECCS design features and/or interlocks which provide for the following: Valve positioning on safety injection signal.	3.9	1
010 Pressurizer Pressure Control						1						K6.03 Knowledge of the effect of a loss or malfunction of the following will have on the PZR PCS: PZR sprays and heaters.	3.2	1
011 Pressurizer Level Control							1					A1.03 Ability to predict and / or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PZR LCS controls including: VCT Level	2.8	1
012 Reactor Protection							1					A1.01 Ability to predict and / or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RPS controls including: Trip setpoint adjustment.	2.9	1
014 Rod Position Indication								1				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the RPIS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of offsite power.	2.8	1
016 Non-nuclear Instrumentation			1									K3.03 Knowledge of the effect that a loss or malfunction of the NNIS will have on the following: SDS (Steam dump system)	3.0	1
026 Containment Spray				1								K4.01 Knowledge of CSS design features and / or interlocks which provide for the following: Source of water for CSS, including recirculation phase after LOCA.	4.2	1

PWR RO Examination Outline

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
029 Containment Purge										1		A4.01 Ability to manually operate and/or monitor in the control room: Containment purge flow rate.	2.5	1
033 Spent Fuel Pool Cooling											1	G2.1.32 Ability to explain and apply all system limits and precautions.	3.4	1
035 Steam Generator				1								K4.01 Knowledge of S/Gs design features and / or interlocks which provide for the following: S/G level control.	3.6	1
039 Main and Reheat Steam	1											K1.07 Knowledge of the physical connections and / or cause-effect relationships between the MRSS and the following systems: AFW	3.4	1
055 Condenser Air Removal	1											K1.06 Knowledge of the physical connections and / or cause-effect relationships between the CARS and the following systems: PRM system. **(Note 1)**	2.6	1
062 AC Electrical Distribution	1											K1.02 Knowledge of the physical connections and / or cause-effect relationships between the AC distribution system and the following systems: ED/G	4.1	1
063 DC Electrical Distribution			1									*K3.02 Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following: Components using DC control power.* **(Note 2)**	3.5	1
064 Emergency Diesel Generator											1	G2.1.8 Ability to coordinate personnel activities outside the control room.	3.8	1
073 Process Radiation Monitoring										1		A4.01 Ability to manually operate and/or monitor in the control room: Effluent release.	3.9	1

PWR RO Examination Outline

Plant Systems - Tier2/Group2

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
075 Circulating Water								1				*A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the circulating water system; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Safety features and relationship between condenser vacuum, turbine trip and steam dumps.* **(Note 3)**	2.5	1
079 Station Air											1	G2.1.31 Ability to locate control room switches, controls and indications and to determine that they are correctly reflecting the desired plant lineup.	4.2	1
086 Fire Protection									1			A3.02 Ability to monitor automatic operation of the Fire Protection System including: Actuation of the FPS.	2.9	1
K/A Category Totals:	3	0	2	3	1	1	2	2	1	2	3	Group Point Total =	20	20

NOTE 1 No randomly generated K/A >2.5. Selected other K/A within the topic >2.5.

NOTE 2 Random generator selected A4 K/As which are of minor relevance to CR-3 control room operations. Selected K3 K/A based on higher importance and relevance to CR3 operation.

NOTE 3 Random generator selected K2 K/As which deal with power supplies to Circ. Water Components. Selected A2 K/A to obtain material of higher importance and relevance to CR-3.

PWR RO Examination Outline

Plant Systems - Tier2/Group3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
005 Residual Heat Removal										1		A4.02 Ability to manually operate and / or monitor in the control room: Heat exchanger bypass flow control.	3.4	1
007 Pressurizer Relief/Quench Tank										1		A4.10 Ability to manually operate and / or monitor in the control room: Recognition of leaking PORV/code safety.	3.6	1
008 Component Cooling Water			1									K3.01 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: Loads cooled by CCWS	3.4	1
027 Containment Iodine Removal											1	G2.1.28 Knowledge of the purpose and function of major system components and controls.	3.2	1
028 Hydrogen Recombiner and Purge Control								1				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the HRPS; and (b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: LOCA condition and related concern over hydrogen.	3.5	1
034 Fuel Handling Equipment								1				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the Fuel Handling System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Dropped fuel element.	3.6	1
041 Steam Dump/Turbine Bypass Control										1		A4.08 Ability to manually operate and / or monitor in the control room: Steam Dump Valves.	3.0	1
045 Main Turbine Generator														
076 Service Water														
078 Instrument Air														

PWR RO Examination Outline

Plant Systems - Tier2/Group3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic	Imp.	Points
103 Containment	1											K1.02 Knowledge of the physical connections and / or cause-effect relationships between the containment system and the following systems: Containment isolation/containment integrity.	3.9	1
K/A Category Totals:	1	0	1	0	0	0	0	2	0	3	1	Group Point Total =	8	8

PWR RO Examination Outline

Generic Knowledge's and Abilities (Form ES-401-5)

Category	KA #	K/A Topic	Imp.	Points
Conduct of Operations	2.1.8	Ability to coordinate personnel activities outside the control room.	3.8	1
	2.1.11	Knowledge of less than one hour technical specification action statements for systems.	3.0	1
	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0	1
	2.1.23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	3.9	1
	Total Points			**4**
Equipment Control	2.2.2	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	4.0	1
	2.2.13	Knowledge of tagging and clearance procedures.	3.6	1
	Total Points			**2**
Radiation Control	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.	2.6	1
	2.3.2	Knowledge of facility ALARA program.	2.5	1
	2.3.9	Knowledge of the process for performing a containment purge.	2.5	1
	Total Points			**3**
Emergency Procedures / Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps.	4.3	1
	2.4.6	Knowledge of symptom based EOP mitigation strategies.	3.1	1
	2.4.9	Knowledge of low power / shutdown implications in accident (e.g. LOCA or loss of RHR mitigation strategies.	3.3	1
	2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	1
	Total Points			**4**
TIER 3 Category Totals:				**13**

Facility: Crystal River Unit 3 Exam Level: RO/SRO		Date of Examination: 09-25-2000 Operating Test No.: 1
Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Plant Parameter Verification	JPM - Perform a reactivity balance calculation/001A4.11/3.5/4.1
	Plant Parameter Verification	JPM – Perform a Reactor Coolant Boron Change Calculation/004A4.04/3.2/3.6
A.2	Surveillance Testing	JPM – Perform a Reactor Coolant System Inventory Balance /2.2.12/3.0/3.4
A.3	Radiation Hazards	JPM - Using survey maps determine radiation requirements and stay times/2.3.1/2.6/3.0*
A.4	SRO Emergency action levels and classifications	JPM – Determine Emergency Action Level and Complete the State of Florida Notification Message Form for Nuclear Power Plants/2.4.41/4.1
A.4	RO Emergency Communications	JPM – Notify State Warning Point Tallahassee with the State of Florida Notification Message Form for Nuclear Power Plants (faulted)/2.4.43/2.8

* Modification of last years A.3 JPM (identified as a Needs Improvement Area)

Facility: Crystal River Unit 3 Exam Level: RO/SRO(I)	Date of Examination: 09-25-2000 Operating Test No.: 1

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. Control Rod Drive (CRD)/Transfer Single Rod to Auxiliary Power Supply/001A4.03/4.0/3.7	D, S	1
b. AC. Electrical/Supply pressurizer heaters from the "B" ES 4160V Bus/062A2.05/2.9/3.3	N, S	6
c. Reactor Coolant (RCS)/Take Actions required for Loss of RCS Pressure/010A1.07/3.7/3.7 (does not result in a Rx trip)	A, D, S	3
d. Building Spray (BS)/Ensure BS actuation/026A3.01/4.3/4.5 (EOP-03)	A, D, S	5
e. Makeup and Purification System (MU)/ Re-establish letdown/004A4.05/3.6/3.1**	A, D, S	2
f. Decay Heat Removal (DH)/ Perform ECCS Suction Transfer/005A4.01/3.6/3.4**	D, L, S	4
g. Reactor Protection System (RPS)/Place RPS in Shutdown Bypass/012A4.03/3.6/3.6	C, N	7

B.2 Facility Walk-Through

a. Fire Service (FS)/Recirculation of FSP-1/086A4.01/3.3/3.3	N	8
b. Emergency Feedwater (EFW)/Placing EFP-2 in Standby/068AA1.02/4.3/4.5**	N	4
c. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.2	A, N, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

Facility: Crystal River Unit 3
Exam Level: SRO(U)

Date of Examination: 09-25-2000
Operating Test No.: 1

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. AC. Electrical/Supply pressurizer heaters from the "B" ES 4160V Bus/062A2.05/2.9/3.3	N, S	6
b. Makeup and Purification System (MU)/ Re-establish letdown/004A4.05/3.6/3.1**	A, D, S	2
c. Reactor Protection System (RPS)/Place RPS in Shutdown Bypass/012A4.03/3.6/3.6	C, N	7

B.2 Facility Walk-Through

System/JPM Title/KA	Type Code*	Safety Function
a. Fire Service (FS)/Recirculation of FSP-1/086A4.01/3.3/3.3	N	8
b. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.3	A, N, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

Facility: Crystal River Unit 3 Exam Level: RO/SRO(I)	Date of Examination: 09-25-2000 Operating Test No.: 2

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. Control Rod Drive (CRD)/Latch and Position Indication align a Safety Group /001A4.03/4.0/3.7	D, S	1
b. Nuclear Services Closed Cycle Cooling (SW)/Isolate Loads following a Loss of SW/008A4.01/3.3/3.1**	D, S	8
c. Reactor Coolant (RCS)/Take Actions required for Loss of RCS Pressure/010A1.07/3.7/3.7 (results in a Rx trip)	A, D, S	3
d. Makeup System (MU)/Restart a MU Pump following a Reactor Coolant System leak isolation/004A4.08/3.8/3.4**	D, S	2
e. Decay Heat Removal (DH)/ Following a LOCA, place a DH train in DH Removal/005A4.01/3.6/3.4**	A, M, L, S	4
f. Air Handling (AH)/Following an ES actuation ensure Containment Cooling is properly aligned/022A3.01/4.1/4.3	A, N, S	5
g. Reactor Protection System (RPS)/Remove RPS from Shutdown Bypass/012A4.03/3.6/3.6	C, N	7

B.2 Facility Walk-Through

a. AC. Electrical/Supply pressurizer heaters from the "B" ES 4160V Bus/062A2.05/2.9/3.3	N	6
b. Emergency Feedwater (EFW)/Placing EFP-2 in Standby/068AA1.02/4.3/4.5**	A, N	4
c. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.2	D, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

Facility: Crystal River Unit 3 Exam Level: SRO(U)	Date of Examination: 09-25-2000 Operating Test No.: 2

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. Nuclear Services Closed Cycle Cooling (SW)/Isolate Loads following a Loss of SW/008A4.01/3.3/3.1**	D, S	8
b. Reactor Coolant (RCS)/Take Actions required for Loss of RCS Pressure/010A1.07/3.7/3.7 (results in a Rx trip)	A, D, S	3
c. Decay Heat Removal (DH)/ Following a LOCA, place a DH train in DH Removal/005A4.01/3.6/3.4**	A, M, L	4

B.2 Facility Walk-Through

a. AC. Electrical/Supply pressurizer heaters from the “B” ES 4160V Bus/062A2.05/2.9/3.3	N	6
b. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.2	D, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

Facility: Crystal Unit #3 PWR: B & W Scenario No.: 3-1 Op-Test No.: 1
(Backup scenario)
Examiners: George Hopper Operators: ______________________
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Objectives:

- The BOP will be evaluated on his ability to shutdown an emergency diesel generator using the surveillance procedure.
- The OAC and SRO will be evaluated on their ability to diagnose a Tave failure and take corrective actions.
- The operating crew will be evaluated on their ability to reduce power to within the capacity of one feedwater pump and to prevent a premature reactor trip.
- The OAC and SRO will be evaluated on their ability to diagnose the neutron error instrument failure and take corrective actions.
- The BOP and SRO will be evaluated on their ability to restore power to an Engineered Safeguards bus and restore normal plant configuration.
- The operating crew will be evaluated on their response to a reactor building isolation and cooling actuation.
- The OAC will diagnose that an ATWAS has occurred and take appropriate corrective actions.
- The operating crew will be evaluated on their ability to diagnose location of a steam leak and isolate the effected steam generator.
- The BOP will be evaluated on his ability to isolate an OTSG when main feedwater isolation circuitry fails.

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover: A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's air compressor. They will notify the control room when maintenance is complete. DHP-1A, RWP-2A and EFP-3 are OOS for pump packing/seal adjustment. WTP-6B is OOS for motor/pump alignment. ARP-1B is OOS for routine motor maintenance. The intake screen wash system is OOS due to mechanical damage from an intake crane accident. OTSG "B" has a 3 GPD primary to secondary leak. EDG-1A is running for SP-354A and is ready to be shutdown. RM-G27 is OOS for repair.

Event No.	Malf. No.	Event Type*	Event Description
1	1	N(BOP) N(SRO)	Shutdown EDG-1A following its monthly functional test. (SP-354A).
2	2	I(OAC) I(SRO)	Selected Tave RC-12-TAS (RC-7A-TAI) fails high (gradual failure) (**MALF**). The OAC stabilizes the plant and transfers to good channel. (OP-501)
3	3	R(OAC) R(SRO) C(All)	The annunciator for "B" main feedwater pump high vibration alarms. The "B" main feedwater pump trips due to high vibration (**MALF**). No automatic runback occurs, the crew runs the plant back to 55%. (AP-510 AP-545)
4	4	I(OAC) I(SRO)	Neutron error fails high, IC-25-NEI (**MALF**). The OAC diagnoses the failure and takes manual control of both feedwater and the reactor to stabilize the plant. (OP-504)
5	5	C(BOP) N(BOP) N(SRO)	Shortly after the Primary Plant Operator trips EDG-1A's fuel rack (post run action) breaker 3211 trips (**MALF**). Power is restored to the "A" ES buses from breaker 3205. Makeup is reestablished. (AP-770)
6	6	M(All)	An unisolable steam leak develops in the reactor building on the "B" OTSG. Reactor does not trip on reactor building pressure (only one channel of RPS trips, AR-502) (**MALF**). OAC must trip the reactor (**CT**). (EOP-02)
7	7	C(All)	Once the "B" OTSG is determined to be the generator with the leak the BOP is directed to isolate the generator. The MFWI does not actuate in manual or automatic (**MALF**). The BOP performs the isolation by manually closing the appropriate valves (**CT**). (EOP-05)

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

Narrative Summary:

SP-354A, Monthly Functional Test of the Emergency Diesel Generator, EGDG-1A is in progress. The step to shut the diesel down has just been reached and the BOP will perform these actions. (SP-354A) (Technical specification opportunity for the SRO)

While the BOP is performing actions of SP-354A, selected Tave gradually fails high (K-3-2). The OAC and SRO will diagnose this failure, stabilize the plant and transfer to a good channel. (OP-501)

The "B" main feedwater pump's high vibration annunciator, L-02-02, will alarm (AR-504. The feedwater pump will trip and no automatic runback will occur. The crew will perform a plant runback manually in accordance with AP-545. (AP-545)

Following the runback IC-25-NEI fails high. The OAC and the SRO diagnose the failure and the OAC takes manual control of both feedwater and the reactor to stabilize the plant. (OP-504)

One of the auxiliary building operator's actions after a diesel is shutdown is to trip the fuel racks. Shortly after this action is taken breaker 3211, the normal supply breaker for the "A" 4160 V ES bus trips due to a control circuit failure. Power is restored to the bus by the BOP closing breaker 3205. The BOP and SRO will restore plant to normal configuration including restarting a makeup pump. (AP-770)

An unisolable steam leak develops in the reactor building on the "B" OTSG. An RBIC (4 psig in the reactor building) actuation is caused by the steam leak. The BOP will verify proper ES actuation. Because of a RPS failure only one (1) channel of RPS trips (AR-502; J-08-01 and J-08-04) on the 4 psig in the reactor building. The OAC recognizes an ATWAS and trips the reactor. (EOP-02)

Once the crew determines the leaking OTSG, that steam generator will be isolated. The MFWI does not actuate in manual or automatic. The BOP (OAC) performs the isolation by manually closing the feedwater valves. (EOP-05) If the feedwater is not isolated the overcooling will continue.

The exercise is terminated when a safe steaming path is established on the "A" OTSG and the cooldown rate is acceptable.

Procedures used during this scenario: (Annunciator Response, AR, not listed)

AP-510	EOP-02	OP-501	SP-354A
AP-545	EOP-05		
AP-770			

Target Quantitative Attributes – Scenario 3	Actual Attributes
1. Total Malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal Events (2-4)	3
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical Task (2-3)	2

Facility: Crystal Unit #3 PWR: B & W Scenario No.: 1-1,2,3 Op-Test No.: 1
Examiners: George Hopper Operators: ____________________

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Objectives:

- The OAC and SRO will be evaluated on their ability to diagnose a power range nuclear instrumentation channel failure and take corrective actions.
- The BOP and the SRO will be evaluated on their ability to place a RPS channel in bypass and verify Technical Specification adherence.
- The OAC will be evaluated on his ability to diagnose the loss of automatic pressurizer level control and take manual actions to control the level.
- The operating crew will be evaluated on their ability to diagnose a high reactor coolant pump thrust bearing temperature and remove the pump from service.
- The operating crew will be evaluated on their ability to diagnose a failure of feedwater to re-ratio following removal of the reactor coolant pump from service and compensate for this failure.
- The operating crew will be evaluated on their ability to run the plant back following a dropped rod.
- The operating crew will be evaluated on their ability to diagnose a small break LOCA in the Reactor Building.
- The BOP will be evaluated on his ability to respond to an engineered safeguards actuation.
- The operating crew will be evaluated on their ability to respond to a reactor trip, a loss of subcooling margin.
- The OAC will be evaluated on his ability to respond to an emergency feedwater instrument failure and take manual action to control emergency feedwater flow.

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover: A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's air compressor. They will notify the control room when maintenance is complete. DHP-1A, RWP-2A and EFP-1 are OOS for pump packing/seal adjustment. WTP-6B is OOS for motor/pump alignment. ARP-1B is OOS for routine motor maintenance. The intake screen wash system is OOS due to mechanical damage from an intake crane accident. OTSG "B" has a 3 GPD primary to secondary leak. RM-G27 is OOS for repair.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I(OAC) I(SRO) N(BOP) N(SRO)	NI-7 power range detector fails high (fails to 102%) (**MALF**). The crew will diagnose the failure and stabilize the plant then transfer to a good channel. The crew then places "C" RPS channel in bypass. (OP-501, OP-507)
2	2	I(OAC)	MUV-31 (Pressurizer level control valve) controller set point fails high (**MALF**). The OAC will diagnose the failure and control pressurizer level in manual.
3	3	C(All) N(All) R(OAC)	An annunciator indicates a high thrust bearing temperature for RCP-1C (**MALF**). A power reduction is required followed by removal of the RCP from service. (AR-501, OP-302)
4	4	I(OAC) I(SRO)	When the RCP is shutdown feedwater does not re-ratio (**MALF**). The crew will manually re-ratio feedwater.
5	5	C(All) R(OAC)	Control rod 7-4 drops into the core (**MALF**). The crew will manually run-back the plant. (AP-545)
6	6	C(All)	A small RCS leak develops on letdown line in the reactor building (**MALF**)**. The crew will perform the actions of AP-520. (AP-520)
7	7	M(All)	Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped (**CT**). (EOP-02, EOP-03)
8	8	C(BOP)	When the ES actuation occurs, RWP-2B does not start. The BOP will start the pump (**MALF**) (**CT**). (EOP-02, EOP-03)
9	9	I(OAC)	After RCPs are tripped emergency feedwater actuates. SP-29-LT fails low (SP-29-LI, EFIC low range instrument) (**MALF**). This will cause EFV-57 to ramp full open. The OAC will manually close EFV-57 (**CT**). (Rule 3)

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

** PRA significant accident

Narrative Summary:

NI-7 power range detector gradually fails to 102% preventing a SASS instigated swap of the NI signal feeding the ICS. The OAC will stop the transient caused by the NI failure. Once the transient is stopped the crew will select an accurate NI signal (OP-501) to the ICS and bypass the "C" RPS channel (OP-507). (Technical specification opportunity for the SRO)

Once all ICS stations are back in automatic the pressurizer level control valve, MUV-31, controller set point fails high. The OAC using diagnostic skills (pressurizer level and MU flow increasing and MUT level decreasing) will discover the failure and select MUV-31's controller to manual.

An annunciator indicates a high thrust bearing temperature, I-02-04 (AR-501). Using the thrust bearing temperature monitor the BOP will determine that RCP-1C has the high temperature. The operators will reduce power and remove RCP-1C service (OP-302).

When the RCP is shutdown, feedwater does not re-ratio and the OAC will have to re-ratio feedwater manually.

When feedwater flow has been properly aligned control rod 7-4 drops into the core. The OAC will have to reduce power to 45% (based on 3 RCPs operating) with ICS in manual (AP-545).

Once the runback is complete a small RCS leak develops on the letdown line in the reactor building. The crew will enter AP-520, and perform actions for a reactor coolant leak (AP-520).

The leak will become bigger (≈ 1000 gpm) causing a reactor trip, a loss of subcooling margin and a reactor building isolation and cooling actuation. The BOP will control the ES actuation while the OAC meets the immediate actions of EOP-02 and EOP-03 (BOP may take the EOP-03 immediate actions) (EOP-2, EOP-3, Rule 1, Rule 2).

When subcooling margin is lost (EOP-3) the reactor coolant pumps must be stopped before the reactor coolant reaches a greater than 70% void fraction which could happen in as little as two minutes. The safety significance of this action is that a greater than 70% void fraction does not leave enough water to keep the core covered if the pumps are lost after the 70% void fraction is reached.

Following the ES actuation, the BOP will discover that RWP-2B did not start. The BOP will start RWP-2B (EOP-02, EOP-03). If RWP-2B is not started there is no cooling water for the only functional decay heat pump (LPI).

When the reactor coolant pumps are turned off, EFIC automatically selects the Natural Circulation setpoint. When the operator selects the ISM setpoint (Rule 1) SP-29-LT (the level transmitter that feeds SP-29-LI, EFW low range level) fails low, EFV-57, emergency feedwater control valve, ramps open and has to be selected to manual and closed (Rule 3). If EFV-57 is not promptly closed and excessive heat transfer symptom will develop.

When EOP-08 actions are in progress with OTSG heat transfer, and stable RCS inventory control then the scenario can be terminated.

Procedures used during this scenario: (Annunciator Response, ARs, not listed)

AP-510	EOP-02	OP-302
AP-520	EOP-03	OP-501
AP-545	EOP-08	OP-507
	EOP-13	

Target Quantitative Attributes – Scenario 1	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	2
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical Task (2-3)	3

Facility: Crystal Unit #3 PWR: B & W Scenario No.: 2-1,2,3 Op-Test No.: 1

Examiners: George Hopper Operators: ______________________

Objectives:

- The BOP will be evaluated on his ability to diagnose Core Flood Tank low pressure and take actions to recover CFT pressure.
- The OAC and SRO will be evaluated on their ability to diagnose a Th instrument failure and take corrective actions.
- The operating crew will be evaluated on their ability to diagnose a failed CDP magnetic coupling and to reduce power level to the capacity of one CDP.
- The OAC and SRO will be evaluated on their ability to diagnose a failure of the ULD and reduce power using manual ICS control.
- The operating crew will be evaluated on their ability to diagnose loss of condenser vacuum and to take actions to remove the turbine from service.
- The crew will be evaluated on their ability to perform AP-660, Turbine Trip.
- The OAC and SRO will be evaluate on their ability to perform EOP-02, Vital System Status Verification, immediate actions.
- The operating crew will be evaluated on their ability to diagnose an OTSG tube leak and to take actions to keep pressurizer level as required.
- The OAC will be evaluated on his ability to diagnose the loss of all feedwater to the OTSGs and take appropriate actions to correct this condition.

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover: A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's air compressor. They will notify the control room when maintenance is complete. DHP-1A, RWP-2A and EFP-3 are OOS for pump packing/seal adjustment. WTP-6B is OOS for motor/pump alignment. ARP-1B is OOS for routine motor maintenance. The intake screen wash system is OOS due to mechanical damage from an intake crane accident. OTSG "B" has a 3 GPD primary to secondary leak. RM-G27 is OOS for repair.

Event No.	Malf. No.	Event Type*	Event Description
1	1	N(BOP) N(SRO)	A valid "B" core flood tank low pressure annunciator alarms. The BOP restores the core flood tank pressure. (AR-305, OP-401)
2	2	I(OAC) I(SRO)	Selected "A" Thot , RC-4A-TE1, fails high (**MALF**). The OAC diagnoses the failure and stabilizes the plant then transfers to a good channel. (AR-503, OP-501)
3	3	C(BOP) C(SRO) R(OAC)	CDP-1A magnetic coupling fails (**MALF**). The crew reduces power to a level within the capability of one CDP (approximately 60%). (AR-602, OP-603, AP-510)
4	4	C(All)	The turbine building operator reports a hissing sound near the main feedwater pump exhaust lines. The crew notices a loss of condenser (**MALF**). (OP-607)
5	5	I(OAC) I(SRO) R(OAC)	While the crew reduces power to < 45% to trip the turbine (degrading vacuum). The ULD fails to respond to operator input (ULD failure) (**MALF**). The OAC reduces power using manual ICS control. (OP-204, AP-510)
6	6	C(OAC) C(SRO	Once the crew is < 45% the OAC discovers the turbine trip pushbutton does not function (**MALF**) and performs the remedial actions for AP-660 and enters EOP-02 (**CT**). (AP-660, EOP-02)
7	7	C(OAC) C(SRO)	The turbine building operator reports steam blowing from both main feedwater pump exhausts. When emergency feedwater actuates (manually or automatically) EFP-2 will fail to start (**MALF**). OAC will start EFP-1(**CT**). (EOP-06, EOP-14 Enclosure 7)
8	8	M(All)	Following the turbine shutdown the "A" OTSG develops a 350 gpm tube leak (**MALF**) while the condenser continues to lose vacuum. The crew will diagnose location of the tube leak (**CT**). (EOP-06)**

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

Narrative Summary:

The core flood tank low pressure annunciator, E-08-05, comes into alarm (AR-305). The BOP corrects the valid low pressure in the "B" core flood tank (OP-401). (Technical specification opportunity for the SRO)

As the BOP is attending to the low CFT pressure the OAC and SRO diagnose a selected Th high failure. The OAC stabilizes the plant and transfers to a good channel (OP-501).

Annunciator alarm N-2-2 (AR-602) alerts the crew that the "A" condensate pump magnetic coupling is failing. Control room indication verifies the CDP problem and power is rapidly reduced to a level that is within the capability of one CDP (60%). The BOP removes CDP-1A from service (OP-603, AP-510).

Condenser vacuum begins to degrade due to a leak in the "A" main feedwater pump exhaust trunk (OP-607). Power is reduced to < 45% to trip the Turbine but not the Reactor. While the crew is reducing power to trip the Turbine, the ULD fails to respond to operator input. The OAC will finish the power reduction using manual ICS control.

When the OAC begins the immediate actions of AP-660, Turbine Trip, he discovers that the Turbine trip pushbutton does not function. The OAC performs the remedial actions, which includes closing the MSIVs and tripping the Reactor. (AP-660, EOP-02) Since the normal heat sink for the reactor is no longer available the reactor is tripped to protect the fuel.

After the Reactor trip the "A" OTSG develops a 350 gpm tube leak. Diagnosing the leaking steam generator post trip with out the "A" side steam line radiation monitor is important to the mitigation strategy for the casualty. This knowledge will help limit the spread of contamination and possible radioactive releases to the environment as two of the three fission product barriers have failed.

The condenser will eventually loose all vacuum and this will be verified by a call from the turbine building operator. (EOP-06)

When emergency feedwater is either manually or automatically actuated EFP-2 fails to start. The OAC will start EFP-1. (EOP-14 Enclosure 7) If EFP-1 is not started the symptom of inadequate heat transfer will have to be entered.

The exercise is terminated when both reactor and turbine are tripped, subcooling margin is minimized and a plant cooldown is started (EOP-06).

Procedures used during this scenario: (Annunciator Response, AR, not listed)

AP-510	EOP-02	OP-401
AP-660	EOP-06	OP-501
	EOP-14	OP-603
		OP-607

Target Quantitative Attributes – Scenario 2	Actual Attributes
1. Total Malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal Events (2-4)	2
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical Task (2-3)	3

OPERATING TEST NO.: Group 1**

Applicant Type	Evolution Type	Minimum Number	Scenario Number 1	2	3	4
SRO-I#1 As RO	Reactivity	1		3, 5		
	Normal	0				
	Instrument	1		2, 5		
	Component	1		4, 6, 8		
	Major	1		7		
SRO-I#1 As SRO	Reactivity	0				
	Normal	1	1, 3, 4			
	Instrument	1	1, 4			
	Component	1	3, 5, 6			
	Major	1	7			
SRO-I#2 As RO	Reactivity	1	3, 5			
	Normal	0	3			
	Instrument	1	1, 2, 4, 9			
	Component	1	3, 5, 6			
	Major	1	7			
SRO-I#2 As SRO	Reactivity	0				
	Normal	1		1		
	Instrument	1		2, 5		
	Component	1		3, 4, 6, 8		
	Major	1		7		

Instructions: (1) Enter the operating test number and Form ES-D1 event numbers for each evolution type.
(2) Reactivity manipulations may be conducted under normal or controlled abnormal conditions (refer to Sections D.4.d) but must be significant per Section C.2.a of Appendix D.

**This form will be submitted again after the crew composition has been finalized and scenario outline approval.

Author: Melissa Galliean

Chief Examiner: ____________________

OPERATING TEST NO.: Group 2**

Applicant Type		Evolution Type	Minimum Number	Scenario Number 1	2	3	4
RO#1		Reactivity	1		3, 5		
		Normal	1	1, 3			
		Instrument	2		2, 5		
		Component	2	3, 5, 6, 8	4, 6, 8		
		Major	1	7	7		
SRO-I#3	As RO	Reactivity	1	3, 5			
		Normal	0	3			
		Instrument	1	1, 2, 4, 9			
		Component	1	3, 5, 6, 8			
		Major	1	7			
	As SRO	Reactivity	0				
		Normal	1		1		
		Instrument	1		2, 5		
		Component	1		3, 4, 6, 8		
		Major	1		7		
SRO#1		Reactivity	0				
		Normal	1	1, 3, 4			
		Instrument	1	1, 4			
		Component	1	3, 5, 6			
		Major	1	7			

Instructions: (1) Enter the operating test number and Form ES-D1 event numbers for each evolution type.
(2) Reactivity manipulations may be conducted under normal or controlled abnormal conditions (refer to Sections D.4.d) but must be significant per Section C.2.a of Appendix D.

**This form will be submitted again after the crew composition has been finalized and scenario outline approval.

Author: ______________________

Chief Examiner: ______________________

OPERATING TEST NO.: Group 3**

Applicant Type	Evolution Type	Minimum Number	Scenario Number 1	2	3	4
RO#2	Reactivity	1		3, 5		
	Normal	1	1, 3			
	Instrument	2		2, 5		
	Component	2	3, 5, 6, 8	4, 6, 8		
	Major	1	7	7		
SRO-I#4 As RO	Reactivity	1	3, 5			
	Normal	0	3			
	Instrument	1	1, 2, 4, 9			
	Component	1	3, 5, 6, 8			
	Major	1	7			
SRO-I#4 As SRO	Reactivity	0				
	Normal	1		1		
	Instrument	1		2, 5		
	Component	1		3, 4, 6, 8		
	Major	1		7		
SRO#2	Reactivity	0				
	Normal	1	1, 3, 4			
	Instrument	1	1, 4			
	Component	1	3, 5, 6			
	Major	1	7			

Instructions: (1) Enter the operating test number and Form ES-D1 event numbers for each evolution type.
(2) Reactivity manipulations may be conducted under normal or controlled abnormal conditions (refer to Sections D.4.d) but must be significant per Section C.2.a of Appendix D.

**This form will be submitted again after the crew composition has been finalized and scenario outline approval.

Author: ______________________

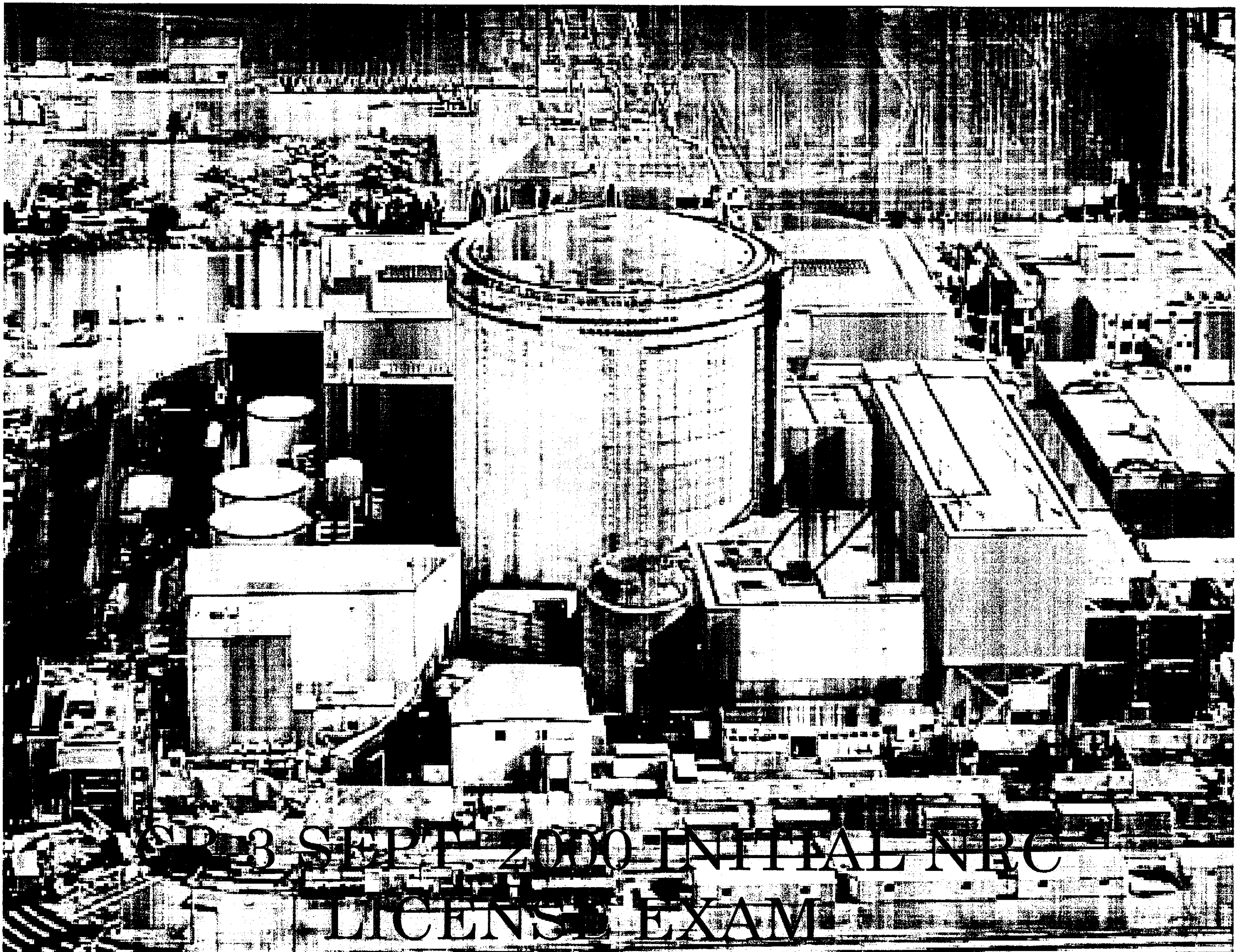
Chief Examiner: ______________________

INITIAL SUBMITTAL

CRYSTAL RIVER 50-302/2000-301
SEPTEMBER 25 - 29, 2000

INITIAL SUBMITTAL

OPERATING TEST
SIMULATOR SCENARIOS


CR-3 SEPT. 2000 INITIAL NRC
LICENSE EXAM

Facility: Crystal Unit #3 PWR: B & W Scenario No.: 1-1,2,3 Rev. 1 Op-Test No.: 1

Examiners: George Hopper
Larry Mellen
Glen Sawyer

Operators: ____________________
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Objectives:

- The OAC and SRO will be evaluated on their ability to diagnose a power range nuclear instrumentation channel failure and take corrective actions.
- The BOP and the SRO will be evaluated on their ability to place a RPS channel in bypass and verify Technical Specification adherence.
- The OAC will be evaluated on his ability to diagnose the loss of automatic pressurizer level control and take manual actions to control the level.
- The operating crew will be evaluated on their ability to diagnose a high reactor coolant pump thrust bearing temperature and remove the pump from service.
- The operating crew will be evaluated on their ability to diagnose a failure of feedwater to re-ratio following removal of the reactor coolant pump from service and compensate for this failure.
- The operating crew will be evaluated on their ability to run the plant back following a dropped rod.
- The operating crew will be evaluated on their ability to diagnose a small break LOCA in the Reactor Building.
- The BOP will be evaluated on his ability to respond to an engineered safeguards actuation.
- The operating crew will be evaluated on their ability to respond to a reactor trip and a loss of subcooling margin.
- The OAC will be evaluated on his ability to respond to an emergency feedwater instrument failure and take manual action to control emergency feedwater flow.

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover: A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's compressor. They will notify the control room when maintenance is complete. DHP-1A, RWP-2A and EFP-1 are OOS for pump packing/seal adjustment. WTP-6B is OOS for motor/pump alignment. ARP-1B is OOS for routine motor maintenance. The intake screen wash system is OOS due to mechanical damage from an intake crane accident. OTSG "B" has a 3 GPD primary to secondary leak. RM-G27 is OOS for repair.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I(OAC) I(SRO) N(BOP) N(SRO)	NI-7 power range detector fails high (fails to 102%) (**MALF**). The crew will diagnose the failure and stabilize the plant then transfer to a good channel. The crew then places "C" RPS channel in bypass. (OP-501, OP-507)
2	2	I(OAC)	MUV-31 (Pressurizer level control valve) controller set point fails high (**MALF**). The OAC will diagnose the failure and control pressurizer level in manual.
3	3	C(All) N(All) R(OAC)	An annunciator indicates a high thrust bearing temperature for RCP-1C (**MALF**). A power reduction is required followed by removal of the RCP from service. (AR-501, OP-302)
4	4	I(OAC) I(SRO)	When the RCP is shutdown feedwater does not re-ratio (**MALF**). The crew will manually re-ratio feedwater.
5	5	C(All) R(OAC)	Control rod 7-4 drops into the core (**MALF**). The crew will manually run-back the plant. (AP-545)
6	6	C(All)	A small RCS leak develops on letdown line in the reactor building (**MALF**)**. The crew will perform the actions of AP-520. (AP-520)
7	7	M(All)	Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped (**CT**). (EOP-02, EOP-03)
8	8	C(BOP)	When the ES actuation occurs, RWP-2B does not start. The BOP will start the pump (**MALF**) (**CT**). (EOP-03)
9	9	I(OAC)	Following EFIC actuation, SP-29-LT fails low (SP-29-LI, EFIC low range instrument) (**MALF**). This will cause EFV-57 to ramp full open. The OAC will manually close EFV-57 (**CT**). (Rule 3)

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

Narrative Summary:

NI-7 power range detector gradually fails to 102% preventing a SASS initiated swap of the NI signal feeding the ICS. The OAC will stop the transient caused by the NI failure. Once the transient is stopped the crew will select an accurate NI signal (OP-501) to the ICS and bypass the "C" RPS channel (OP-507). (Technical specification opportunity for the SRO)

Once all ICS stations are back in automatic the pressurizer level control valve, MUV-31, controller set point fails high. The OAC using diagnostic skills (pressurizer level and MU flow increasing and MUT level decreasing) will discover the failure and select MUV-31's controller to manual.

An annunciator indicates a high thrust bearing temperature, I-02-04 (AR-501). Using the thrust bearing temperature monitor the BOP will determine that RCP-1C has the high temperature. The operators will reduce power and remove RCP-1C service (OP-302).

When the RCP is shutdown, feedwater does not re-ratio and the OAC will have to re-ratio feedwater manually.

When feedwater flow has been properly aligned control rod 7-4 drops into the core. The OAC will have to reduce power to 45% (based on 3 RCPs operating) with ICS in manual (AP-545).

Once the runback is complete a small RCS leak develops on the letdown line in the reactor building. The crew will enter AP-520, and perform actions for a reactor coolant leak (AP-520).

The leak will become bigger (≈ 1000 gpm) causing a reactor trip, a loss of subcooling margin and a reactor building isolation and cooling actuation. The BOP will control the ES actuation while the OAC meets the immediate actions of EOP-02 and EOP-03 (BOP may take the EOP-03 immediate actions) (EOP-2, EOP-3, Rule 1, Rule 2).

When subcooling margin is lost (EOP-3) the reactor coolant pumps must be stopped to ensure compliance with SBLOCA analysis ensuring continued core coverage and cooling.

Following the ES actuation, the BOP will discover that RWP-2B did not start. The BOP will start RWP-2B (EOP-03). If RWP-2B is not started there is no cooling water for required ECCS equipment.

Following EFIC actuation, SP-29-LT (the level transmitter that feeds SP-29-LI, EFW low range level) fails low, EFV-57, emergency feedwater control valve, ramps open and has to be selected to manual and closed (Rule 3). If EFV-57 is not promptly closed and excessive heat transfer symptom will develop.

When EOP-08 actions are in progress with OTSG heat transfer, and stable RCS inventory control then the scenario can be terminated.

Procedures used during this scenario: (Annunciator Response, ARs, not listed)

AP-510	EOP-02	OP-302
AP-520	EOP-03	OP-501
AP-545	EOP-08	OP-507
	EOP-13	
	EOP-14	

Target Quantitative Attributes – Scenario 1	Actual Attributes
1. Total Malfunctions (5-8)	8
2. Malfunctions after EOP entry (1-2)	2
3. Abnormal Events (2-4)	2
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical Task (2-3)	3

Examination Setup/Execution
Scenario 1

Scenario Setup

1. [ ] Initialize the simulator to IC# 21 (GF or 11 on FAT) and UNFREEZE the simulator
2. [ ] In the "NRCEXAM" directory of LESSON PLAN, execute and start lesson plan #1
3. [ ] Trigger Lesson Plan Steps #1 and #2
4. [ ] Trigger Lesson Plan Steps #10 and #11
5. Place the following Red Tags on the main control panel:
   a. [ ] DHP-1A, Red Tag
   b. [ ] RWP-2A, Red Tag, Pull-to-Lock
   c. [ ] EFP-1, Red Tag, Pull-to-Lock
   d. [ ] WTP-6B, Red Tag, Pull-to-Lock
   e. [ ] ARP-1B, Red Tag, Pull-to-Lock
   f. [ ] RM-G27, Red Tag
6. Perform the following setup actions:
   a. [ ] Ensure PPC group 59 on the right overhead CRT and group 108 on left overhead CRT
   b. [ ] Ensure SPDS left screen selected to normal and right screen to imbalance
   c. [ ] Ensure Batch Controller reset
   d. [ ] Ensure steam line monitor reset
   e. [ ] Ensure PPC/ANN alarms acknowledged
   f. [ ] Ensure status board indicates P → S 3 GPD (B)
   g. [ ] Set MUT level to 80 inches and clear high pressure alarm by venting.
7. Ensure clean copies of the following "consumable" procedures are available.
   a. [ ] AP-510
   b. [ ] AP-520
   c. [ ] AP-545
   d. [ ] EOP-02
   e. [ ] EOP-03
   f. [ ] EOP-08
   g. [ ] OP-302
   h. [ ] OP-501
   i. [ ] OP-507
7. Advance all MCB recorders and delete alarm summary on computer station.
8. FREEZE the simulator and notify the lead examiner that simulator is ready to begin.

Scenario Execute

1. When notified by the lead examiner UNFREEZE the simulator
2. When notified by the lead examiner TRIGGER LESSON PLAN step #3 (NI-7 failure)
3. When the crew begins to return the ICS to automatic TRIGGER LESSON PLAN step #5 (RCP-1C thrust bearing).
4. Once ICS is back in full automatic TRIGGER LESSON PLAN step #4 (MUV-31 failure).
5. Prior to shutting down RCP-1C TRIGGER LESSON PLAN step #6 (Feedwater does not re-ratio)
6. When notified by the lead examiner TRIGGER LESSON PLAN step #7 (Rod 7-4 drops)
7. When notified by the lead examiner TRIGGER LESSON PLAN step #8 (Small leak)
8. When notified by the lead examiner TRIGGER LESSON PLAN step #9 (Large leak)
9. Prior to RCP shutdown for loss of subcooling margin TRIGGER LESSON PLAN step #12 (SP-29-LI failure)

Booth Operator actions (Not included, standard call Chemistry, call HPs, etc.)

1. First call to engineering about RCP-1C, have the Operators check temperatures and trend.
2. Second call to engineering about RCP-1C, recommend removing RCP-1C from service.
3. Call to SPO to complete Enclosure 1 of EOP-14, enter "encl", if required. Delay input of "encl" for at least 3 minutes post trip to prevent continued MFWP operation on auxiliary steam.
4. Call to PPO to complete Enclosure 2 of EOP-14, enter "enc2", if required.
5. If call about presence of people in the RB, respond that there are no people in the RB.

TURNOVER SHEET

Initial Conditions: The plant is at 100% full power with the ICS in automatic control.

Turnover:

A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's compressor. They will notify the control room when maintenance is complete.

DHP-1A, RWP-2A and EFP-1 are OOS for pump packing/seal adjustment.

WTP-6B is OOS for motor/pump alignment.

ARP-1B is OOS for routine motor maintenance.

The intake screen wash system is OOS due to mechanical damage from an intake crane accident.

OTSG "B" has a 3 GPD primary to secondary leak.

RM-G27 is OOS for repair.

ITS Action Items:

3.5.3, Condition "A" for DHP-1A.
3.7.9, Condition "A" for RWP-1A.

Activities to be Performed this Shift:

None planned.

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

Event Description: NI-7 power range detector fails high (fails to 102%) (**MALF**). The crew will diagnose the failure, stabilize the plant and transfer to a good channel. The crew then places "C" RPS channel in bypass. (OP-501, OP-507)

Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses NI-7 failure - SASS mismatch alarm (K-3-2 alarms) - Reactor power, Feedwater flow and Turbine load all decreasing - NI-7 indication
	SRO	Directs OAC to stabilize plant by taking required ICS stations to manual/hand
	OAC	Stabilizes the plant (no order required) - Take Reactor diamond to manual (in Track, K-6-2 alarms, with first ICS station in hand/manual) - Take Reactor Bailey to hand - Take both Feedwater Loops to hand - Adjusts stations for stable plant operation
	SRO	Declares NI-7 inoperable and enters ITS 3.3.1, condition "A". Directs BOP to Bypass RPS channel "C" using OP-507, Operation of the ES, RPS, and ATWAS Systems (may leave in tripped condition)
	BOP	Executes actions to place RPS channel "C" in bypass using OP-507 section 4.16 - Verify no EFIC channel is in bypass - Obtain bypass key - Reposition channel bypass switch (J-7-3 alarms)
	SRO	Directs BOP to transfer NI feed to ICS per OP-501
	BOP	Executes actions to select alternate NI signal to ICS using OP-501 section 4.7 - Determine proper operating channel - Selects NI signal from NI-5/NI-6

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

Event Description: NI-7 power range detector fails high (fails to 102%) **(MALF)**. The crew will diagnose the failure, stabilize the plant and transfer to a good channel. The crew then places "C" RPS channel in bypass. (OP-501, OP-507)

Time	Position	Applicant's Actions or Behavior
	SRO	Directs OAC to return ICS stations to automatic and return to full power
	OAC	Returns ICS to automatic (no order required) - Take both Feedwater Loops to automatic - Take Reactor Bailey to automatic - Take Reactor diamond to automatic (K-6-2 clears) Starts power increase - Bumps ULD toggle up

Op-Test No.: 1 Scenario No.: 1 Event No.: 2 Event Description: MUV-31 (Pressurizer level control valve) controller set point fails high (**MALF**). The OAC will diagnose the failure and control pressurizer level in manual.		
Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses MUV-31 failure - Pressurizer level increasing - MUV-31 demand increasing - MU flow increasing Selects MUV-31 to hand - Verifies MUV-31 responding in hand - Establishes appropriate MU flow Notifies SRO of failure and response

Op-Test No.: 1 Scenario No.: 1 Event No.: 3
Event Description: An annunciator indicates a high thrust bearing temperature for RCP-1C (**MALF**). A power reduction is required followed by removal of the RCP from service. (AR-501, OP-302)

Time	Position	Applicant's Actions or Behavior
	SRO	Following thrust bearing alarm (I-2-4 alarm) uses AR-501 to direct BOP to determine affected RCP
	BOP	Determines RCP-1C upper thrust bearing face is the cause of alarm - Indication at thrust bearing temperature monitor, RC-133-TI
	SRO	Per AR-501, directs OAC to start lift oil pumps for RCP-1C and directs BOP to trend RCP-1C parameters.
	OAC	Starts lift oil pumps - Starts RCP-2C - Starts RCP-3C
	BOP	Trends RCP-1C parameters - Displays group 80 using the plant computer - Monitors RC-19C-PR1, RCP-1C seal recorder - Monitors RC-133-TI

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

Event Description: An annunciator indicates a high thrust bearing temperature for RCP-1C (**MALF**). A power reduction is required followed by removal of the RCP from service. (AR-501, OP-302)

Time	Position	Applicant's Actions or Behavior
	SRO	Enters OP-302, Reactor Coolant Pump, section 4.10, Abnormal RCP Thrust Bearing Temperatures - Contacts engineering - Directs OAC to reduce power to ≤ 72% (using OP-204 power operations or AP-510, Rapid Power Reduction, depending on urgency) • Adjust ICS load rate to desired setpoint • Adjust Unit Load Master Demand to 10 (AP-510) or desired MW electric power (OP-204) • Maintain imbalance (AP-510) • At < 75% set IC-2-MS (ICS high load limit) to 64.5% (OP-204) - Directs BOP to reduce power to ≤ 72% (using OP-204 power operations or AP-510, Rapid Power Reduction, depending on urgency) • Notify plant personnel • Notify chemistry of 15% power changes • Maintain MUT level ≥ 55 inches (AP-510) • Notify SPO to ensure proper operation of ASV-27
	OAC	Reduces power to ≤ 72% (using OP-204 power operations or - AP-510, Rapid Power Reduction, depending on urgency) - Adjust ICS load rate to desired setpoint - Adjust Unit Load Master Demand to 10 (AP-510) or desired MW electric power (OP-204) - Maintain imbalance (AP-510) - At < 75% set IC-2-MS to 64.5% (OP-204)
	BOP	Reduces power to ≤ 72% (using OP-204 power operations or AP-510, Rapid Power Reduction, depending on urgency) - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level ≥ 55 inches (AP-510) - Notify SPO to ensure proper operation of ASV-27

Op-Test No.: 1 Scenario No.: 1 Event No.: 3
Event Description: An annunciator indicates a high thrust bearing temperature for RCP-1C (**MALF**). A power reduction is required followed by removal of the RCP from service. (AR-501, OP-302)

Time	Position	Applicant's Actions or Behavior
	SRO	When power is $\leq$ 72%, directs OAC to stop RCP-1C
	OAC	Stops RCP-1C

Op-Test No.: 1 Scenario No.: 1 Event No.: 4
Event Description: When RCP-1C is shutdown, feedwater does not re-ratio (**MALF**). The crew will manually re-ratio feedwater.

Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses feedwater does not re-ratio - "A" and "B" feedwater flows approximately equal - ΔTc shows "A" Tc hotter
	SRO	Directs OAC to re-ratio feedwater for 3 RCP operation
	OAC	Re-ratios feedwater - Take both Feedwater Loops to hand - Reduces "B" Feedwater Loop to approximately one-third of the current total FW flow requirement. - Increases "A" Feedwater Loop to approximately two-thirds of the current total FW flow requirement;. - Minimizes ΔTc

Op-Test No.: 1 Scenario No.: 1 Event No.: 5
Event Description: Control rod 7-4 drops into the core (**MALF**). The crew will manually run-back the plant. (AP-545)

Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses dropped rod (7-4) - Asymmetric rod runback alarm (K-4-2 alarms) - PI indication - CRD panel green rod in-limit light on - CRD panel asymmetric rod amber light on
	SRO	Enters AP-545 and directs the OAC to - Ensure plant runback is in progress - Ensure feedwater is re-ratioed - Ensure maximum power $\leq$ 45% - Ensure narrow range Tc selected to TT3 Directs the BOP to - Notify plant personnel - Ensure RCS pressure is stable
	OAC	Performs AP-545 - Ensure plant back is in progress (runback in manual) - Ensure feedwater is properly ratioed (maintaining proper ratio with MFW Loop Demands in hand) - Ensure maximum power $\leq$ 45% - Ensure narrow range Tc selected to TT3
	BOP	Performs AP-545 - Notifies plant personnel - Ensure RCS pressure is stable

Op-Test No.: 1 Scenario No.: 1 Event No.: 6		
Event Description: A small RCS leak develops on letdown line in the reactor building **(MALF)**. The crew will perform the actions of AP-520. (AP-520)		
Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnose RCS leak - MUT level - Pressurizer level - Reactor Building Sump level - Radiation Monitor trends
	SRO	Enters AP-520 and directs the BOP to - Notify personnel - Determine if leak is OTSG leakage - Maintain pressurizer level - Maintain MUT level - Determine leak rate
	BOP	Performs AP-520 - Notifies personnel - Determine if leak is OTSG leakage • RM-A12 • RM-G26 through RM-G28 - Maintain pressurizer level • Controls MUV-31 • May close MUV-49 and MUV-567 - Maintain MUT level - Determine leak rate • Makeup flow • Seal injection flow • Letdown flow • Pressurizer level

Op-Test No.: 1 Scenario No.: 1 Event No.: 7

Event Description: Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped (**CT**). (EOP-02, EOP-03)

Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnose RCS leak - MUT level - Pressurizer level - Reactor Building Sump level - Radiation Monitor trends - Reactor trip
	OAC	May perform a manual reactor trip due to RCS leakage in excess of normal make-up capability. (AI-505) Perform immediate action of EOP-2, Vital System Status Verification - Depresses reactor trip push button - Verifies CRD groups 1 through 7 are fully inserted. - Verifies NIs indicate reactor is shutdown - Depresses turbine trip push button - Verifies TVs and GVs are closed
	SRO	May direct a manual reactor trip due to RCS leakage in excess of normal make-up capability (AI-505) Enters EOP-2 directs OAC to - Repeat immediate actions - Scan for symptoms - Verify all control rods are fully inserted (may not perform if transitioned to EOP-3) - Verify all MFW is operating (may not perform if transitioned to EOP-3) Directs BOP to - Scan for symptoms - Notify SPO to complete enclosure 1 of EOP-14

Op-Test No.: 1 Scenario No.: 1 Event No.: 7

Event Description: Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped (**CT**). (EOP-02, EOP-03)

Time	Position	Applicant's Actions or Behavior
	OAC	Performs EOP-2 - Repeats immediate actions - Scans for symptoms - Verifies all control rods are fully inserted (may not perform if transitioned to EOP-3) (all in-limit lights are on) - Verify all MFW is operating (may not perform if transitioned to EOP-3) • Main Feedwater Pumps are operating • Main Feedwater flow present
	BOP	Performs EOP-2 - Scans for symptoms - Notifies SPO to complete enclosure 1 of EOP-14
	OAC BOP	Diagnose loss of subcooling margin - SPDS screen flashing alarm - SPDS audible alarm
	BOP	Performs immediate actions of EOP-3, Inadequate Subcooling Margin and Rule 1, EOP-13 - Trips running RCPs (may be performed by OAC) - Manually actuates ES • Depresses HPI MAN ACT push buttons on "A" and "B" trains • Depresses RB ISO MAN ACT push buttons on "A" and "B" trains • Depresses ISCM push buttons for EFIC channels "A" and "B" - Ensures Tincore is selected on SPDS.

Op-Test No.: 1 Scenario No.: 1 Event No.: 7

Event Description: Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped (**CT**). (EOP-02, EOP-03)

Time	Position	Applicant's Actions or Behavior
	SRO	SRO enters EOP-3 and directs OAC to - Verify RCPs tripped - Verify EFW is operating and flow is controlled Directs BOP to - Notify personnel - Notify PPO to perform enclosure 2 of EOP-14 - Verify proper HPI discharge flow path exists - Ensure at least 1 HPI train is properly aligned - Ensure at least 1 letdown isolation valve is closed - Ensure DHV-3 is closed - Ensure ES equipment properly aligned
	OAC	Performs EOP-3 - Verifies RCPs tripped - Verifies EFW is operating and flow is controlled • Ensures level in OTSGs is at or trending toward ISCM level (Rule 3) • SEE EVENT #9

Op-Test No.: 1 Scenario No.: 1 Event No.: 7 Event Description: Leak size increases to 1000 gpm causing a reactor trip and ES actuation. Leak size causes loss of subcooling margin. The RCPs are tripped **(CT)**. (EOP-02, EOP-03)

Time	Position	Applicant's Actions or Behavior
	BOP	Performs EOP-3 - Notify personnel - Notify PPO to perform enclosure 2 of EOP-14 - Verify proper HPI discharge flow path exists • Verifies MUV-23 and MUV-24 are open OR MUV-25 and MUV-26 are open • Verifies MUV-586 and MUV-587 are open - Ensure at least 1 HPI train is properly aligned • Ensures MUV-73 and MUV-58 are open • Ensures MUP-1B and MUP-1C are running • Ensures MUV-53 and MUV-257 are closed • Ensures MUV-543, MUV-544, MUV-545, MUV-546 are closed • Ensures MUV-596 is closed OR MUV-18 and MUV-27 are closed - Ensures at least 1 letdown isolation valve is closed • Ensures MUV-567 is closed OR MUV-49 is closed - Ensures DHV-3 is closed - Ensures ES equipment properly aligned • Ensures applicable ES actuations • SEE EVENT #8 • Bypasses ES actuation both auto and manual • Controls ES systems as required

Op-Test No.: 1 Scenario No.: 1 Event No.: 8

Event Description: When the ES actuation occurs, RWP-2B does not start. The BOP will start RWP-2B **(MALF)** **(CT)**. (EOP-03)

Time	Position	Applicant's Actions or Behavior
	BOP	Ensures applicable ES actuations - Verifies ES status lights green for applicable equipment - Discovers RWP-2B not operating - Manually starts RWP-2B

Op-Test No.: 1 Scenario No.: 1 Event No.: 9 Event Description: After RCPs are tripped emergency feedwater actuates. SP-29-LT fails low (SP-29-LI, EFIC low range instrument) (**MALF**). This will cause EFV-57 to ramp open give disproportionately high EFW flow to the "B" OTSG. The OAC will manually close EFV-57 (**CT**). (Rule 3)

Time	Position	Applicant's Actions or Behavior
	OAC	Verifies EFW is operating and flow is controlled - Ensures level in OTSGs is at or trending toward ISCM level (Rule 3) - Discovers SP-29-LI failure • SP-29-LI failed • EFV-57 open (amber light) • Excessive EFW flow to the "B" OTSG - Selects EFV-57 to hand and closes

Facility: Crystal Unit #3 PWR: B & W Scenario No.: 2-1,2,3 Rev. 1 Op-Test No.: 1

Examiners: George Hopper
Larry Mellen
Glen Sawyer

Operators: ____________
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Objectives:

- The BOP will be evaluated on his ability to take actions to recover CFT pressure.
- The SRO will be evaluated on his ability to apply ITS to the CFT low pressure condition.
- The OAC and SRO will be evaluated on their ability to diagnose a Th instrument failure and take corrective actions.
- The operating crew will be evaluated on their ability to diagnose a failed CDP magnetic coupling and to reduce power level to the capacity of one CDP.
- The OAC and SRO will be evaluated on their ability to diagnose a failure of the ULD and reduce power using manual ICS control.
- The operating crew will be evaluated on their ability to diagnose loss of condenser vacuum and to take actions to remove the turbine from service.
- The crew will be evaluated on their ability to perform AP-660, Turbine Trip.
- The OAC and SRO will be evaluate on their ability to perform EOP-02, Vital System Status Verification, immediate actions.
- The operating crew will be evaluated on their ability to diagnose an OTSG tube leak and to take actions to keep pressurizer level as required.
- The OAC will be evaluated on his ability to diagnose the loss of all feedwater to the OTSGs and take appropriate actions to correct this condition.

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover: A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's air compressor. They will notify the control room when maintenance is complete. DHP-1A, RWP-2A and EFP-3 are OOS for pump packing/seal adjustment. WTP-6B is OOS for motor/pump alignment. ARP-1B is OOS for routine motor maintenance. The intake screen wash system is OOS due to mechanical damage from an intake crane accident. OTSG "B" has a 3 GPD primary to secondary leak. RM-G27 is OOS for repair. "B" CFT has reduced pressure from a valve alignment error. The alignment has been corrected and pressure in the CFT is stable but out of the specified range.

Event No.	Malf. No.	Event Type*	Event Description
1	1	N(BOP) N(SRO)	A valid "B" core flood tank low pressure condition exists. The SRO enters ITS 3.5.1 condition B and directs the BOP to restore pressure. The BOP restores the core flood tank pressure. (AR-305, OP-401) The SRO exits ITS 3.5.1 when CFT pressure is recovered.
2	2	I(OAC) I(SRO)	Selected "A" Thot , RC-4A-TE1, fails high (**MALF**). The OAC diagnoses the failure and stabilizes the plant then transfers to a good channel. (AR-503, OP-501)
3	3	C(BOP) C(SRO) R(OAC)	CDP-1A magnetic coupling fails (**MALF**). The crew reduces power to a level within the capability of one CDP (approximately 60%). (AR-602, OP-603, AP-510)
4	4	C(All)	The turbine building operator reports a hissing sound near the main feedwater pump exhaust lines. The crew notices a loss of condenser vacuum (**MALF**). (OP-607)
5	5	I(OAC) I(SRO) R(OAC)	When the crew reduces power to < 45% to trip the turbine (degrading vacuum). The ULD fails to respond to operator input (ULD failure) (**MALF**). The OAC reduces power using manual ICS control. (AP-510)
6	6	C(OAC) C(SRO	Once the crew is < 45% the OAC discovers the turbine trip pushbutton does not function (**MALF**) and performs the remedial actions for AP-660 and enters EOP-02 (**CT**). (AP-660, EOP-02)
7	7	C(OAC) C(SRO)	Emergency feedwater EFP-2 will trip after starting (**MALF**). OAC will start EFP-1 (**CT**). (EOP-02, EOP-14 Enclosure 7)
8	8	M(All)	Following the turbine shutdown the "A" OTSG develops a 350 gpm tube leak (**MALF**) while the condenser continues to lose vacuum. The crew will diagnose the existence of an OTSG tube leak without the aid of normal radiation monitoring(**CT**). (EOP-06)**

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

Narrative Summary:

Core flood tank low pressure annunciator, E-08-05, is in alarm (AR-305). CFT-1B pressure is below the ITS minimum value. The SRO will enter ITS 3.5.1 condition B and direct the BOP to recover CFT pressure. The BOP corrects the valid low pressure in the "B" core flood tank (OP-401). The SRO exits ITS 3.5.1 when CFT pressure is recovered.

As the BOP is attending to the low CFT pressure the OAC and SRO diagnose a selected Th high failure. The OAC stabilizes the plant and transfers to a good channel (OP-501).

Annunciator alarm N-2-2 (AR-602) alerts the crew that the "A" condensate pump magnetic coupling is failing. Control room indication verifies the CDP problem and power is rapidly reduced to a level that is within the capability of one CDP (60%). The BOP removes CDP-1A from service (OP-603, AP-510).

Condenser vacuum begins to degrade due to a leak in the "A" main feedwater pump exhaust trunk (OP-607). Power is reduced to < 45% to trip the Turbine but not the Reactor. While the crew is reducing power to trip the Turbine, the ULD fails to respond to operator input. The OAC will finish the power reduction using manual ICS control (AP-510).

When the OAC begins the immediate actions of AP-660, Turbine Trip, he discovers that the Turbine trip pushbutton does not function. The OAC performs the remedial actions, which include closing the MSIVs and tripping the Reactor. (AP-660, EOP-02) Since the normal heat sink for the reactor is no longer available, the reactor is tripped to protect the fuel.

After the Reactor trip the "A" OTSG develops a 350 gpm tube leak. Diagnosing the leaking steam generator post trip with out the "A" side steam line radiation monitor is important to the mitigation strategy for the casualty. This knowledge will help limit the spread of contamination and possible radioactive releases to the environment as two of the three fission product barriers have failed.

The condenser will eventually lose all vacuum and this will be verified by a call from the turbine building operator. (EOP-06)

Soon after emergency feedwater is actuated EFP-2 will trip causing a loss of all main and emergency feedwater. The OAC will start EFP-1. (EOP-14 Enclosure 7) If EFP-1 is not started the symptom of inadequate heat transfer will develop.

The exercise is terminated when both reactor and turbine are tripped, subcooling margin is minimized and a plant cooldown is started (EOP-06).

Procedures used during this scenario: (Annunciator Response, AR, not listed)

AP-510	EOP-02	OP-401
AP-660	EOP-06	OP-501
	EOP-13	OP-603
	EOP-14	OP-607

Target Quantitative Attributes – Scenario 2	Actual Attributes
1. Total Malfunctions (5-8)	7
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal Events (2-4)	2
4. Major Transients (1-2)	1
5. EOPs entered requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical Task (2-3)	3

Examination Setup/Execution
Scenario 2

Scenario Setup

1. [ ] Initialize the simulator to IC# 21 (GF or 11 on FAT) and UNFREEZE the simulator
2. [ ] In the "NRCEXAM " directory of LESSON PLAN, start lesson plan #2
3. [ ] Trigger Lesson Plan Steps #1 and #2
4. Place the following Red Tags on the main control panel:
   a. [ ] DHP-1A, Red Tag
   b. [ ] RWP-2A, Red Tag, Pull-to-Lock
   c. [ ] EFP-3, Red Tag, Pull-to-Lock
   d. [ ] WTP-6B, Red Tag, Pull-to-Lock
   e. [ ] ARP-1B, Red Tag, Pull-to-Lock
   f. [ ] RM-G27, Red Tag
5. Perform the following setup actions:
   a. [ ] Ensure PPC group 59 on the right overhead CRT and group 108 on left overhead CRT
   b. [ ] Ensure SPDS left screen selected to normal and right screen to imbalance
   c. [ ] Ensure Batch Controller reset
   d. [ ] Ensure steam line monitor reset
   e. [ ] Ensure PPC/ANN alarms acknowledged
   f. [ ] Ensure status board indicates P → S 3 GPD (B)
   g. [ ] Reduce CFT-1B pressure to 570 – 575 psig (CFV-15 and CFV-29).
   h. [ ] Set MUT level to 80 inches and clear high pressure alarm by venting.
6. Ensure clean copies of the following "consumable" procedures are available.
   a. [ ] AP-510
   b. [ ] AP-660
   c. [ ] EOP-02
   d. [ ] EOP-06
   e. [ ] EOP-14
   f. [ ] OP-401
   g. [ ] OP-501
   h. [ ] OP-603
   i. [} OP-607
7. Advance all MCB recorders and delete alarm summary on computer station.
8. FREEZE the simulator and notify the lead examiner that simulator is ready to begin.

Scenario Execute

1. When notified by the lead examiner UNFREEZE the simulator
2. When notified by the lead examiner TRIGGER LESSON PLAN step #5 (Thot failure)
3. When notified by the lead examiner TRIGGER LESSON PLAN step #6 (Condensate pump mag coupling)
4. When notified by the lead examiner TRIGGER LESSON PLAN step #7 (Vacuum leak). Pre-setup a pending file with bearing friction at 0.5 for each of the Main Feedwater Pumps as well as Main Feedwater Pump trip for each of the Main Feedwater Pumps. TRIGGER one of the pumps bearing friction at 48% and the other at 41%. The Main Feedwater Pump trips will only be used if required to speed scenario along.
5. When crew starts power decrease for vacuum leak TRIGGER LESSON PLAN step #11 (ULD fails)
6. When crew reaches < 45% and prior to tripping the turbine, TRIGGER LESSON PLAN step #8 (Turbine trip p/b does not work)
7. When the reactor is tripped TRIGGER LESSON PLAN step #9 (OTSG leak)
8. After the reactor is tripped and when step 3.3 in EOP-02 is reached TRIGGER LESSON PLAN step #10 (EFP-2 trip) and step #9 (OTSG leak; should be started right before EFP failure)

Booth Operator actions (Not included, standard call Chemistry, call HPs, etc.)

1. Play role of SPO and PPO for nitrogen addition.
2. SPO calls control room about CDP-1A noise.
3. SPO calls control room about noise at "A" MFWP exhaust.
4. When control room asks about local vacuum readings, respond what vacuum is and say it is decreasing (1 minute)
5. When reactor power is < 45%, increase the size of the vacuum leak to quickly establish condenser vacuum > 5.5" absolute.
6. Call to SPO to complete Enclosure 1 of EOP-14, enter "encl".
   (Do NOT perform this enclosure until the crew has determined that NO Main Feedwater flow exists).
7. When HP is called, respond that "A" MS lines read 15-20 mR. (5 minutes).
8. Call to PPO to complete Enclosure 2 of EOP-14, enter "enc2", if required.
9. If called as SPO to trip the main turbine locally, wait 2 minutes and report the trip lever will not move to the trip position.;

TURNOVER SHEET

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover:

A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's air compressor. They will notify the control room when maintenance is complete.

DHP-1A, RWP-2A and EFP-3 are OOS for pump packing/seal adjustment.

WTP-6B is OOS for motor/pump alignment.

ARP-1B is OOS for routine motor maintenance.

The intake screen wash system is OOS due to mechanical damage from an intake crane accident.

OTSG "B" has a 3 GPD primary to secondary leak.

RM-G27 is OOS for repair.

CFT-1B sample line valve misalignment has caused reduced pressure in the "B" CFT. The valve alignment has been corrected and the pressure decrease has stopped. No further actions have been taken.

ITS Action Items:

3.5.3, Condition "A" for DHP-1A.
3.7.9, Condition "A" for RWP-1A.
3.7.5, Condition "B" for EFP-3.

Activities to be Performed this Shift:

Evaluate "B" CFT low pressure and recover to normal operating parameters.

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

Event Description: A valid "B" core flood tank low pressure condition exists. The SRO enters ITS 3.5.1 and directs the BOP to restore pressure. The BOP restores the core flood tank pressure. (AR-305, OP-401)

Time	Position	Applicant's Actions or Behavior
	SRO	Enter ITS 3.5.1, condition B, for "B" CFT pressure. Directs BOP to add nitrogen to CFT-1B using OP-401 Exits ITS 3.5.1 when CFT pressure has been restored.
	BOP	Raises pressure of CFT-1B using OP-401 section 4.4 - Directs SPO to align for nitrogen addition - Cycles CFV-27 to raise CFT-1B pressure - Directs SPO to secure nitrogen addition

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

Event Description: Selected "A" Thot , RC-4A-TE1, fails high (**MALF**). The OAC diagnoses the failure and stabilizes the plant then transfers to a good channel. (AR-503, OP-501)

Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses RC-4A-TE1 failure - SASS mismatch alarm (K-3-2 alarms) - Reactor power decreasing - Tave increasing - RC-4A-TE1 indication
	SRO	Directs OAC to stabilize plant by taking required ICS stations to manual/hand
	OAC	Stabilizes the plant (no order required) - Selects Reactor diamond to manual (in Track, K-6-2 alarms, with first ICS station in hand/manual) - Selects Reactor Bailey to hand - Selects both Feedwater Loops to hand - Adjusts stations for stable plant operation
	SRO	Directs OAC to transfer RC Th "A" loop feed to ICS per OP-501
	OAC	Executes actions to select alternate RC Th "A" loop signal to ICS using OP-501 section 4.7 - Determine proper operating channel - Selects RC Th "A" loop to TT4
	SRO	Directs OAC to return ICS stations to automatic and return to full power
	OAC	Returns ICS to automatic (no order required) - Selects both Feedwater Loops to automatic - Selects Reactor Bailey to automatic - Selects Reactor diamond to automatic (K-6-2 clears) Starts power increase - Raises ULD demand

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

Event Description: CDP-1A magnetic coupling fails (**MALF**). The crew reduces power to a level within the capability of one CDP (approximately 60%). (AR-602, OP-603, AP-510)

Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnoses CDP-1A magnetic coupling failure - Magnetic coupling alarm (N-2-2) - Condensate flow lowering.
	SRO	Enters AP-510, Rapid Power Reduction, and directs OAC to - Adjust ICS load rate to desired setpoint - Adjust Unit Load Master Demand to 10 (required power level approximately 60%) - Maintain imbalance Directs BOP to reduce power to - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level $\geq$ 55 inches - Notify SPO to ensure proper operation of ASV-27
	OAC	Performs AP-510 - Adjusts ICS load rate to desired setpoint - Adjusts Unit Load Master Demand to 10 (required power level approximately 60% - Maintains imbalance
	BOP	Performs AP-510 - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level $\geq$ 55 inches - Notify SPO to ensure proper operation of ASV-27
	SRO	At 60% power directs OAC to stop power reduction. Directs BOP to shutdown CDP-1A
	OAC	Stops power reduction - Selects Steam Generator master to hand (track) - Selects Steam Generator master to auto (track clear)
	BOP	Stops CDP-1A

Op-Test No.: 1 Scenario No.: 2 Event No.: 4 Event Description: The turbine building operator reports a hissing sound near the main feedwater pump exhaust lines. The crew notices a loss of condenser vacuum **(MALF)**. (OP-607)		
Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnoses condenser vacuum lowering - SPO reports hissing sound in turbine building - Condenser vacuum indications
	SRO	Enter OP-607 section 4.5 - Reviews condenser vacuum limits with operators - Re-enters AP-510 for power reduction to < 45% (below turbine anticipatory trip)

Op-Test No.: 1 Scenario No.: 2 Event No.: 5		
Event Description: As the crew reduces power to < 45% to trip the turbine (degrading vacuum), the ULD fails to respond to operator input (ULD failure) (**MALF**). The OAC reduces power using manual ICS control. (AP-510)		

Time	Position	Applicant's Actions or Behavior
	SRO	Enters AP-510, Rapid Power Reduction, and directs OAC to - Adjust ICS load rate to desired setpoint - Adjust Unit Load Master Demand to 10 (required power level approximately < 45% - below turbine anticipatory trip setpoint) - Maintain imbalance Directs BOP to reduce power to - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level ≥ 55 inches - Notify SPO to ensure proper operation of ASV-27 - Maintain deaerator level - Ensure FW block valves stay closed
	OAC	Performs AP-510 - Adjusts ICS load rate to desired setpoint - Adjusts Unit Load Master Demand to 10 (required power level approximately < 45% - below turbine anticipatory trip setpoint) Diagnoses ULD failure to respond; continues power reduction with Steam Generator master in hand - Selects hand on Steam Generator master (track alarm) - Lowers Steam Generator master demand
	BOP	Performs AP-510 - Notifies plant personnel of AP-510 entry - Notifies chemistry of power change - Maintains MUT level ≥ 55 inches - Notifies SPO to ensure proper operation of ASV-27 - Maintains deaerator level - Ensures FW block valves stay closed • Selects FWV-29 and FWV-30 to closed • Selects FWV-29 and FWV-30 toggle to manual

Op-Test No.: 1 Scenario No.: 2 Event No.: 6
Event Description: Once the crew is < 45% the OAC discovers the turbine trip pushbutton does not function (**MALF**), performs the remedial actions for AP-660 and enters EOP-02 (**CT**). (AP-660, EOP-02)

Time	Position	Applicant's Actions or Behavior
	SRO	At < 45% enters AP-660, Turbine Trip, and directs the OAC (BOP) to trip the turbine
	OAC	Performs AP-660 - Depresses turbine trip push button Discovers turbine trip push button does not function. TVs and GVs do not close; performs remedial actions - Closes MSV-411, MSV-412, MSV-413, MSV-414 - Depresses reactor trip push button Performs immediate action of EOP-02, Vital System Status Verification - Depresses reactor trip push button - Verifies CRD groups 1 through 7 are fully inserted. - Verifies NIs indicate reactor is shutdown - Depresses turbine trip push button - Verifies TVs and GVs are closed
	SRO	Enters EOP-2 directs OAC to - Repeat immediate actions - Scan for symptoms - Verify all control rods are fully inserted - Verify MFW flow exists Directs BOP to - Scan for symptoms - Notify SPO to complete enclosure 1 of EOP-14
	OAC	Performs EOP-2 - Repeats immediate actions - Scans for symptoms - Verifies all control rods are fully inserted (all in-limit lights are on) - Discovers MFW is not operating (MSIV's closed) and EFW is not operating

Op-Test No.: 1 Scenario No.: 2 Event No.: 6

Event Description: Once the crew is < 45% the OAC discovers the turbine trip pushbutton does not function (**MALF**), performs the remedial actions for AP-660 and enters EOP-02 (**CT**). (AP-660, EOP-02)

Time	Position	Applicant's Actions or Behavior
	BOP	Performs EOP-2 - Scans for symptoms - Notifies SPO to complete enclosure 1 of EOP-14
	SRO	Directs OAC (BOP) to perform enclosure 7 of EOP-14 when OAC reports MFW and EFW are not operating. - SEE EVENT #7
	SRO	Continues in EOP-2 (until OTSG tube leak is diagnosed) directs OAC to - Verify MFW flow is not excessive - Ensure OTSG trending toward low level limits - Adjust MUV-31 to 100 inches - Verify pressurizer level is $\geq$ 50 inches Directs BOP to maintain pressurizer level - Close MUV-49 - Open MUV-24 - Ensure MUV-73 and MUV-58 open - If pressurizer does not recover start second MUP, required cooling pumps, and open additional HPI valves
	OAC	Performs EOP-2 - Verifies MFW flow is not excessive - Ensures OTSG trending toward low level limits (SEE EVENT #7) - Adjusts MUV-31 to 100 inches - Verifies pressurizer level is $\geq$ 50 inches

Op-Test No.: 1 Scenario No.: 2 Event No.: 6 Event Description: Once the crew is < 45% the OAC discovers the turbine trip pushbutton does not function (**MALF**), performs the remedial actions for AP-660 and enters EOP-02 (**CT**). (AP-660, EOP-02)		
Time	Position	Applicant's Actions or Behavior
	BOP	Performs EOP-2 - Closes MUV-49 - Open MUV-24 - Ensure MUV-73 and MUV-58 open - Continues to fill pressurizer and (may) • Starts second MUP • Starts required cooling pumps • Opens additional HPI valves (MUV-23, MUV-25 and MUV-26)

Op-Test No.: 1 Scenario No.: 2 Event No.: 7

Event Description: Emergency feedwater pump, EFP-2, will trip during EOP-2 follow-up actions **(MALF)**. OAC will start EFP-1 **(CT)**. (EOP-02, EOP-14 Enclosure 7)

Time	Position	Applicant's Actions or Behavior
	OAC (BOP)	Performs enclosure 7 of EOP-14 - Verifies EFP-3 is not running - Verifies EFP-2 is not running - Verifies EDG-1A is not supplying the ES "A" 4160V bus - Verifies EFP-1 is available - Ensures EFP-1 is running • Depresses manual permissive push buttons on EFIC channels "A" and "B" • Ensures EFV-58 and EFV-57 are closed • Ensures EFV-14 and EFV-33 are open • Ensures EFP-3 is in pull-to-lock • Starts EFP-1 - Establish EFW flow to OTSG • Throttles open EFW-58 and EFV-57 (rule 3 EOP-13)

Op-Test No.: 1 Scenario No.: 2 Event No.: 8
Event Description: Following the reactor trip, "A" OTSG develops a 350 gpm tube leak **(MALF)** while the condenser continues to lose vacuum. The crew will diagnose a SGTR without the aid of normal radiation monitoring equipment **(CT)**. (AP-520, EOP-06)

Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnose "A" OTSG tube leak - Decreasing pressurizer level - Decreasing makeup tank (MUT) level - Rising "A" OTSG level - Differential EFW flow to the OTSGs - "A" side MSSVs opening - OAC controlling cooldown while reducing EFW flow
	SRO	Transitions to EOP-6, Steam Generator Tube Rupture, and directs OAC to - Close MSV-55 - Verify MSSVs closed - Verify at least 1 RCP is running. - Select all pressurizer heaters to off Directs BOP to - Continue actions to recover pressurizer level - Notify plant personnel - Maintain MUT level $\geq$ 55 inches - Complete enclosure 10 of EOP-14
	OAC	Performs EOP-6 - Closes MSV-55 - Verifies MSSVs not closed. May attempt to reseat. • Open ADV-25 to lower pressure - Verify at least 1 RCP is running. - Select all pressurizer heaters to off

Op-Test No.: 1 Scenario No.: 2 Event No.: 8

Event Description: Following the reactor trip, "A" OTSG develops a 350 gpm tube leak (**MALF**) while the condenser continues to lose vacuum. The crew will diagnose a SGTR without the aid of normal radiation monitoring equipment (**CT**). (AP-520, EOP-06)

Time	Position	Applicant's Actions or Behavior
	BOP	Performs EOP-6 - Continues actions to recover pressurizer level • SEE EVENT #6 • Closes MUV-53 and MUV-257 - Notify plant personnel - Maintain MUT level $\geq$ 55 inches - Complete enclosure 10 of EOP-14 • Ensures MUV-31 setpoint is 100 inches • Verifies one SWP running • Ensures one SW Raw Water pump is running • Ensures breakers 1661 and 1662 are open • Separates CR-3 from the grid by opening the field breaker and selecting the voltage regulator to off

Examination Setup/Execution
Scenario 3

Scenario Setup

1. [ ] Initialize the simulator to IC# 21 (GF or 11 on FAT) and UNFREEZE the simulator
2. [ ] In the "NRCEXAM " directory of LESSON PLAN, start lesson plan #3
3. [ ] Trigger Lesson Plan Steps #1 and #2
4. Place the following Red Tags on the main control panel:
   a. [ ] DHP-1A, Red Tag
   b. [ ] RWP-2A, Red Tag, Pull-to-Lock
   c. [ ] EFP-3, Red Tag, Pull-to-Lock
   d. [ ] WTP-6B, Red Tag, Pull-to-Lock
   e. [ ] ARP-1B, Red Tag, Pull-to-Lock
   f. [ ] RM-G27, Red Tag
5. Perform the following setup actions:
   a. [ ] Ensure PPC group 59 on the right overhead CRT and group 108 on left overhead CRT
   b. [ ] Ensure SPDS left screen selected to normal and right screen to imbalance
   c. [ ] Ensure Batch Controller reset
   d. [ ] Ensure steam line monitor reset
   e. [ ] Ensure PPC/ANN alarms acknowledged
   f. [ ] Ensure status board indicates P → S 3 GPD (B)
   g. [ ] Provide signed-off copy (up to shutdown) of SP-354A (fast start)
   h. [ ] Ensure event point 1206, alarm B-8-3 and local EDG alarms clear
   i. [ ] Ensure EGDG-1A is running at approximately 2700 KW and ± 1.5 megavars
   j. [ ] Place EGDG-1A EDGA EXC VOLT ADJ SELECT switch is selected to CONT RM
   h. [ ] Set MUT level to 80 inches and clear high pressure alarm by venting.
6. Ensure clean copies of the following "consumable" procedures are available.
   a. [ ] AP-510
   b. [ ] AP-660
   c. [ ] EOP-02
   d. [ ] EOP-06
   e. [ ] EOP-14
   f. [ ] OP-401
   g. [ ] OP-501
   h. [ ] OP-603
   i. [} OP-607

7. Advance all MCB recorders and delete alarm summary on computer station.
8. FREEZE the simulator and notify the lead examiner that simulator is ready to begin.

Scenario Execute

1. When notified by the lead examiner UNFREEZE the simulator
2. When notified by the lead examiner TRIGGER LESSON PLAN step #3 (Selected RCS Narrow Range Pressure fail high)
3. When notified by the lead examiner TRIGGER LESSON PLAN step #4 (FWP-2B high vibration)
4. When notified by the lead examiner TRIGGER LESSON PLANT step #5 (FWP-2B trip on vibration with no runback)
5. When ICS is taken to track to perform the runback, delete the malfunction blocking the ICS runback. (This permits eventual return to automatic control on the ICS).
6. When notified by the lead examiner TRIGGER LESSON PLAN step #6 (neutron error fails high)
7. When lesson plan step #5 is active TRIGGER LESSON PLAN step #7 (EDG restore) or called by RO
8. When notified by the lead examiner TRIGGER LESSON PLAN step #8 (3211 trips)
9. When lesson plan step #8 is active TRIGGER LESSON PLAN step #10 (MFWI fails)
10. When MUP restored TRIGGER LESSON PLAN step #9 (steam leak 0.03)

Booth Operator actions (Not included, standard call Chemistry, call HPs, etc.)

1. To assist with EDG shutdown, review SP-354, steps 4.6.21 through 4.6.32. Report engine hours as 32.8, fuel oil pressure as 28 psig, and be prepared to reset local EDG alarms.
2. Associated with Scenario Execute step #3, the SPO will be asked to check FWP-2B vibration instrumentation. The SPO responds after 1 minute that FWP-2B is in the danger region (6 mils and slowly increasing) on all vibration instrumentation.
3. The fuel rack to EDG-1A will be tripped by the PPO.
4. When notified, take EFIC MFLI isolation key switches "both to both" (delay of approximately 3 minutes).
5. As PPO support MUP-1A startup with selection for ES start; and breaker manipulation for MUV-69 and MUV-62

TURNOVER SHEET

Initial Conditions: The plant is at 100% full power with full ICS auto control.

Turnover:

A line crew is in the CR-3 switchyard performing routine maintenance on output breaker 1661's compressor. They will notify the control room when maintenance is complete.

DHP-1A, RWP-2A and EFP-3 are OOS for pump packing/seal adjustment.

WTP-6B is OOS for motor/pump alignment.

ARP-1B is OOS for routine motor maintenance.

The intake screen wash system is OOS due to mechanical damage from an intake crane accident.

OTSG "B" has a 3 GPD primary to secondary leak.

RM-G27 is OOS for repair.

ITS Action Items:

3.5.3, Condition "A" for DHP-1A.
3.7.9, Condition "A" for RWP-1A.
3.7.5, Condition "B" for EFP-3.
3.8.1, Condition "B" for EGDG-1A.

Activities to be Performed this Shift:

The "A" Diesel Generator (EGDG-1A) has been running for 4 hours (SP-354A) and is ready to be shutdown.

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

Event Description: Shutdown EGDG-1A following its monthly functional test. (SP-354A).

Time	Position	Applicant's Actions or Behavior
	SRO	Directs BOP to complete SP-354A
	BOP	Perform SP-354A section 4.6 - Reduces EGDG-1A load to approximately 3 to 5 minutes - Reduces EGDG-1A 200 KW - Opens breaker 3209 - Directs SPO to perform steps 4.6.4 and 4.6.5 - Adjusts engine speed to within 59.7 Hz and 60.3 Hz - Selects EGDG-1A manual voltage control to MAN - Exercises EDG A MANUAL VOLTAGE ADJUST rheostat - Selects EGDG-1A manual voltage control to AUTO - Selects EDG A VOLT ADJ SELECT to DG RM (DIESEL GEN A VOLTAGE ADJ IN CONTROL RM clears) - Directs SPO to perform step 4.6.13 - Depresses EGDG-1A stop pushbutton - Notifies Chemistry to sample coolant - Ensures high lamp is on - Verifies AHF-22A and/or AHF-22B are shutdown and not in pull-to-lock - Resets time-to-start timer - Records 33 ft. temperature - Directs SPO to complete SP-354A starting with step 4.6.21

Op-Test No.: 1 Scenario No.: 3 Event No.: 2
Event Description: Selected narrow range RC pressure, RC-3B-PT1, fails high (gradual failure) (**MALF**). The OAC takes manual control of pressurizer heaters, spray and PORV. The BOP transfers to good channel. (OP-501)

Time	Position	Applicant's Actions or Behavior
	OAC	Diagnoses RC-3B-PT1 failure - SASS mismatch alarm (K-3-2 alarms) - Pressurizer heater demand lowering - Spray valve open in automatic - PORV open indication (alarm and ultrasonic) - "B" loop RC pressure recorders show increasing trend
	SRO	Directs OAC to stabilize plant by taking required RC pressure controls to manual
	OAC	Stabilizes the plant (no order required) - Selects pressurizer spray valve to manual and close (may close block valve) - Selects PORV to close (may close block valve) - Takes pressurizer heater control to hand - Adjusts pressurizer heater demand for stable plant operation
	SRO	Directs BOP to transfer RC pressure feed to NNI to "A" loop per OP-501
	BOP	Executes the actions to select alternate RC narrow range pressure signal to NNI using OP-501, section 4.7. - Determines proper operating channel - Selects controlling signal to "A" loop
	SRO	Directs OAC to return RC pressure control to automatic.
	OAC	Returns RC pressure control to automatic (no order required) - Selects pressurizer spray valve to automatic (reopen block valve if closed) - Selects PORV to open (reopen block valve if closed). - Returns pressurizer heater demand station to automatic.

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

Event Description: The annunciator for "B" main feedwater pump high vibration alarms. The "B" main feedwater pump trips due to high vibration (**MALF**). No automatic runback occurs, the crew runs the plant back to 55%. (AP-510 AP-545)

Time	Position	Applicant's Actions or Behavior
	OAC BOP	Diagnoses FWP-2B vibration problems - FWP-2B vibration alarm (L-2-2) - Report from SPO (once notified by control room to monitor FWP-2B vibration)
	SRO	Enters AP-510, Rapid Power Reduction, and directs OAC to - Adjust ICS load rate to desired setpoint - Adjust Unit Load Master Demand to 10 (required power level approximately 55%) - Maintain imbalance Directs BOP to reduce power to - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level $\geq$ 55 inches - Notify SPO to ensure proper operation of ASV-27
	OAC	Performs AP-510 - Adjusts ICS load rate to desired setpoint - Adjusts Unit Load Master Demand to 10 (required power level approximately 55%) - Maintains imbalance
	BOP	Performs AP-510 - Notify plant personnel - Notify chemistry of 15% power changes - Maintain MUT level $\geq$ 55 inches - Notify SPO to ensure proper operation of ASV-27
	OAC	Prior to 55% FWP-2B trips; OAC diagnoses no runback present - ULD meter indication - Rod motion (initially insert but later pull) - Feedwater flow - Neutron error demanding rod withdrawal while > runback limit. - Other ICS stations meter indication.

Op-Test No.: 1 Scenario No.: 3 Event No.: 3 Event Description: The annunciator for "B" main feedwater pump high vibration alarms. The "B" main feedwater pump trips due to high vibration (**MALF**). No automatic runback occurs, the crew runs the plant back to 55%. (AP-510 AP-545)

Time	Position	Applicant's Actions or Behavior
	SRO	Enters AP-545 and directs the OAC to - Ensure the plant is running back - Ensure feedwater valve positions Directs the BOP to - Notify plant personnel - Ensure RCS pressure is stable - Notify PPO to select FWV-28 to both
	OAC	Performs AP-545 - Runs plant back in manual using steam generator master - Ensures FWV-28 open - Ensures FWV-29 and FWV-30 closed
	BOP	Performs AP-545 - Notifies plant personnel - Ensures RCS pressure is stable using pressurizer spray and heaters - Notifies PPO to select FWV-28 to both
	SRO	Following runback, directs OAC to place ICS station(s) back in automatic.
	OAC	Places ICS station(s) back in automatic. - Checks MEAS-VAR - Adjusts station(s) as required - Places station(s) in auto

Op-Test No.: 1 Scenario No.: 3 Event No.: 4
Event Description: Neutron error fails high, IC-25-NEI (**MALF**). The OAC diagnoses the failure and takes manual control of both feedwater and the reactor to stabilize the plant. (OP-504)

Time	Position	Applicant's Actions or Behavior
	OAC SRO	Diagnose IC-25-NEI failure - Control rods inserting - Feedwater flow increasing
	SRO	Direct OAC to stop plant movement and stabilize the plant
	OAC	Stops plant movement - Places reactor diamond and master in hand - Place feedwater loop masters in hand - Adjusts ICS stations as required to stabilize the plant

Op-Test No.: 1 Scenario No.: 3 Event No.: 5 Event Description: Shortly after the Primary Plant Operator trips EDG-1A's fuel rack (post run action) breaker 3211 trips (**MALF**). Makeup is reestablished. (AP-770)		
Time	Position	Applicant's Actions or Behavior
	SRO BOP	Diagnose the loss of power to the "A" 4160V ES bus - Voltage indication - Loss of some lighting - Loss of "A" side ES equipment
	SRO	Enters AP-770 and directs the BOP to - Make plant notifications - Verify letdown flow - Verify 1 SW pump is running - Verify 1 SW RW pump is running - Verify 1 MU pump running; if not concurrently perform enclosure 3 of AP-770
	BOP	Performs AP-770 - Makes plant notifications - Verifies letdown flow - Verifies 1 SW pump is running - Verifies 1 SW RW pump is running - Verifies 1 MU pump running; if not concurrently perform enclosure 3 of AP-770 Performs enclosure 3 of AP-770 - Closes MUV-16 and MUV-31 - Starts DCP-1B and RWP-3B - Verifies MUV-53 and MUV-257 are open - Starts MUP-2C; ensures MUP-3C is in normal after stop; starts MUP-4C; ensure MUP-5C in auto - Ensure MUP-1A, MUP-1B and MUP-1C are in normal after stop - Notify PPO to ES select MUP-1A - Notify PPO to energize MUV-69 and MUV-62 - Close MUV-69 and MUV-58 - Open MUV-62 and MUV-73 - Start MUP-1C

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

Event Description: An unisolable steam leak develops in the reactor building on the "B" OTSG. Reactor does not trip on reactor building pressure (only one channel of RPS trips, AR-502) **(MALF)**. OAC must trip the reactor **(CT)**. (EOP-02)

Time	Position	Applicant's Actions or Behavior
	BOP OAC SRO	Diagnoses steam leak in reactor building - Reactor building pressure - 4 psig ES actuation (RB isolation)
	OAC	Diagnoses ATWAS and trips reactor - Depresses reactor trip pushbutton - Performs immediate actions of EOP-2 • Depresses reactor trip push button • Verifies CRD groups 1 through 7 are fully inserted. • Verifies NIs indicate reactor is shutdown • Depresses turbine trip push button • Verifies TVs and GVs are closed
	SRO	Enters EOP-2 directs OAC to - Repeat immediate actions - Scan for symptoms Directs BOP to - Ensure proper ES actuation - Scan for symptoms
	OAC	Performs EOP-2 - Repeats immediate actions - Scans for symptoms - Determines steam leak on "B" OTSG (see event 7)
	BOP	Performs EOP-2 - Ensures proper ES actuation - Scans for symptoms; backup for OAC

Op-Test No.: 1 Scenario No.: 3 Event No.: 7
Event Description: Once the "B" OTSG is determined to be the generator with the leak the BOP is directed to isolate the generator. The MFWI does not actuate in manual or automatic (**MALF**). The BOP performs the isolation by manually closing the appropriate valves (**CT**). (EOP-05)

Time	Position	Applicant's Actions or Behavior
	SRO	Enters EOP-5, Excessive Heat Transfer and directs OAC to - Isolate affected OTSG
	OAC	Performs EOP-5 - Isolates "B" OTSG • Depresses MAIN STM ISOLATION push buttons on EFIC channels A and B for "B" OTSG • Depresses MAIN FEED ISOLATION push buttons on EFIC channels A and B for "B" OTSG and determines no isolation ✓ Closes FWV-32 ✓ Places FWV-29 toggle in MAN ✓ Closes FWV-29 ✓ Closes FWV-33 ✓ Closes FWV-28 ✓ Closes FWV-15 ✓ Trips FWP 2A • Closes MSV-56 • Ensures MSV-25 and MSV-26 closed

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

Event Description: Once the "B" OTSG is determined to be the generator with the leak the BOP is directed to isolate the generator. The MFWI does not actuate in manual or automatic **(MALF)**. The BOP performs the isolation by manually closing the appropriate valves **(CT)**. (EOP-05)

Time	Position	Applicant's Actions or Behavior
	SRO	Continues direction of EOP-05 having the OAC - Close EFV-57 and EFV-55 - Ensure proper MSLI and MFWI • Ensure closed MSV-413 and MSV-414 • Ensure closed MWV-32, FWV-29, FWV-33, FWV-28, FWV-15 and FWV-29 toggle in MAN • Ensure FWP-2B and FWP-2A tripped Directing the BOP to - Ensure closed MSV-130 and MSV-148 - If pressurizer level falls below 50 inches • Close MUV-49 • Open MUV-24 • Open MUV-73 and MUV-58 • If needed start second MUP and associated cooling water pumps and open MUV-23, MUV-25, and MUV-26 as needed. • If needed close MUV-53 and MUV-257
	OAC	Performs EOP-05 - Close EFV-57 and EFV-55 - Ensure proper MSLI and MFWI • Ensure closed MSV-413 and MSV-414 • Ensure closed MWV-32, FWV-29, FWV-33, FWV-28, FWV-15 and FWV-29 toggle in MAN • Ensure FWP-2B and FWP-2A tripped

Op-Test No.: 1 Scenario No.: 3 Event No.: 7
Event Description: Once the "B" OTSG is determined to be the generator with the leak the BOP is directed to isolate the generator. The MFWI does not actuate in manual or automatic **(MALF)**. The BOP performs the isolation by manually closing the appropriate valves **(CT)**. (EOP-05)

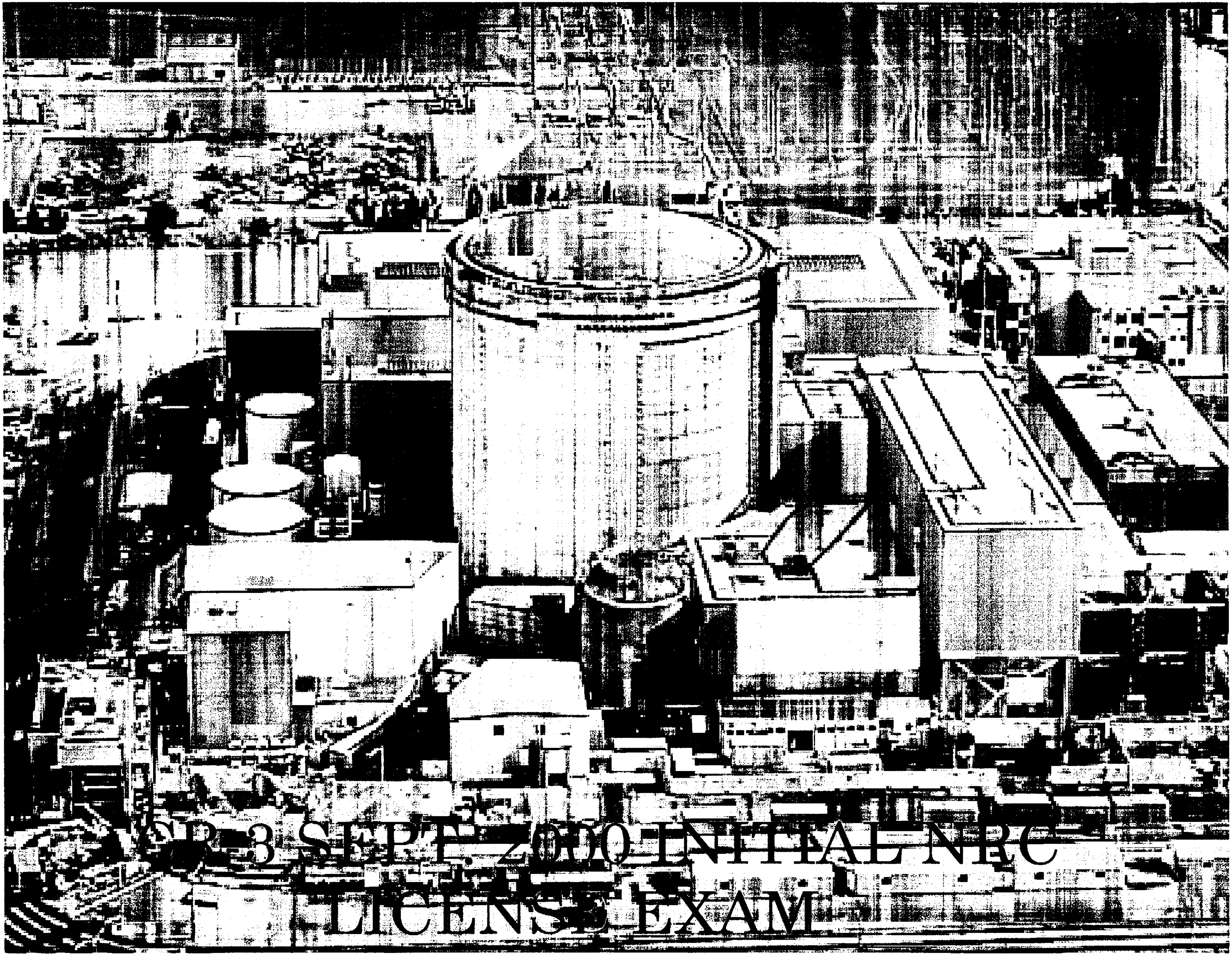
Time	Position	Applicant's Actions or Behavior
	BOP	Performs EOP-5 - Ensure closed MSV-130 and MSV-148 - If pressurizer level falls below 50 inches • Close MUV-49 • Open MUV-24 • Open MUV-73 and MUV-58 • If needed start second MUP and associated cooling water pumps and open MUV-23, MUV-25, and MUV-26 as needed. • If needed close MUV-53 and MUV-257

INITIAL SUBMITTAL

CRYSTAL RIVER 50-302/2000-301
SEPTEMBER 25 - 29, 2000

INITIAL SUBMITTAL JPMS

ADMINISTRATIVE JPMs/QUESTIONS
SIMULATOR JPMs
IN-PLANT JPMs


CR-3 SEPT. 2000 INITIAL NRC
LICENSE EXAM

Facility: Crystal River Unit 3 Exam Level: RO/SRO		Date of Examination: 09-25-2000 Operating Test No.: 1
Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Plant Parameter Verification	JPM - Perform a reactivity balance calculation/001A4.11/3.5/4.1
	Plant Parameter Verification	JPM – Perform a Reactor Coolant Boron Change Calculation/004A4.04/3.2/3.6
A.2	Surveillance Testing	JPM – Perform a Reactor Coolant System Inventory Balance /2.2.12/3.0/3.4
A.3	Radiation Hazards	JPM - Using survey maps determine radiation requirements and stay times/2.3.1/2.6/3.0*
A.4	SRO Emergency action levels and classifications	JPM – Determine Emergency Action Level and Complete the State of Florida Notification Message Form for Nuclear Power Plants/2.4.41/4.1
A.4	RO Emergency Communications	JPM – Notify State Warning Point Tallahassee with the State of Florida Notification Message Form for Nuclear Power Plants (faulted)/2.4.43/2.8

* Modification of last years A.3 JPM (identified as a Needs Improvement Area)

Facility: Crystal River Unit 3 Exam Level: RO/SRO(I)	Date of Examination: 09-25-2000 Operating Test No.: 1

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. Control Rod Drive (CRD)/Transfer Single Rod to Auxiliary Power Supply/001A4.03/4.0/3.7	D, S	1
b. AC. Electrical/Supply pressurizer heaters from the "B" ES 4160V Bus/062A2.05/2.9/3.3	N, S	6
c. Reactor Coolant (RCS)/Take Actions required for Loss of RCS Pressure/010A1.07/3.7/3.7 (does not result in a Rx trip)	A, D, S	3
d. Building Spray (BS)/Ensure BS actuation/026A3.01/4.3/4.5 (EOP-03)	A, D, S	5
e. Makeup and Purification System (MU)/ Re-establish letdown/004A4.05/3.6/3.1**	A, D, S	2
f. Decay Heat Removal (DH)/ Perform ECCS Suction Transfer/005A4.01/3.6/3.4**	D, L, S	4
g. Reactor Protection System (RPS)/Place RPS in Shutdown Bypass/012A4.03/3.6/3.6	S, N	7

B.2 Facility Walk-Through

a. Fire Service (FS)/Recirculation of FSP-1/086A4.01/3.3/3.3	N	8
b. Emergency Feedwater (EFW)/Placing EFP-2 in Standby/068AA1.02/4.3/4.5**	N	4
c. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.2	A, N, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

ES-301 Control Room Systems and Facility Walk-Through Test Outline Form ES-301-2

Facility: Crystal River Unit 3 Exam Level: SRO(U)	Date of Examination: 09-25-2000 Operating Test No.: 1

B.1 Control Room Systems

System/JPM Title/KA	Type Code*	Safety Function
a. AC. Electrical/Supply pressurizer heaters from the "B" ES 4160V Bus/062A2.05/2.9/3.3	N, S	6
b. Makeup and Purification System (MU)/ Re-establish letdown/004A4.05/3.6/3.1**	A, D, S	2
c. Reactor Protection System (RPS)/Place RPS in Shutdown Bypass/012A4.03/3.6/3.6	S, N	7

B.2 Facility Walk-Through

a. Fire Service (FS)/Recirculation of FSP-1/086A4.01/3.3/3.3	N	8
b. Waste Gas (WG)/Release a Waste Gas Decay Tank to Plant Ventilation/G2.3.11/2.7/3.3	A, N, R	9

*Type Codes: (D)irect, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA, **PRA High System Importance

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A1a, Perform a Reactivity Balance Calculation

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ __________

REVIEWED BY: ______________________________ Date/ __________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ __________
(Operations Representative)

APPROVED BY: ______________________________ Date/ __________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Perform a Reactivity Balance Calculation.

Alternate Path: N/A

JPM #: A1a (modified bank #253)

K/A Rating/Importance: 001A4.11/3.5/4.1 **Task Number/Position:** 1150202004/RO

Task Standard: Perform a reactivity balance calculation at < 15% power using SP-421.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant _____ Admin ___X__ Perform __X___ Simulate ______

References:
1. SP-421, Rev 50

Validation Time: 30 min. **Time Critical**: No

Candidate: ______________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. N/A

SIMULATOR OPERATOR INSTRUCTIONS:

1. N/A

Tools/Equipment/Procedures Needed:

1. SP-421
2. Calculator
3. OP-103C

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at 10% power.
Steady state power conditions ($\pm$ 1%) have been maintained for the last 30 minutes.
Core Burnup is 150 EFPD.
Rod Index is 245 %WD.
Group 8 is at 30.4 %WD
Boron Concentration is 1350 ppm.
Samarium is –0.73 %Δk/k
Per the Saxon, Xenon is –2.40 %Δk/k and is increasing.
Reactor Coolant average temperature is 555°F.

Initiating Cues:

You are requested to perform a reactivity balance (SP-421).

START TIME: __________

<table>
<tr><td>

<u>STEP 1</u>:

Obtain a copy of appropriate procedure.

<u>EXAMINER NOTE</u>: Provide candidate with a clean copy of SP-421 and OP-103C. Calculators will also be provided if the candidate does not have one.

<u>STANDARD:</u> N/A

<u>COMMENTS:</u>

</td><td>

SAT ____

UNSAT ___

</td></tr>
<tr><td>

<u>STEP 2</u>:

Candidate should complete SP-421 including Enclosure 2A.

<u>STANDARD:</u> Candidate completes SP-421. Candidate returns materials to you.

<u>EXAMINER NOTE</u>: See attached key for answers; each reactivity listed on Enclosure 2A should be within $\pm$ 0.05 %Δk/k.

<u>COMMENTS:</u>

</td><td>

Critical Step

SAT ____

UNSAT ___

</td></tr>
<tr><td>

END OF TASK

</td><td></td></tr>
</table>

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at 10% power.
Steady state power conditions ($\pm$ 1%) have been maintained for the last 30 minutes.
Core Burnup is 150 EFPD.
Rod Index is 245 %WD.
Group 8 is at 30.4 %WD
Boron Concentration is 1350 ppm.
Samarium is –0.73 %Δk/k
Per the Saxon, Xenon is –2.40 %Δk/k and is increasing.
Reactor Coolant average temperature is 555°F.

Initiating Cues:

You are requested to perform a reactivity balance (SP-421).

REACTIVITY BALANCE DURING POWER OPERATION (< 15% FP)

REFERENCE CONDITIONS: 532°F, 0% FP, No Xenon, CRG 1-8 at 100% wd, HFP Samarium.

1. Excess Fuel Reactivity
   a. Core Burnup = 150 EFPD
   b. Excess Fuel Reactivity from Curve 1 of OP-103C, Reactivity Worth Curves. + 13.4 % Δ k/

2. Boron Reactivity
   a. Boron Concentration 1350 ppmB
   b. Using core burnup from Step 1(a), find the HZP inverse boron worth from Curve 4 of OP-103C, Reactivity worth Curves 147 ppm/ % Δ k/k
   c. Divide Step 2(a) by the inverse boron worth in Step 2(b). 2(a)/2(b) = 1350 ppmB / 147 ppm/ % Δ k/k = - 9.18 % Δ k/

3. Xenon Reactivity
   a. Obtain Xenon reactivity from Saxon. (Submit printout.)
   b. IF Saxon is unavailable, THEN contact Reactor Engineering for a value. - 2.40 % Δ k/

4. RCS Temperature and Power Reactivity Deficit
   a. Average RC Temperature 555 °F
   b. Obtain temperature and power reactivity deficit from Curve 6 of OP-103C, Reactivity Worth Curves. - 0.34 % Δ k/

5. Control Rod Reactivity
   a. Reactivity worth of inserted regulating rods as read from Curve 8 or 8A of OP-103C, Reactivity Worth Curves: - 0.54 % Δ k/

      Rod Index 245 % WD

   b. Worth of inserted Group 8 rods at 30.4 % withdrawn from Curve 9 of OP-103C, Reactivity Worth Curves. - 0.16 % Δ k/

6. Samarium Reactivity
   a. Obtain Samarium reactivity from Saxon. (Submit printout.)
   b. IF Saxon is unavailable, THEN contact Reactor Engineering for a value. - 0.73 % Δ k/

7. Net Reactivity +0.05 % Δ k/
   a. Net reactivity is the sum of Steps 1 thru 6.
   b. Inform the Shift Supervisor of the results.

Acceptability

1. IF the absolute value of Step 7a is greater than 1.0% Δ k/k, THEN IMMEDIATELY go to Step 5.2.2.
2. IF the absolute value of Step 7a is greater than 0.3% Δ k/k, THEN go to Step 5.2.3.

Calculated By Signed Date/Time Date / Time

Checked By ______ Date/Time ______

COMPARISON OF OVERALL CORE REACTIVITY BALANCE TO PREDICTED VALUE

Date __________ Time __________ Core Age ______________EFPD's (based on 2544 MWth)

Reactivity Balance = ___________% Δ k/k (0 ± 1% Δ k/k required)

Computations are attached.

Computed By ______________________________

The following reactivity values were normalized ____

____

____

____

____

____

____

COMMENTS: ____

____

____

____

____

____

Reactor Engineer ____________________________________ Date: ____________________

Rev. 50

Effective Date 11/09/99

SURVEILLANCE PROCEDURE

SP-421

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTIVITY BALANCE CALCULATIONS

APPROVED BY: Procedure Owner

Mike Collins for Mike Culver
(SIGNATURE ON FILE)

DATE: 11/09/99

PROCEDURE OWNER: Reactor Engineer

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

ENCLOSURES		PAGE

1.0 PURPOSE

1.1 INTENT

1.1.1 This procedure is used for the following:

- To implement the Improved Technical Specification (ITS) Surveillance Requirements which are listed in Section 2.2.1 of this procedure
- To calculate shutdown margin in Modes 1, 2, 3, 4 & 5 (In particular, during startups and shutdowns and when reactivity anomalies occur, such as a stuck rod.)
- To determine how closely the plant's actual reactivity follows the predicted reactivity changes with burn-up
- To provide shutdown value calculations for the case of a single withdrawn rod group

1.2 CMIS EQUIPMENT

1.2.1 The following tags are listed in CMIS as being affected by this procedure:

None

2.0 REFERENCES

2.1 IMPLEMENTING REFERENCES

2.1.1 Improved Technical Specifications

2.1.2 SAXON (Plant Computer)

2.1.3 OP-103C, Cycle 11 Reactivity Worth Curves

2.1.4 OP-103D, Withdrawal Limit Curves

2.2 DEVELOPMENTAL REFERENCES

2.2.1 Improved Technical Specification References

Applicable ITS References	Surv. Perf. During Modes	LCO/Other Requirements During Modes	Surv. Freq.	Freq. Notes	Applicable Procedure Section
3.1.1.1	3,4,5	3,4,5	D	40	4.1
3.1.8.4	1	1	D	SP(3)	4.1
3.1.9.3	2	2	D	SP(3)	4.1
3.1.2.1	2	1,2	SP(2)	31	4.2 (4.3*)
3.1.2.1	1,2	1,2	SP(4)	SU+60	4.2 (4.3*)

SURVEILLANCE FREQUENCY:

S - At least once per 12 hours

D - At least once per 24 hours

M - At least once per 31 days

SP(2) - Startup after refueling

SP(4) - Every 31 EFPD (for the purposes of this procedure, every 31 days)

FREQUENCY NOTES:

31 - Prior to entering Mode 1

40 - Establish surveillance prior to ascension into applicable mode

SP(3) - During Physics Testing

SU+60 - Not required if fuel burnup is < 60 EFPD

APPLICABLE PROCEDURE SECTION:

* - The predicted reactivity values may be adjusted (normalized) per Section 4.3, to correspond to the measured core reactivity prior to exceeding a fuel burn up of 60 effective full power days (EFPD) after each fuel loading.

3.0 PERSONNEL INDOCTRINATION

3.1 SETPOINTS

None

3.2 DESCRIPTION

3.2.1 The shutdown margin shall be greater than or equal to the limit specified in the COLR. The minimum limit shall be ≥ 1.0% delta-k/k. (Verified every 24 hours in Modes 3, 4 and 5.) [ITS 3.1.1]

3.2.2 The measured core reactivity balance shall be within ± 1.0% delta-k/k of predicted values. (Verified prior to entering Mode 1 after each fuel loading and every 31 EFPD after the core reaches 60 EFPD, in Modes 1 and 2.) [ITS 3.1.2]

3.2.3 With one control rod inoperable, or not aligned to within 6.5%wd of its group average, or both; the shutdown margin must be verified within one hour. Enclosure 1A was written specifically for this one hour verification. It removes the need to immediately run a new SAXON printout without removing all credit for xenon. This enclosure allows the use of the pre-misaligned rod SAXON printout value for xenon as long as two restrictions are met:

- o the pre-misaligned rod SAXON printout accurately models the pre-misaligned power history and,
- o the maximum post-misaligned rod power level is less than or equal to the power used for that hour in the pre-misaligned rod SAXON printout.

These two restrictions assure the xenon value used in the calculation is less than or equal to the actual xenon value in the core.

3.2.4 The predicted reactivity values may be adjusted (normalized) to correspond to the actual core conditions prior to exceeding a fuel burnup of 60 EFPDs after each fuel loading.

3.2.5 Curve 10 of OP-103C, Fuel Reactivity Worth Versus Cycle Lifetime at HFP, includes Group 8 worth at the HFP nominal position. Since the plant is operated at, or near, this HFP nominal position during steady state operation, no additional compensation for Group 8 worth is required. If for some reason Group 8 is not near its HFP nominal position, the reactivity balance could be slightly in error. However, the group would not be significantly away from its HFP nominal position unless the plant was in a transient. Under transient conditions, additional error is injected into many of the curves. The maximum possible error induced would be the difference in worth between the HFP nominal position and 100% wd. Group 8 position in Step 5b of Enclosure 2 is recorded simply to assist Reactor Engineering in long term trending of reactivity parameters.

3.2.6 A rod that is inoperable but is fully inserted is considered operable for the purposes of shutdown margin or shutdown value calculations since it is performing its function of adding negative core reactivity. Therefore, for this case, use Curve 18 of OP-103C in Enclosures 1 and 1A.

3.2.7 A rod that is stuck only partially inserted or fully withdrawn is considered inoperable for the purposes of shutdown calculations and achieving actual shutdown. Therefore, for this case, use Curve 19 of OP-103C in Enclosures 1 and 1A.

3.2.8 Section 4.4 provides a shutdown value calculation (using Enclosure 4). Basically, the calculation takes the shutdown margin calculation which assumes the stuck rod is out and then, after verifying there are no stuck rods, increases the shutdown value by the worth of the stuck rod. Then, the worth of the rod bank to be withdrawn is subtracted.

- Step 7 of Enclosure 4 multiplies the Stuck Rod Worth (SRW) by 0.90 and Step 9 multiplies the Withdrawn Rod Group Worth by 1.10. In both cases this is to take into account the 10% uncertainty in rod worth. The SRW increases the shutdown value therefore decreasing its worth by 10% is conservative. The Withdrawn Worth decreases the shutdown value so an increase in its worth is conservative.

- Step 11 of Enclosure 4 compares the shutdown value calculated to -1.5% Δ k/k, not -1.0% Δ k/k. This is again for conservatism.

3.2.9 Section 6 of Enclosure 1 and Enclosure 1A exists to predict when the decay of xenon will result in a violation of shutdown margin requirements. Simply put, it accomplishes this in three simple steps:

a. Determines the difference between the existing shutdown margin and the minimum allowed shutdown margin (-1% Δ k/k).

b. Reduces the existing xenon reactivity by this difference. This provides the xenon reactivity at which minimum shutdown margin occurs.

c. Finds this calculated xenon value on the SAXON printout. This provides the time at which the shutdown margin requirement will be violated if no compensating steps are taken.

3.3 DEFINITIONS

3.3.1 S/D - Shutdown

3.3.2 ITS - Improved Technical Specifications

3.3.3 EFPD - Effective Full Power Days

3.3.4 FP - Full Power

3.3.5 NSS - Nuclear Shift Supervisor

3.3.6 ρ - Reactivity

3.3.7 Δ K/K - delta-k/k

3.3.8 HFP - Hot Full Power

3.3.9 wd - withdrawn

3.3.10 ppm - parts per million

3.3.11 RCS - Reactor Coolant System

3.4 RESPONSIBILITIES

3.4.1 Enclosures 1 and 1A, dealing with shutdown margin, and Enclosure 4, dealing with shutdown value, are intended to be performed by Nuclear Operators and Shift Technical Advisors.

3.4.2 Reactor Engineers may perform, verify or assist with the performance of any section of this procedure.

3.5 LIMITS AND PRECAUTIONS

3.5.1 Steady state power conditions (± 1% FP) shall be maintained while gathering data for the performance of this procedure.

3.5.2 Ensure that the algebraic signs and units for all reactivity component values are correct for the calculation in which they are being used.

3.5.3 When using previously printed out values of xenon and samarium from SAXON, ensure the input power history is correct.

3.5.4 Do not enter the red zone in the Control Room without permission from a control board operator or a Shift Supervisor.

3.5.5 The shutdown value calculations of Enclosure 4 are valid only for withdrawal of a maximum of one rod group at a time. All other rod groups must be inserted except group 8. Group 8 rods may be in any position but are preferred to be within ± 5% wd of the HFP nominal position of 30.4%wd (100%wd after 650 (+/-10) EFPD).

3.5.6 The shutdown value calculation of Section 4.4 is valid for moving rods only if RCS temperature is within ± 5°F of the temperature value used in the calculation. Otherwise, the calculation must be reperformed at the new RCS temperature prior to withdrawing rods.

3.6 ACCEPTANCE CRITERIA

3.6.1 The shutdown margin shall be greater than or equal to the limit specified in the COLR. The minimum limit shall be ≥ 1.0% delta-k/k. [ITS 3.1.1]

3.6.2 The measured core reactivity balance shall be within ± 1% delta-k/k of predicted values. [ITS 3.1.2]

3.6.3 The curves in OP-103C shall be normalized to actual core conditions, if required, prior to 60 EFPD. [ITS 3.1.2.1]

3.6.4 The shutdown value calculated for the case of a single withdrawn rod group (for groups 2 through 7) must be more negative than -1.5% delta k/k during modes 3 through 5. (Non-Technical Specification)

3.7 PREREQUISITES

3.7.1 Equipment

NOTE: Reactor Engineering determines equivalency for performing SAXON calculations.

3.7.1.1 Plant computer, or equivalent (when SAXON calculations are required) |

3.7.1.2 Four function calculator

3.7.2 Supplies

None

3.7.3 Personnel Requirements

3.7.3.1 Two people are required to complete each section of this procedure. One to perform the calculation and another to provide an independent verification.

3.7.3.2 Procedural assistance in performance or interpretation may be obtained from the Reactor Engineer.

3.7.3.3 The approximate time frame to complete the various sections are:

(a) 4.1 - Normal S/D Margin Calculation - 30 minutes

(b) 4.1 - S/D Margin with an inoperable rod - 40 minutes

(c) 4.2 - Reactivity Balance at Power - 30 minutes

(d) 4.3 - Comparison of Overall Core Reactivity Balance to Predicted Values - 30 minutes

(e) 4.4 - Shutdown Value Calculation for Single Rod Group Withdrawal - 50 minutes

3.7.3.4 All data taking and calculations may be performed in the Control Room.

3.7.4 Initial Conditions

3.7.4.1 Notify the NSS prior to the start of this procedure.

Initial / Date
Initial/Date

3.7.4.2 For the performance of Section 4.2, REACTIVITY BALANCE AT POWER, reactor power is stable ± 1% FP.

Initial / Date
Initial/Date

3.7.4.3 For the performance of Section 4.4, SHUTDOWN VALUE FOR SINGLE GROUP WITHDRAWAL, ensure the unit is in mode 3, 4, or 5.

N/A /
Initial/Date

3.7.4.4 The Limits and Precautions and the Personnel Indoctrination have been read and understood.

Initial/ Date
Initial/Date

3.7.5 Data Collection

3.7.5.1 As required by the section or enclosure being performed.

4.0 INSTRUCTIONS

4.1 SHUTDOWN MARGIN CALCULATIONS

NOTES: (1) A fully inserted dropped or stuck rod is not considered inoperable for shutdown margin calculations. For this case, Curve 18 of OP-103C is the appropriate curve for use in Enclosures 1 and 1A.

(2) A rod stuck only partially inserted or fully withdrawn is inoperable for the purposes of shutdown margin calculations. For this case, Curve 19 of OP-103C is the appropriate curve for use in Enclosures 1 and 1A.

NOTE: The shutdown margin must be greater than or equal to the limit specified in the COLR. The minimum limit shall be $\geq$ 1.0% Δ k/k. In other words, the value calculated in Step 5 of Enclosure 1 must be more negative than or equal to -1.0% Δ k/k.

4.1.1 Complete Enclosure 1, Shutdown Margin Calculation, for all shutdown margin calculations except the one hour misaligned rod shutdown margin verification.

4.1.2 Complete Enclosure 1A for a one hour misaligned rod shutdown margin calculation.
[ITS 3.1.4, ACTION A.2.1.1, C.1.1 and D.1.1 (one untrippable rod only) and ITS 3.1.5, ACTION A.2.1.1]

4.2 REACTIVITY BALANCE AT POWER

NOTE: In this calculation, the plant is assumed to be at equilibrium conditions. The reactivity effects of all the components are added together. The desired sum is "0" (when K = 1, ρ = 0). However, an acceptable value for ρ (Net) is 0% Δ k/k (+0.3% to -0.3%). The value of ρ (Net) SHALL be within 0% Δ k/k (+1.0% to -1.0%) per Improved Technical Specification 3.1.2.

4.2.1 Complete Enclosure 2 or 2A, depending on power level, for calculation.

4.3 COMPARISON OF OVERALL CORE REACTIVITY BALANCE TO PREDICTED VALUES

4.3.1 Calculate the reactivity balance using the method of Section 4.2 of this procedure. Record the computed value on Enclosure 3.

4.3.2 Forward Enclosure 3, with Enclosure 2 or 2A attached, to the Reactor Engineer.

NOTE: ITS 3.1.2.1 requires that adjustments to the predicted reactivity values to normalize them to the actual measured values be completed prior to exceeding a fuel burnup of 60 EFPD after each fuel loading.

4.3.3 The Reactor Engineer, or his designee, will document adjustments to the predicted reactivity values on Enclosure 3.

4.4 SHUTDOWN VALUE FOR SINGLE ROD GROUP WITHDRAWAL

****

CAUTION: This calculation is NOT valid for a rod stuck in a fully or partially withdrawn position.

IF there are any known or suspected stuck or inoperable rod(s),
THEN the calculation can still be valid provided that the stuck or inoperable rod(s) are stuck in the fully inserted position (and are therefore operable for shutdown purposes).

****

NOTE: This section may be used to calculate the shutdown value for no rods withdrawn, one rod group already withdrawn or to pre-determine the shutdown value before withdrawing a rod group. It was written specifically for pre-determining before withdrawal but can be adapted to the others.

Since this calculation is used to ensure K_{eff} <0.99 when exercising rods, conservatisms similar to those used in shutdown margin calculations are used. This includes a 10% conservatism on rod worths and preservation of the conservatisms inherent in Curve 18 of OP-103C.

4.4.1 Complete Enclosure 4, Shutdown Value Calculation for Single Rod Group Withdrawal.

4.4.2 IF the Enclosure 4 calculation is acceptable for the highest worth rod group,
THEN it need not be repeated for the other rod groups.

4.5 WITHDRAWAL OF A SINGLE CONTROL ROD

4.5.1 The shutdown margin calculation of Enclosure 1 assumes the maximum worth stuck rod is fully withdraw. Therefore, in modes 3, 4, and 5 any single control rod can be fully withdrawn provided that:

- The shutdown margin calculation of Enclosure 1 is more negative than -1.0% Δ k/k.
- All the rods in groups 1 through 7 are fully inserted except the rod to be withdrawn.

4.6 WITHDRAWAL OF SAFETY ROD GROUP 1

4.6.1 The shutdown margin calculation of Enclosure 1 assumes that rod group 1 or the maximum worth stuck rod, whichever is greater, is fully withdrawn. Therefore, in modes 3, 4, and 5 rod group 1 may be fully withdrawn without first performing Section 4.4 provided that:

- The shutdown margin calculation of Enclosure 1 is more negative than -1.0% Δ k/k.
- All the rods in groups 2 through 7 are fully inserted.

5.0 FOLLOW-UP ACTIONS

5.1 RESTORATION INSTRUCTIONS

None required.

5.2 CONTINGENCIES

5.2.1 IF the value determined in Enclosure 1 or 1A, is less negative than -1.0% Δ k/k,
THEN IMMEDIATELY inform the Nuclear Shift Supervisor and refer to ITS 3.1.1.

5.2.2 IF the absolute value of the value calculated in Step 7a, of Enclosure 2, or Step 7a of Enclosure 2A, is greater than 1.0% Δ k/k,
THEN IMMEDIATELY inform the Nuclear Shift Supervisor and refer to ITS 3.1.2.

5.2.3 IF the absolute value of the value calculated in Step 7a, of Enclosure 2, or Step 7a of Enclosure 2A, is greater than 0.3% Δ k/k,
THEN notify the Reactor Engineer to investigate the situation. The Reactor Engineer will document the results of the investigation on Enclosure 3.

1. Core Burnup

Core Burnup = ______________ EFPD

****
CAUTION: In Modes 3, 4, or 5, 73°F boron requirements for shutdown apply if OTSG levels are > 40 inches or if EFIC MSLI Actuation logic is bypassed.
****

NOTES: For the remaining steps (2-4) the following NOTES apply:

(1) It is permissible to round to the nearest whole EFPD.

(2) It is permissible to round to the nearest whole %wd.

(3) For RCS > 532 degrees F, 532 degrees F data may be used.

(4) Two decimal place accuracy is required in calculations.

2. Boron Reactivity
   a. RCS temperature _______ °F
   b. Boron concentration required for shutdown from appropriate Curve 18 or Curve 19 of OP-103C. ______________ ppm
   c. Actual Boron Concentration: ________ ppm
   d. Differential boron worth from Curve 3 of OP-103C, Reactivity Worth Curves.
      ____________ % Δ k/k/100 ppm
   e. Reactivity During Modes 1, 2, 3, 4, and 5
      Reactivity = [(b - c) x d/100] - 1.0
      = [(______ - ______) x _______ ÷ 100] - 1.0 = + / - _______% Δ k/k

3. Control Rod Group 8 Reactivity
   a. Group 8 worth at the HFP nominal position* from Curve 9 of OP-103C, Reactivity Worth Curves. - _______% Δ k/k
   b. Current Group 8 Position: ___________ % WD
   c. Group 8 worth at current position from Curve 9 of OP-103C, Reactivity Worth Curves. - _______% Δ k/k
   d. Reactivity = c - a
      = (- ____) - (- ____) + / - _______% Δ k/k

NOTE: (5) Using a xenon value of 0.0% delta k/k is conservative and may be used at any time.

4. Xenon Reactivity
   a. Obtain Xenon reactivity from Saxon code (submit printout).
      OR
   b. IF the Saxon code is unavailable,
      THEN use 0.0% Δ k/k or contact Reactor Engineering for a value (0.0% Δ k/k is conservative and therefore preferred). - _______% Δ k/k

*HFP nominal position for Group 8 is 30.4% wd until 650 (+/-10) EFPD.
AFTER 650 (+/-10) EFPD IT IS 100% WD.

SHUTDOWN MARGIN CALCULATION (Cont'd)

5. Shutdown Margin
Determine the shutdown margin by adding Items 2, 3 and 4 above, and round to the nearest tenth.

__________ + __________ + __________ = + / - _______% Δ k/k

Item 2 Item 3 Item 4

NOTE: IF no credit was taken for xenon in Section 4, THEN it is permissible to N/A Section 6.

6. Reduction of Shutdown Margin by Xenon Decay

a. Reduce the shutdown margin in Step 5 by -1.0% Δ k/k.
(value in 5) - (-1% Δ k/k)
- _______________% Δ k/k - (-1% Δ k/k) = _______% Δ k/k

b. Record the xenon reactivity from Step 4: - _______% Δ k/k

c. Reduce the xenon reactivity by the value in 6a.
(value in Step 6b) - (value in Step 6a)
- _______________% Δ k/k - (- ____________% Δ k/k) = + / - _______% Δ k/k

d.1 IF the value of 6c is positive, THEN sufficient shutdown margin will be preserved even when xenon decays to zero. Steps 6.d.2 - 6.d.5 do not need to be completed.

d.2 IF the value of 6c is negative, THEN determine from the SAXON printout when the xenon reactivity will drop to the resulting value calculated in Step 6c. If it will not drop to this value, inform the NSS and NA step 6.d.3 to 6.d.5.

d.3 Record when xenon reactivity will reach the value calculated in 6c. It is acceptable to pick the nearest hour preceding reaching that value.
date _______________ time _____________

d.4 Record this date and time in the Nuclear Operators logbook and the Nuclear Operators Turnover Sheet.

d.5 Inform the NSS that boron must be increased to compensate for xenon decay prior to reaching this time.

SHUTDOWN MARGIN CALCULATION (Cont'd)

7. Shutdown Margin
   a. IF the shutdown margin determined in Step 5 is less negative than -1.0% k/k (i.e., zero, positive or between 0.0 and -1.0).
   THEN the shutdown margin is unacceptable. IMMEDIATELY inform the Nuclear Shift Supervisor and refer to ITS 3.1.1.

   b. IF the shutdown margin determined in Step 5 is more negative than -1.0%k/k, THEN the shutdown margin is acceptable.

Calculated By ______________________ Date/Time ___________

Checked By ______________________ Date/Time ___________

ONE HOUR MISALIGNED ROD SHUTDOWN MARGIN CALCULATION

1. **Core Burnup**

   a. Core Burnup = ________________ EFPD

NOTES: For the remaining steps (2-4) the following NOTES apply:

(1) It is permissible to round to the nearest whole EFPD.

(2) It is permissible to round to the nearest whole %wd.

(3) For RCS > 532 degrees F, 532 degrees F data may be used.

(4) Two decimal place accuracy is required in calculations.

2. **Boron Reactivity**

   a. RCS temperature _______ °F
   b. Boron concentration required for shutdown from appropriate Curve 18 or Curve 19 of OP-103C. _______________ ppm
   c. Actual Boron Concentration: _________ ppm
   d. Differential boron worth from Curve 3 of OP-103C, Reactivity Worth Curves.
      ____________ % Δ k/k/100 ppm
   e. Reactivity During Modes 1, 2, 3, 4, and 5
      Reactivity = [(b - c) x d/100]-1.0
      = [(______ - ______) x _______ ÷ 100]-1.0 = + / - _______% Δ k/

NOTE: (5) It is permissible to NA steps 3a, 3b, 3c and 3d, and use 0.0 % delta k/k for the APSR reactivity contribution if the current APSR position is between 26%wd and 34%wd.

3. **Control Rod Group 8 Reactivity**

   a. Group 8 worth at the HFP nominal position* from Curve 9 of OP-103C, Reactivity Worth Curves. - _______% Δ k/k
   b. Current Group 8 Position: __________ % WD
   c. Group 8 worth at current position from Curve 9 of OP-103C, Reactivity Worth Curves. - ______ % Δ k/k
   d. Reactivity = c - a
      = (-) - (-) + / - _______% Δ k/

ONE HOUR MISALIGNED ROD SHUTDOWN MARGIN CALCULATION (Cont'd)

NOTE: (6) For the one hour misaligned rod calculation ONLY, the value for xenon calculated prior to the misaligned rod for this hour may still be used provided that:

- o the existing SAXON printout accurately reflects the core conditions prior to the misaligned rod, and
- o the maximum post-misaligned rod power level is less than, or equal to, the power level used on the existing SAXON printout for calculating this hour's xenon.

NOTE: (7) Using a xenon value of 0.0% delta k/k is conservative and may be used at any time.

4. Xenon Reactivity

a. Obtain Xenon reactivity from Saxon code (submit printout).
OR

b. IF the Saxon code is unavailable,
THEN use 0.0% Δ k/k or contact Reactor Engineering for a value (0.0% Δ k/k is conservative and therefore preferred). - ______% Δ k/

5. Shutdown Margin

a. Determine the shutdown margin by adding Items 2, 3 and 4 above, and round to the nearest tenth + /.- ______% Δ k/

b.1 IF the shutdown margin determined in Step 5a is less negative than -1.0% k/k (i.e., zero, positive or between 0.0 and -1.0),
THEN the shutdown margin is unacceptable. IMMEDIATELY inform the Nuclear Shift Supervisor and refer to ITS 3.1.1.

b.2 IF the shutdown margin determined in Step 5a is more negative than -1.0% k/k,
THEN the shutdown margin is acceptable. Notify the Nuclear Shift Supervisor and continue to step 6.

__________/____
Calculated By/Dat

__________/____
Verified By/Dat

CONTINUED NEXT PAGE.

ONE HOUR MISALIGNED ROD SHUTDOWN MARGIN CALCULATION (Cont'd)

NOTE: (A) IF no credit was taken for xenon in Section 4, THEN it is permissible to N/A Section 6.

(B) Step 5 completed the one hour shutdown margin verification requirement. Since steps 6a through 6d.5 will require producing a new SAXON printout, it may be delayed one additional hour as long as the shutdown margin calculated in step 5 was greater than 1.5% delta k/k.

6. Reduction of Shutdown Margin by Xenon Decay

a. Reduce the shutdown margin in Step 5a by -1.0% Δ k/k.
(value in 5a) - (-1% Δ k/k)
- ____________ % Δ k/k - (-1% Δ k/k) = - ________% Δ k/

b. Record the xenon reactivity from Step 4: - ________% Δ k/

c. Reduce the xenon reactivity by the value in 6a.
(value in Step 6b) - (value in Step 6a)
- ____________% Δ k/k - (- __________% Δ k/k) = + / - ________% Δ k/

d.1 IF the value of 6c is positive,
THEN sufficient shutdown margin will be preserved even when xenon decays to zero. Steps 6.d.2-6.d.5 do not need to be completed.

d.2 IF the value of 6c is negative,
THEN determine from the SAXON printout when the xenon reactivity will drop to the resulting value calculated in Step 6c. If it will not drop to this value, inform the NSS and NA step 6.d.3 to 6.d.5.

d.3 Record when xenon reactivity will reach the value calculated in 6c. It is acceptable to pick the nearest hour preceding reaching that value.
date ____________ time ____________

d.4 Record this date and time in the Nuclear Operators logbook and the Nuclear Operators Turnover Sheet. ________/____
Initial/Dat

d.5 Inform the NSS that boron must be increased to compensate for xenon decay prior to reaching this time.

Calculated By ______________________________ Date/Time ____________

Checked By ______________________________ Date/Time ____________

REACTIVITY BALANCE DURING POWER OPERATION (> 15% FP)

REFERENCE CONDITIONS: 579°F, 100% FP, No Xenon, CRG 1-7 at 100% wd, HFP Samarium,
CRG 8 at HFP nominal position

1. Excess Fuel Reactivity
   a. Core Burnup = ____________________ EFPD
   b. Excess Fuel Reactivity from Curve 10 of OP-103C, Reactivity Worth Curves. +________% Δ k/

2. Boron Reactivity
   a. Boron Concentration _________ ppmB
   b. Using core burnup from Step 1 (a), find the HFP inverse boron worth from Curve 4 of OP-103C, Reactivity Worth Curves: ________ ppm/% Δ k/k
   c. Divide Step 2(a) by the inverse boron worth in Step 2 (b) 2(a)/2(b) = ______ ppmB / ________ ppm/% Δ k/k = -________% Δ k/

3. Xenon Reactivity (Use Step 3.1, 3.2, or 3.3)

3.1 Obtain Xenon reactivity from SAXON (submit printout).

OR

3.2 a. Last power level was __________ % FP for _______ hrs.
   b. IF time at 100% FP power level was > 40 hrs., THEN obtain Xenon reactivity from Curve 12 of OP-103C, Reactivity Worth Curves.

3.3 IF the value cannot be derived from 3.1 or 3.2, THEN contact Reactor Engineering for a value. -________% Δ k/

4. Reactivity Effect From Temperature
   a. Average RC Temperature ____________ °F
   b. Reference temperature is 579°F.
   c. Temperature coefficient at _______ ppmB obtained from Curve 13 of OP-103C, Reactivity Worth Curves, is ______ x 10^{-2}% Δ k/k°F.
   d. Reactivity = [T(ave) - 579] [Temp. Coeff.]
   e. Reactivity = (_______ - 579) (_______) = + / - _______% Δ k/

5. Control Rod Reactivity
   a. Reactivity worth of inserted regulating rods as read from Curve 14 of OP-103C, Reactivity Worth Curves. - _______% Δ k/

   Rod Index _____________ % WD

   NOTE: Group 8 worth compensation is not required since Group 8 HFP nominal position is already included in Curve 10 of OP-103C (see paragraph 3.2.5 for additional detail). This data on Group 8 position is recorded for use, where necessary, by Reactor Engineering for long term trending.

   b. Record Group 8 position ____________ % wd.

REACTIVITY BALANCE DURING POWER OPERATION ($\geq$ 15% FP)
(Continued)

6. Reactivity Effect of Power Doppler
   a. Core Power Level = _______% FP
   b. Power Doppler reactivity correction from Curve 15 of OP-103C, Reactivity Worth Curves. + _______% Δ k/

7. Net Reactivity
   a. Net reactivity is the sum of Steps 1 thru 6. _______% Δ k/
   b. Inform the Shift Supervisor of the results.

Acceptability

1. IF the absolute value of Step 7a is greater than 1.0% Δ k/k, THEN IMMEDIATELY inform the Nuclear Shift Supervisor and refer to ITS 3.1.2.

2. IF the absolute value of Step 7a is greater than 0.3% Δ k/k, THEN notify Reactor Engineering to investigate the situation. Reactor Engineering will document the results of the investigation on Enclosure 3.

Calculated By __________________ Date ______________ Time _________

Checked By __________________ Date ______________ Time _________

REACTIVITY BALANCE DURING POWER OPERATION (< 15% FP)

REFERENCE CONDITIONS: 532°F, 0% FP, No Xenon, CRG 1-8 at 100% wd, HFP Samarium.

1. Excess Fuel Reactivity
   a. Core Burnup = ________ EFPD
   b. Excess Fuel Reactivity from Curve 1 of OP-103C, Reactivity Worth Curves. + _______% Δ k/

2. Boron Reactivity
   a. Boron Concentration ________ ppmB
   b. Using core burnup from Step 1(a), find the HZP inverse boron worth from Curve 4 of OP-103C, Reactivity worth Curves __________ ppm/ % Δ k/k
   c. Divide Step 2(a) by the inverse boron worth in Step 2(b).
   2(a)/2(b) = ______ ppmB / _________ ppm/ % Δ k/k = - _______% Δ k/

3. Xenon Reactivity
   a. Obtain Xenon reactivity from Saxon. (Submit printout.)
   b. IF Saxon is unavailable,
      THEN contact Reactor Engineering for a value. - _______% Δ k/

4. RCS Temperature and Power Reactivity Deficit
   a. Average RC Temperature __________°F
   b. Obtain temperature and power reactivity deficit from Curve 6 of OP-103C, Reactivity Worth Curves. - _______% Δ k/

5. Control Rod Reactivity
   a. Reactivity worth of inserted regulating rods as read from Curve 8 or 8A of OP-103C, Reactivity Worth Curves: - _______% Δ k/

      Rod Index _________ % WD

   b. Worth of inserted Group 8 rods at ________% withdrawn from Curve 9 of OP-103C, Reactivity Worth Curves. - _______% Δ k/

6. Samarium Reactivity
   a. Obtain Samarium reactivity from Saxon. (Submit printout.)
   b. IF Saxon is unavailable,
      THEN contact Reactor Engineering for a value. - _______% Δ k/

7. Net Reactivity
   a. Net reactivity is the sum of Steps 1 thru 6. ________% Δ k/
   b. Inform the Shift Supervisor of the results.

Acceptability

1. IF the absolute value of Step 7a is greater than 1.0% Δ k/k, THEN IMMEDIATELY go to Step 5.2.2.
2. IF the absolute value of Step 7a is greater than 0.3% Δ k/k, THEN go to Step 5.2.3.

Calculated By ______________________________ Date/Time ______________

Checked By ______________________________ Date/Time ______________

COMPARISON OF OVERALL CORE REACTIVITY BALANCE TO PREDICTED VALUE

Date __________ Time __________ Core Age _______________EFPD's (based on 2544 MWth)

Reactivity Balance = ____________% Δ k/k (0 ± 1% Δ k/k required)

Computations are attached.

Computed By ________________________________

The following reactivity values were normalized ____

____

____

____

____

____

____

COMMENTS: ____

____

____

____

____

____

Reactor Engineer ______________________________________ Date: _____________________

1. Core Burnup = ________________ EFPD

   RCS Temperature ______________ °F

2. Rod Position Status

   grp. 1 _____ %wd grp. 3_____ %wd grp. 5_____ %wd grp. 7_____ %wd

   grp. 2 _____ %wd grp. 4_____ %wd grp. 6_____ %wd grp. 8_____ %wd

   a. Are all the rods in groups 1-7 fully inserted? circle one: Yes No

   b. IF all rods in grps 1-7 are not fully inserted, THEN review Step 3.5.5 and the CAUTION on Step 4.4.1. ______/______ Initial/Date

****

CAUTION: In Modes 3,4 or 5, 73°F boron requirements for shutdown apply if OTSG levels are > 40 inches or if EFIC MSLI Actuation logic is bypassed.

****

NOTES: For the remaining steps the following NOTES apply:

(1) It is permissible to round to the nearest whole EFPD.

(2) It is permissible to round to the nearest whole %wd.

(3) Two decimal place accuracy is required in calculations.

3. Boron Reactivity Contribution

   a. Required boron concentration from Curve 18 of OP-103C ________ ppmb

   b. Actual boron concentration _________ ppmb

   c. Differential boron worth from Curve 3 of OP-103C ________ %Δk/k/100ppmb

   d. Reactivity = [(a-b) x c/100] -1.0
      = [(____ - ____) x ______ ÷ 100] -1.0 = + / - ______% Δk/k

4. Group 8 Reactivity Contribution

   a. Group 8 HFP nominal position is: 0-650 (+/-10) EFPD 30.4%wd
      650 (+/-10) - 680 EFPD 100%wd

   b. Group 8 worth from Curve 9 of OP-103C at the HFP nominal position - ___________%Δk/k

   c. Current group 8 position _________%wd

   d. Group 8 worth from Curve 9 of OP-103C at the current position ___________%Δk/k

   e. Reactivity = d - b = (-_____) - (-_____) = + / - __________% Δ k/k

Continued

5. Xenon Reactivity Contribution

   a. IF credit is to be taken for transient xenon, THEN this enclosure must be completed within one hour of moving each rod group. This may require more than one calculation to test all the rod groups.

   b. Use SAXON (time: ____________)

      OR

      use 0.0% Δ k/k. Using 0.0% Δ k/k is conservative. - ______________% Δ k/k

6. Samarium Reactivity Contribution

   Use SAXON

   OR

   use 0.0%Δk/k. Using 0.0%Δk/k is conservative. - ______________% Δ k/k

7. Stuck Rod Worth Contribution

   Use the value from Curve 11 of OP-103C

   a. Stuck Rod Worth = __________%Δk/k

   b. Rod Worth decreased by 10% value (7a x 0.90)
      __________%Δk/k x 0.90 = - ______________% Δ k/k

8. Subtotal With All Rods (1-7) In

   Add the values of Steps 3 through 7 - ______________% Δ k/k

Continued

NOTE: The values for rod groups on Curve 20 of OP-103C are valid only if all other rods in grps 1-7 are inserted.

9. Withdrawn Rod Group Contribution

   a. Rod group no. that is, or is to be, withdrawn.

      rod group ________

   b. Worth of the rod group from Curve 20 of OP-103C

      __________ %Δk/k

   c. Rod worth increased by the standard 10% conservatism

      (value in 9b) x 1.10 = ____________%Δk/k x 1.10 = - ______________% Δ k/k

10. Shutdown Value with the Rod Group withdrawn

NOTE: Subtracting a negative value is the same as adding a positive value.

(value in Step 8) - (value in Step 9)

(-_________%Δk/k) - (-_________%Δk/k) - ______________% Δ k/k

Continued

11. ACCEPTABILITY

a. Is the value in Step 10 more negative than -1.5%Δk/k?
circle one: Yes No

b. IF the value in Step 10 is more negative than -1.5% Δ k/k,
THEN the k_{eff} remains less than 0.99,
AND the value is acceptable. Rod withdrawal may be performed.

c. IF the value in Step 10 is less negative than -1.5% Δ k/k,
THEN the value is unacceptable for single group withdrawal of rod groups 2-7.

(1) Do not withdraw the rod group.
(2) IF the rod group is already withdrawn,
THEN immediately insert it.
(3) Inform the NSS
(4) Compare to 11.d., below.

d. IF the value in Step 10 is less negative than -1.0% Δ k/k,
THEN:
(1) Do not withdraw the rod group
(2) IF the rod group is already withdrawn (including rod group 1),
THEN immediately insert it.
(3) Initiate a shutdown margin calculation
(4) Inform the NSS.
IF the rod group was already withdrawn,
THEN k_{eff} was greater than or equal to 0.99 k_{eff}. Refer to the operational mode definitions of ITS Table 1.1.

Performed By: ______________________ Date: ____________

Verified By: ______________________ Date: ____________

Rev. 19

Effective Date 3/6/00

OPERATING PROCEDURE

OP-103C

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

CYCLE 12
REACTIVITY WORTH CURVES

APPROVED BY: Procedure Owner

Mike Collins
(SIGNATURE ON FILE)

DATE: 3/1/2000

PROCEDURE OWNER: Reactor Engineer

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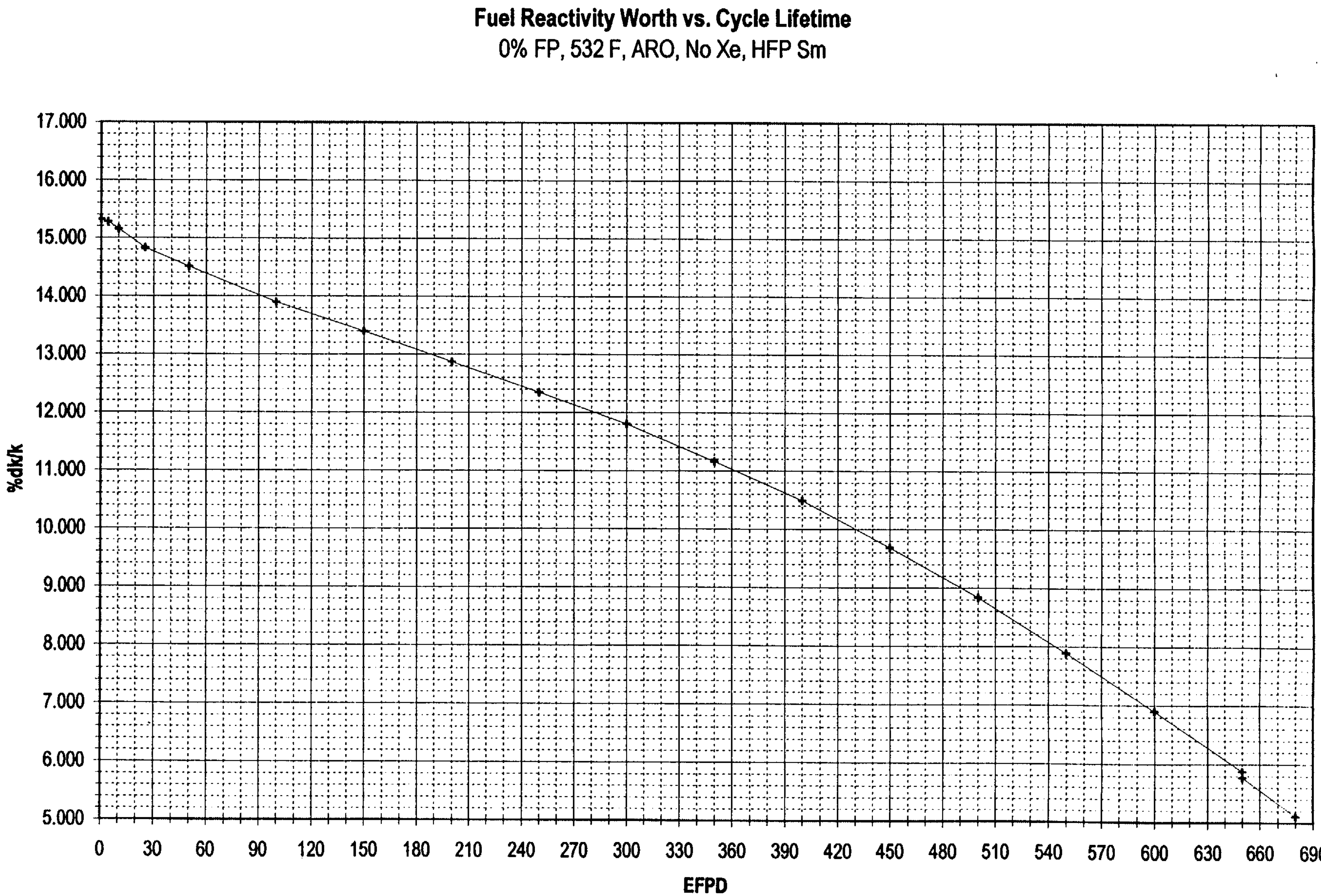

Fuel Reactivity Worth vs. Cycle Lifetime
0% FP, 532 F, ARO, No Xe, HFP Sm
%dk/k
17.000
16.000
15.000
14.000
13.000
12.000
11.000
10.000
9.000
8.000
7.000
6.000
5.000
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
570
600
630
660
690
EFPD

EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k
[redacted]	[redacted]	48	14.5346	96	13.9487	144	13.4565	192	12.9594	240	12.4528
1	15.3088	49	14.5217	97	13.9365	145	13.4464	193	12.9490	241	12.4422
2	15.2988	[redacted]	[redacted]	98	13.9244	146	13.4364	194	12.9386	242	12.4316
3	15.2888	51	14.4966	99	13.9122	147	13.4263	195	12.9282	243	12.4210
[redacted]	[redacted]	52	14.4845	[redacted]	[redacted]	148	13.4162	196	12.9178	244	12.4105
5	15.2575	53	14.4723	101	13.8899	149	13.4061	197	12.9075	245	12.3999
6	15.2362	54	14.4601	102	13.8798	[redacted]	[redacted]	198	12.8971	246	12.3893
7	15.2149	55	14.4479	103	13.8698	151	13.3857	199	12.8867	247	12.3787
8	15.1936	56	14.4357	104	13.8597	152	13.3753	[redacted]	[redacted]	248	12.3681
9	15.1723	57	14.4236	105	13.8496	153	13.3649	201	12.8657	249	12.3575
[redacted]	[redacted]	58	14.4114	106	13.8395	154	13.3545	202	12.8551	[redacted]	[redacted]
11	15.1297	59	14.3992	107	13.8294	155	13.3441	203	12.8445	251	12.3361
12	15.1084	60	14.3870	108	13.8194	156	13.3337	204	12.8339	252	12.3254
13	15.0871	61	14.3749	109	13.8093	157	13.3233	205	12.8233	253	12.3146
14	15.0658	62	14.3627	110	13.7992	158	13.3129	206	12.8127	254	12.3038
15	15.0445	63	14.3505	111	13.7891	159	13.3025	207	12.8022	255	12.2930
16	15.0231	64	14.3383	112	13.7791	160	13.2921	208	12.7916	256	12.2822
17	15.0018	65	14.3262	113	13.7690	161	13.2817	209	12.7810	257	12.2714
18	14.9805	66	14.3140	114	13.7589	162	13.2713	210	12.7704	258	12.2606
19	14.9592	67	14.3018	115	13.7488	163	13.2609	211	12.7598	259	12.2499
20	14.9379	68	14.2896	116	13.7387	164	13.2505	212	12.7492	260	12.2391
21	14.9166	69	14.2775	117	13.7287	165	13.2401	213	12.7386	261	12.2283
22	14.8953	70	14.2653	118	13.7186	166	13.2297	214	12.7281	262	12.2175
23	14.8739	71	14.2531	119	13.7085	167	13.2193	215	12.7175	263	12.2067
24	14.8526	72	14.2409	120	13.6984	168	13.2089	216	12.7069	264	12.1959
[redacted]	[redacted]	73	14.2288	121	13.6883	169	13.1985	217	12.6963	265	12.1851
26	14.8184	74	14.2166	122	13.6783	170	13.1881	218	12.6857	266	12.1743
27	14.8055	75	14.2044	123	13.6682	171	13.1777	219	12.6751	267	12.1636
28	14.7926	76	14.1922	124	13.6581	172	13.1673	220	12.6645	268	12.1528
29	14.7797	77	14.1801	125	13.6480	173	13.1569	221	12.6539	269	12.1420
30	14.7668	78	14.1679	126	13.6379	174	13.1466	222	12.6434	270	12.1312
31	14.7539	79	14.1557	127	13.6279	175	13.1362	223	12.6328	271	12.1204
32	14.7410	80	14.1435	128	13.6178	176	13.1258	224	12.6222	272	12.1096
33	14.7281	81	14.1313	129	13.6077	177	13.1154	225	12.6116	273	12.0988
34	14.7152	82	14.1192	130	13.5976	178	13.1050	226	12.6010	274	12.0880
35	14.7023	83	14.1070	131	13.5875	179	13.0946	227	12.5904	275	12.0773
36	14.6894	84	14.0948	132	13.5775	180	13.0842	228	12.5798	276	12.0665
37	14.6765	85	14.0826	133	13.5674	181	13.0738	229	12.5693	277	12.0557
38	14.6636	86	14.0705	134	13.5573	182	13.0634	230	12.5587	278	12.0449
39	14.6507	87	14.0583	135	13.5472	183	13.0530	231	12.5481	279	12.0341
40	14.6378	88	14.0461	136	13.5372	184	13.0426	232	12.5375	280	12.0233
41	14.6249	89	14.0339	137	13.5271	185	13.0322	233	12.5269	281	12.0125
42	14.6120	90	14.0218	138	13.5170	186	13.0218	234	12.5163	282	12.0018
43	14.5991	91	14.0096	139	13.5069	187	13.0114	235	12.5057	283	11.9910
44	14.5862	92	13.9974	140	13.4968	188	13.0010	236	12.4951	284	11.9802
45	14.5733	93	13.9852	141	13.4868	189	12.9906	237	12.4846	285	11.9694
46	14.5604	94	13.9731	142	13.4767	190	12.9802	238	12.4740	286	11.9586
47	14.5475	95	13.9609	143	13.4666	191	12.9698	239	12.4634	287	11.9478

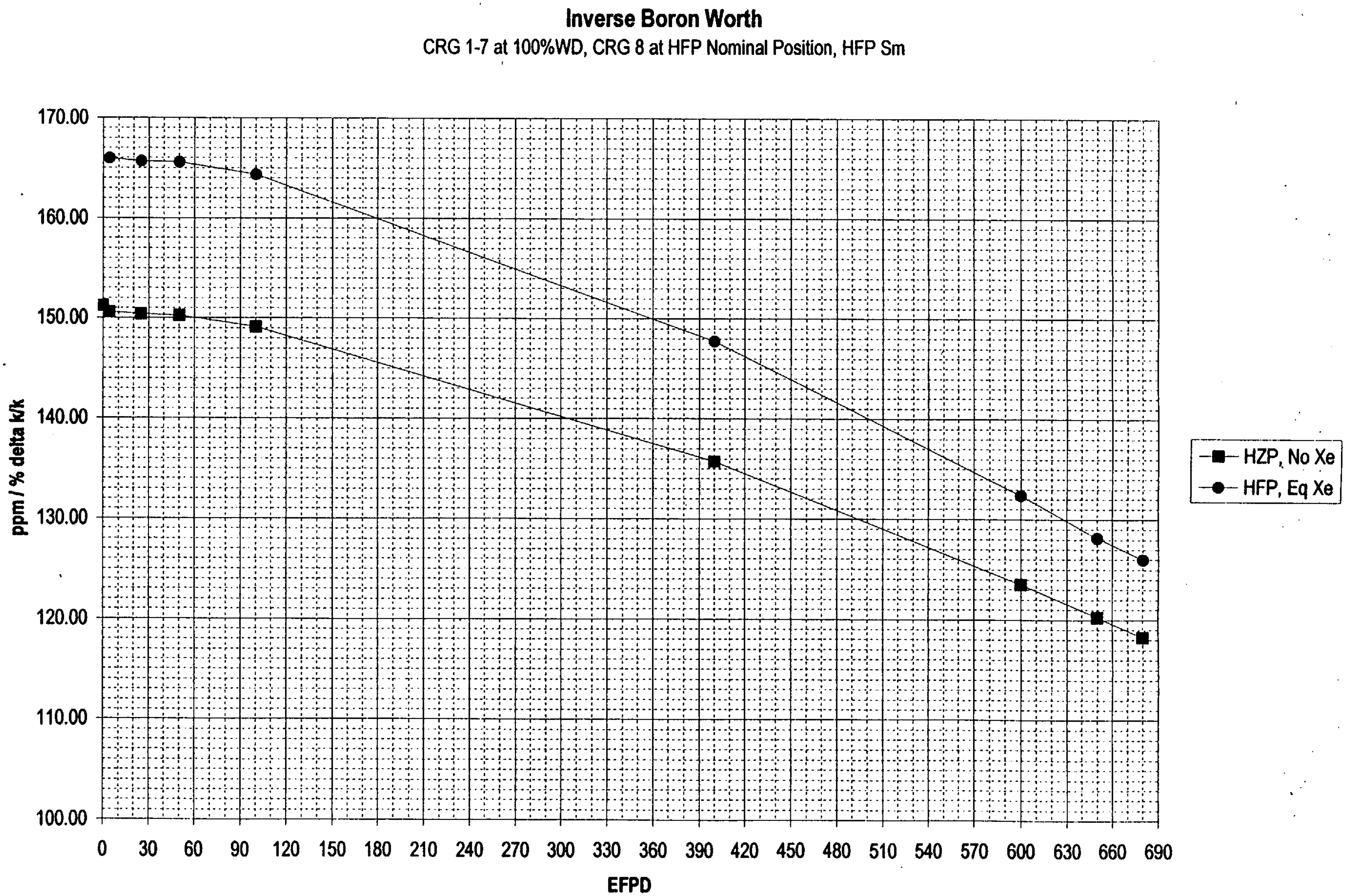
IT IS PERMISSIBLE TO INTERPOLATE BETWEEN EFPD RANGES

EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k
288	11.9370	336	11.3411	384	10.7043	432	9.9738	480	9.1764	528	8.3087
289	11.9262	337	11.3281	385	10.6909	433	9.9577	481	9.1595	529	8.2898
290	11.9155	338	11.3152	386	10.6775	434	9.9416	482	9.1426	530	8.2709
291	11.9047	339	11.3022	387	10.6641	435	9.9254	483	9.1257	531	8.2519
292	11.8939	340	11.2893	388	10.6508	436	9.9093	484	9.1088	532	8.2330
293	11.8831	341	11.2763	389	10.6374	437	9.8932	485	9.0919	533	8.2141
294	11.8723	342	11.2633	390	10.6240	438	9.8770	486	9.0750	534	8.1952
295	11.8615	343	11.2504	391	10.6106	439	9.8609	487	9.0580	535	8.1763
296	11.8507	344	11.2374	392	10.5972	440	9.8448	488	9.0411	536	8.1574
297	11.8400	345	11.2245	393	10.5838	441	9.8286	489	9.0242	537	8.1385
298	11.8292	346	11.2115	394	10.5704	442	9.8125	490	9.0073	538	8.1195
299	11.8184	347	11.1985	395	10.5570	443	9.7964	491	8.9904	539	8.1006
[redacted]		348	11.1856	396	10.5436	444	9.7802	492	8.9735	540	8.0817
301	11.7946	349	11.1726	397	10.5302	445	9.7641	493	8.9566	541	8.0628
302	11.7817	[redacted]		398	10.5168	446	9.7480	494	8.9397	542	8.0439
303	11.7687	351	11.1463	399	10.5034	447	9.7319	495	8.9228	543	8.0250
304	11.7558	352	11.1329	[redacted]		448	9.7157	496	8.9059	544	8.0060
305	11.7428	353	11.1195	401	10.4739	449	9.6996	497	8.8890	545	7.9871
306	11.7298	354	11.1061	402	10.4578	[redacted]		498	8.8721	546	7.9682
307	11.7169	355	11.0927	403	10.4416	451	9.6666	499	8.8552	547	7.9493
308	11.7039	356	11.0793	404	10.4255	452	9.6497	[redacted]		548	7.9304
309	11.6910	357	11.0659	405	10.4094	453	9.6327	501	8.8194	549	7.9115
310	11.6780	358	11.0525	406	10.3932	454	9.6158	502	8.8005	[redacted]	
311	11.6650	359	11.0391	407	10.3771	455	9.5989	503	8.7816	551	7.8727
312	11.6521	360	11.0257	408	10.3610	456	9.5820	504	8.7627	552	7.8528
313	11.6391	361	11.0124	409	10.3449	457	9.5651	505	8.7437	553	7.8330
314	11.6262	362	10.9990	410	10.3287	458	9.5482	506	8.7248	554	7.8131
315	11.6132	363	10.9856	411	10.3126	459	9.5313	507	8.7059	555	7.7932
316	11.6003	364	10.9722	412	10.2965	460	9.5144	508	8.6870	556	7.7734
317	11.5873	365	10.9588	413	10.2803	461	9.4975	509	8.6681	557	7.7535
318	11.5743	366	10.9454	414	10.2642	462	9.4806	510	8.6492	558	7.7337
319	11.5614	367	10.9320	415	10.2481	463	9.4637	511	8.6302	559	7.7138
320	11.5484	368	10.9186	416	10.2319	464	9.4468	512	8.6113	560	7.6939
321	11.5355	369	10.9052	417	10.2158	465	9.4299	513	8.5924	561	7.6741
322	11.5225	370	10.8918	418	10.1997	466	9.4130	514	8.5735	562	7.6542
323	11.5095	371	10.8784	419	10.1835	467	9.3961	515	8.5546	563	7.6343
324	11.4966	372	10.8650	420	10.1674	468	9.3792	516	8.5357	564	7.6145
325	11.4836	373	10.8516	421	10.1513	469	9.3623	517	8.5168	565	7.5946
326	11.4707	374	10.8382	422	10.1351	470	9.3454	518	8.4978	566	7.5748
327	11.4577	375	10.8249	423	10.1190	471	9.3285	519	8.4789	567	7.5549
328	11.4448	376	10.8115	424	10.1029	472	9.3116	520	8.4600	568	7.5350
329	11.4318	377	10.7981	425	10.0867	473	9.2947	521	8.4411	569	7.5152
330	11.4188	378	10.7847	426	10.0706	474	9.2778	522	8.4222	570	7.4953
331	11.4059	379	10.7713	427	10.0545	475	9.2609	523	8.4033	571	7.4754
332	11.3929	380	10.7579	428	10.0384	476	9.2440	524	8.3843	572	7.4556
333	11.3800	381	10.7445	429	10.0222	477	9.2271	525	8.3654	573	7.4357
334	11.3670	382	10.7311	430	10.0061	478	9.2102	526	8.3465	574	7.4159
335	11.3540	383	10.7177	431	9.9900	479	9.1933	527	8.3276	575	7.3960

IT IS PERMISSIBLE TO INTERPOLATE BETWEEN EFPD RANGES

EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k	EFPD	% dk/k
576	7.3761	624	6.4053	671	5.3070	APSRs Out					
577	7.3563	625	6.3847	672	5.2848	APSRs Out					
578	7.3364	626	6.3641	673	5.2626	APSRs Out					
579	7.3166	627	6.3435	674	5.2405	APSRs Out					
580	7.2967	628	6.3229	675	5.2183	APSRs Out					
581	7.2768	629	6.3024	676	5.1961	APSRs Out					
582	7.2570	630	6.2818	677	5.1739	APSRs Out					
583	7.2371	631	6.2612	678	5.1517	APSRs Out					
584	7.2172	632	6.2406	679	5.1296	APSRs Out					
585	7.1974	633	6.2200	[redacted]		APSRs Out					
586	7.1775	634	6.1994								
587	7.1577	635	6.1788								
588	7.1378	636	6.1582								
589	7.1179	637	6.1376								
590	7.0981	638	6.1171								
591	7.0782	639	6.0965								
592	7.0583	640	6.0759								
593	7.0385	641	6.0553								
594	7.0186	642	6.0347								
595	6.9988	643	6.0141								
596	6.9789	644	5.9935								
597	6.9590	645	5.9729								
598	6.9392	646	5.9523								
599	6.9193	647	5.9318								
[redacted]		648	5.9112								
601	6.8789	649	5.8906								
602	6.8583	[redacted]									
603	6.8377	[redacted]		APSRs Out							
604	6.8171	651	5.7506	APSRs Out							
605	6.7965	652	5.7284	APSRs Out							
606	6.7759	653	5.7062	APSRs Out							
607	6.7553	654	5.6840	APSRs Out							
608	6.7347	655	5.6619	APSRs Out							
609	6.7141	656	5.6397	APSRs Out							
610	6.6936	657	5.6175	APSRs Out							
611	6.6730	658	5.5953	APSRs Out							
612	6.6524	659	5.5731	APSRs Out							
613	6.6318	660	5.5510	APSRs Out							
614	6.6112	661	5.5288	APSRs Out							
615	6.5906	662	5.5066	APSRs Out							
616	6.5700	663	5.4844	APSRs Out							
617	6.5494	664	5.4622	APSRs Out							
618	6.5288	665	5.4401	APSRs Out							
619	6.5083	666	5.4179	APSRs Out							
620	6.4877	667	5.3957	APSRs Out							
621	6.4671	668	5.3735	APSRs Out							
622	6.4465	669	5.3514	APSRs Out							
623	6.4259	670	5.3292	APSRs Out							

IT IS PERMISSIBLE TO INTERPOLATE BETWEEN EFPD RANGES


Inverse Boron Worth
CRG 1-7 at 100%WD, CRG 8 at HFP Nominal Position, HFP Sm
170.00
160.00
150.00
140.00
130.00
120.00
110.00
100.00
ppm / % delta k/k
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
570
600
630
660
690
EFPD
HZP, No Xe
HFP, Eq Xe

	IBW, ppm/%dk/k			IBW, ppm/%dk/k			IBW, ppm/%dk/k	
EFPD	HZP	HFP	EFPD	HZP	HFP	EFPD	HZP	HFP
[redacted]		166.0333	48	150.2804	165.3933	96	149.2488	164.4668
1	151.0975	166.0200	49	150.2752	165.3800	97	149.2266	164.4426
2	150.9350	166.0067	[redacted]			98	149.2044	164.4184
3	150.7725	165.9933	51	150.2478	165.5558	99	149.1822	164.3942
[redacted]			52	150.2256	165.5316	[redacted]		
5	150.6000	165.9667	53	150.2034	165.5074	101	149.1153	164.3146
6	150.5900	165.9533	54	150.1812	165.4832	102	149.0706	164.2592
7	150.5800	165.9400	55	150.1590	165.4590	103	149.0259	164.2038
8	150.5700	165.9267	56	150.1368	165.4348	104	148.9812	164.1484
9	150.5600	165.9133	57	150.1146	165.4106	105	148.9365	164.0930
10	150.5500	165.9000	58	150.0924	165.3864	106	148.8918	164.0376
11	150.5400	165.8867	59	150.0702	165.3622	107	148.8471	163.9822
12	150.5300	165.8733	60	150.0480	165.3380	108	148.8024	163.9268
13	150.5200	165.8600	61	150.0258	165.3138	109	148.7577	163.8714
14	150.5100	165.8467	62	150.0036	165.2896	110	148.7130	163.8160
15	150.5000	165.8333	63	149.9814	165.2654	111	148.6683	163.7606
16	150.4900	165.8200	64	149.9592	165.2412	112	148.6236	163.7052
17	150.4800	165.8067	65	149.9370	165.2170	113	148.5789	163.6498
18	150.4700	165.7933	66	149.9148	165.1928	114	148.5342	163.5944
19	150.4600	165.7800	67	149.8926	165.1686	115	148.4895	163.5390
20	150.4500	165.7667	68	149.8704	165.1444	116	148.4448	163.4836
21	150.4400	165.7533	69	149.8482	165.1202	117	148.4001	163.4282
22	150.4300	165.7400	70	149.8260	165.0960	118	148.3554	163.3728
23	150.4200	165.7267	71	149.8038	165.0718	119	148.3107	163.3174
24	150.4100	165.7133	72	149.7816	165.0476	120	148.2660	163.2620
[redacted]			73	149.7594	165.0234	121	148.2213	163.2066
26	150.3948	165.6867	74	149.7372	164.9992	122	148.1766	163.1512
27	150.3896	165.6733	75	149.7150	164.9750	123	148.1319	163.0958
28	150.3844	165.6600	76	149.6928	164.9508	124	148.0872	163.0404
29	150.3792	165.6467	77	149.6706	164.9266	125	148.0425	162.9850
30	150.3740	165.6333	78	149.6484	164.9024	126	147.9978	162.9296
31	150.3688	165.6200	79	149.6262	164.8782	127	147.9531	162.8742
32	150.3636	165.6067	80	149.6040	164.8540	128	147.9084	162.8188
33	150.3584	165.5933	81	149.5818	164.8298	129	147.8637	162.7634
34	150.3532	165.5800	82	149.5596	164.8056	130	147.8190	162.7080
35	150.3480	165.5667	83	149.5374	164.7814	131	147.7743	162.6526
36	150.3428	165.5533	84	149.5152	164.7572	132	147.7296	162.5972
37	150.3376	165.5400	85	149.4930	164.7330	133	147.6849	162.5418
38	150.3324	165.5267	86	149.4708	164.7088	134	147.6402	162.4864
39	150.3272	165.5133	87	149.4486	164.6846	135	147.5955	162.4310
40	150.3220	165.5000	88	149.4264	164.6604	136	147.5508	162.3756
41	150.3168	165.4867	89	149.4042	164.6362	137	147.5061	162.3202
42	150.3116	165.4733	90	149.3820	164.6120	138	147.4614	162.2648
43	150.3064	165.4600	91	149.3598	164.5878	139	147.4167	162.2094
44	150.3012	165.4467	92	149.3376	164.5636	140	147.3720	162.1540
45	150.2960	165.4333	93	149.3154	164.5394	141	147.3273	162.0986
46	150.2908	165.4200	94	149.2932	164.5152	142	147.2826	162.0432
47	150.2856	165.4067	95	149.2710	164.4910	143	147.2379	161.9878

	IBW, ppm/%dk/k			IBW, ppm/%dk/k			IBW, ppm/%dk/k	
EFPD	HZP	HFP	EFPD	HZP	HFP	EFPD	HZP	HFP
144	147.1932	161.9324	192	145.0476	159.2732	240	142.9020	156.6140
145	147.1485	161.8770	193	145.0029	159.2178	241	142.8573	156.5586
146	147.1038	161.8216	194	144.9582	159.1624	242	142.8126	156.5032
147	147.0591	161.7662	195	144.9135	159.1070	243	142.7679	156.4478
148	147.0144	161.7108	196	144.8688	159.0516	244	142.7232	156.3924
149	146.9697	161.6554	197	144.8241	158.9962	245	142.6785	156.3370
150	146.9250	161.6000	198	144.7794	158.9408	246	142.6338	156.2816
151	146.8803	161.5446	199	144.7347	158.8854	247	142.5891	156.2262
152	146.8356	161.4892	200	144.6900	158.8300	248	142.5444	156.1708
153	146.7909	161.4338	201	144.6453	158.7746	249	142.4997	156.1154
154	146.7462	161.3784	202	144.6006	158.7192	250	142.4550	156.0600
155	146.7015	161.3230	203	144.5559	158.6638	251	142.4103	156.0046
156	146.6568	161.2676	204	144.5112	158.6084	252	142.3656	155.9492
157	146.6121	161.2122	205	144.4665	158.5530	253	142.3209	155.8938
158	146.5674	161.1568	206	144.4218	158.4976	254	142.2762	155.8384
159	146.5227	161.1014	207	144.3771	158.4422	255	142.2315	155.7830
160	146.4780	161.0460	208	144.3324	158.3868	256	142.1868	155.7276
161	146.4333	160.9906	209	144.2877	158.3314	257	142.1421	155.6722
162	146.3886	160.9352	210	144.2430	158.2760	258	142.0974	155.6168
163	146.3439	160.8798	211	144.1983	158.2206	259	142.0527	155.5614
164	146.2992	160.8244	212	144.1536	158.1652	260	142.0080	155.5060
165	146.2545	160.7690	213	144.1089	158.1098	261	141.9633	155.4506
166	146.2098	160.7136	214	144.0642	158.0544	262	141.9186	155.3952
167	146.1651	160.6582	215	144.0195	157.9990	263	141.8739	155.3398
168	146.1204	160.6028	216	143.9748	157.9436	264	141.8292	155.2844
169	146.0757	160.5474	217	143.9301	157.8882	265	141.7845	155.2290
170	146.0310	160.4920	218	143.8854	157.8328	266	141.7398	155.1736
171	145.9863	160.4366	219	143.8407	157.7774	267	141.6951	155.1182
172	145.9416	160.3812	220	143.7960	157.7220	268	141.6504	155.0628
173	145.8969	160.3258	221	143.7513	157.6666	269	141.6057	155.0074
174	145.8522	160.2704	222	143.7066	157.6112	270	141.5610	154.9520
175	145.8075	160.2150	223	143.6619	157.5558	271	141.5163	154.8966
176	145.7628	160.1596	224	143.6172	157.5004	272	141.4716	154.8412
177	145.7181	160.1042	225	143.5725	157.4450	273	141.4269	154.7858
178	145.6734	160.0488	226	143.5278	157.3896	274	141.3822	154.7304
179	145.6287	159.9934	227	143.4831	157.3342	275	141.3375	154.6750
180	145.5840	159.9380	228	143.4384	157.2788	276	141.2928	154.6196
181	145.5393	159.8826	229	143.3937	157.2234	277	141.2481	154.5642
182	145.4946	159.8272	230	143.3490	157.1680	278	141.2034	154.5088
183	145.4499	159.7718	231	143.3043	157.1126	279	141.1587	154.4534
184	145.4052	159.7164	232	143.2596	157.0572	280	141.1140	154.3980
185	145.3605	159.6610	233	143.2149	157.0018	281	141.0693	154.3426
186	145.3158	159.6056	234	143.1702	156.9464	282	141.0246	154.2872
187	145.2711	159.5502	235	143.1255	156.8910	283	140.9799	154.2318
188	145.2264	159.4948	236	143.0808	156.8356	284	140.9352	154.1764
189	145.1817	159.4394	237	143.0361	156.7802	285	140.8905	154.1210
190	145.1370	159.3840	238	142.9914	156.7248	286	140.8458	154.0656
191	145.0923	159.3286	239	142.9467	156.6694	287	140.8011	154.0102

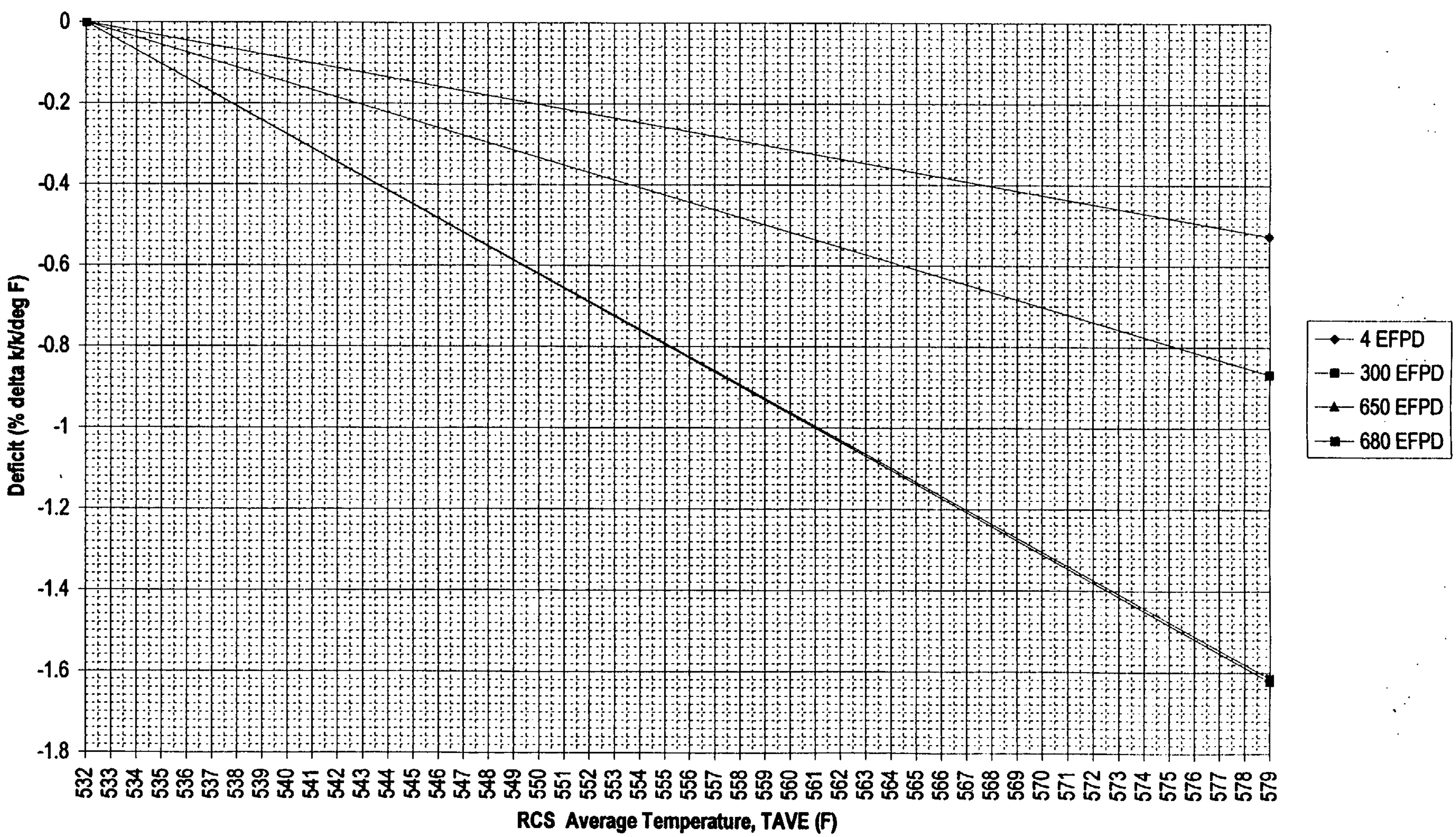
	IBW, ppm/%dk/k			IBW, ppm/%dk/k			IBW, ppm/%dk/k	
EFPD	HZP	HFP	EFPD	HZP	HFP	EFPD	HZP	HFP
288	140.7564	153.9548	336	138.6108	151.2956	384	136.4652	148.6364
289	140.7117	153.8994	337	138.5661	151.2402	385	136.4205	148.5810
290	140.6670	153.8440	338	138.5214	151.1848	386	136.3758	148.5256
291	140.6223	153.7886	339	138.4767	151.1294	387	136.3311	148.4702
292	140.5776	153.7332	340	138.4320	151.0740	388	136.2864	148.4148
293	140.5329	153.6778	341	138.3873	151.0186	389	136.2417	148.3594
294	140.4882	153.6224	342	138.3426	150.9632	390	136.1970	148.3040
295	140.4435	153.5670	343	138.2979	150.9078	391	136.1523	148.2486
296	140.3988	153.5116	344	138.2532	150.8524	392	136.1076	148.1932
297	140.3541	153.4562	345	138.2085	150.7970	393	136.0629	148.1378
298	140.3094	153.4008	346	138.1638	150.7416	394	136.0182	148.0824
299	140.2647	153.3454	347	138.1191	150.6862	395	135.9735	148.0270
300	140.2200	153.2900	348	138.0744	150.6308	396	135.9288	147.9716
301	140.1753	153.2346	349	138.0297	150.5754	397	135.8841	147.9162
302	140.1306	153.1792	350	137.9850	150.5200	398	135.8394	147.8608
303	140.0859	153.1238	351	137.9403	150.4646	399	135.7947	147.8054
304	140.0412	153.0684	352	137.8956	150.4092	[redacted]		
305	139.9965	153.0130	353	137.8509	150.3538	401	135.6889	147.6733
306	139.9518	152.9576	354	137.8062	150.2984	402	135.6278	147.5966
307	139.9071	152.9022	355	137.7615	150.2430	403	135.5667	147.5199
308	139.8624	152.8468	356	137.7168	150.1876	404	135.5056	147.4432
309	139.8177	152.7914	357	137.6721	150.1322	405	135.4445	147.3665
310	139.7730	152.7360	358	137.6274	150.0768	406	135.3834	147.2898
311	139.7283	152.6806	359	137.5827	150.0214	407	135.3223	147.2131
312	139.6836	152.6252	360	137.5380	149.9660	408	135.2612	147.1364
313	139.6389	152.5698	361	137.4933	149.9106	409	135.2001	147.0597
314	139.5942	152.5144	362	137.4486	149.8552	410	135.1390	146.9830
315	139.5495	152.4590	363	137.4039	149.7998	411	135.0779	146.9063
316	139.5048	152.4036	364	137.3592	149.7444	412	135.0168	146.8296
317	139.4601	152.3482	365	137.3145	149.6890	413	134.9557	146.7529
318	139.4154	152.2928	366	137.2698	149.6336	414	134.8946	146.6762
319	139.3707	152.2374	367	137.2251	149.5782	415	134.8335	146.5995
320	139.3260	152.1820	368	137.1804	149.5228	416	134.7724	146.5228
321	139.2813	152.1266	369	137.1357	149.4674	417	134.7113	146.4461
322	139.2366	152.0712	370	137.0910	149.4120	418	134.6502	146.3694
323	139.1919	152.0158	371	137.0463	149.3566	419	134.5891	146.2927
324	139.1472	151.9604	372	137.0016	149.3012	420	134.5280	146.2160
325	139.1025	151.9050	373	136.9569	149.2458	421	134.4669	146.1393
326	139.0578	151.8496	374	136.9122	149.1904	422	134.4058	146.0626
327	139.0131	151.7942	375	136.8675	149.1350	423	134.3447	145.9859
328	138.9684	151.7388	376	136.8228	149.0796	424	134.2836	145.9092
329	138.9237	151.6834	377	136.7781	149.0242	425	134.2225	145.8325
330	138.8790	151.6280	378	136.7334	148.9688	426	134.1614	145.7558
331	138.8343	151.5726	379	136.6887	148.9134	427	134.1003	145.6791
332	138.7896	151.5172	380	136.6440	148.8580	428	134.0392	145.6024
333	138.7449	151.4618	381	136.5993	148.8026	429	133.9781	145.5257
334	138.7002	151.4064	382	136.5546	148.7472	430	133.9170	145.4490
335	138.6555	151.3510	383	136.5099	148.6918	431	133.8559	145.3723

	IBW, ppm/%dk/k			IBW, ppm/%dk/k			IBW, ppm/%dk/k	
EFPD	HZP	HFP	EFPD	HZP	HFP	EFPD	HZP	HFP
432	133.7948	145.2956	480	130.8620	141.6140	528	127.9292	137.9324
433	133.7337	145.2189	481	130.8009	141.5373	529	127.8681	137.8557
434	133.6726	145.1422	482	130.7398	141.4606	530	127.8070	137.7790
435	133.6115	145.0655	483	130.6787	141.3839	531	127.7459	137.7023
436	133.5504	144.9888	484	130.6176	141.3072	532	127.6848	137.6256
437	133.4893	144.9121	485	130.5565	141.2305	533	127.6237	137.5489
438	133.4282	144.8354	486	130.4954	141.1538	534	127.5626	137.4722
439	133.3671	144.7587	487	130.4343	141.0771	535	127.5015	137.3955
440	133.3060	144.6820	488	130.3732	141.0004	536	127.4404	137.3188
441	133.2449	144.6053	489	130.3121	140.9237	537	127.3793	137.2421
442	133.1838	144.5286	490	130.2510	140.8470	538	127.3182	137.1654
443	133.1227	144.4519	491	130.1899	140.7703	539	127.2571	137.0887
444	133.0616	144.3752	492	130.1288	140.6936	540	127.1960	137.0120
445	133.0005	144.2985	493	130.0677	140.6169	541	127.1349	136.9353
446	132.9394	144.2218	494	130.0066	140.5402	542	127.0738	136.8586
447	132.8783	144.1451	495	129.9455	140.4635	543	127.0127	136.7819
448	132.8172	144.0684	496	129.8844	140.3868	544	126.9516	136.7052
449	132.7561	143.9917	497	129.8233	140.3101	545	126.8905	136.6285
450	132.6950	143.9150	498	129.7622	140.2334	546	126.8294	136.5518
451	132.6339	143.8383	499	129.7011	140.1567	547	126.7683	136.4751
452	132.5728	143.7616	500	129.6400	140.0800	548	126.7072	136.3984
453	132.5117	143.6849	501	129.5789	140.0033	549	126.6461	136.3217
454	132.4506	143.6082	502	129.5178	139.9266	550	126.5850	136.2450
455	132.3895	143.5315	503	129.4567	139.8499	551	126.5239	136.1683
456	132.3284	143.4548	504	129.3956	139.7732	552	126.4628	136.0916
457	132.2673	143.3781	505	129.3345	139.6965	553	126.4017	136.0149
458	132.2062	143.3014	506	129.2734	139.6198	554	126.3406	135.9382
459	132.1451	143.2247	507	129.2123	139.5431	555	126.2795	135.8615
460	132.0840	143.1480	508	129.1512	139.4664	556	126.2184	135.7848
461	132.0229	143.0713	509	129.0901	139.3897	557	126.1573	135.7081
462	131.9618	142.9946	510	129.0290	139.3130	558	126.0962	135.6314
463	131.9007	142.9179	511	128.9679	139.2363	559	126.0351	135.5547
464	131.8396	142.8412	512	128.9068	139.1596	560	125.9740	135.4780
465	131.7785	142.7645	513	128.8457	139.0829	561	125.9129	135.4013
466	131.7174	142.6878	514	128.7846	139.0062	562	125.8518	135.3246
467	131.6563	142.6111	515	128.7235	138.9295	563	125.7907	135.2479
468	131.5952	142.5344	516	128.6624	138.8528	564	125.7296	135.1712
469	131.5341	142.4577	517	128.6013	138.7761	565	125.6685	135.0945
470	131.4730	142.3810	518	128.5402	138.6994	566	125.6074	135.0178
471	131.4119	142.3043	519	128.4791	138.6227	567	125.5463	134.9411
472	131.3508	142.2276	520	128.4180	138.5460	568	125.4852	134.8644
473	131.2897	142.1509	521	128.3569	138.4693	569	125.4241	134.7877
474	131.2286	142.0742	522	128.2958	138.3926	570	125.3630	134.7110
475	131.1675	141.9975	523	128.2347	138.3159	571	125.3019	134.6343
476	131.1064	141.9208	524	128.1736	138.2392	572	125.2408	134.5576
477	131.0453	141.8441	525	128.1125	138.1625	573	125.1797	134.4809
478	130.9842	141.7674	526	128.0514	138.0858	574	125.1186	134.4042
479	130.9231	141.6907	527	127.9903	138.0091	575	125.0575	134.3275

	IBW, ppm/%dk/k			IBW, ppm/%dk/k			IBW, ppm/%dk/k		
EFPD	HZP	HFP	EFPD	HZP	HFP	EFPD	HZP	HFP	
576	124.9964	134.2508	624	121.9556	130.3604	671	118.8480	126.6710	APSRs Out
577	124.9353	134.1741	625	121.8900	130.2750	672	118.7827	126.5987	APSRs Out
578	124.8742	134.0974	626	121.8244	130.1896	673	118.7173	126.5263	APSRs Out
579	124.8131	134.0207	627	121.7588	130.1042	674	118.6520	126.4540	APSRs Out
580	124.7520	133.9440	628	121.6932	130.0188	675	118.5867	126.3817	APSRs Out
581	124.6909	133.8673	629	121.6276	129.9334	676	118.5213	126.3093	APSRs Out
582	124.6298	133.7906	630	121.5620	129.8480	677	118.4560	126.2370	APSRs Out
583	124.5687	133.7139	631	121.4964	129.7626	678	118.3907	126.1647	APSRs Out
584	124.5076	133.6372	632	121.4308	129.6772	679	118.3253	126.0923	APSRs Out
585	124.4465	133.5605	633	121.3652	129.5918	[redacted]			
586	124.3854	133.4838	634	121.2996	129.5064				
587	124.3243	133.4071	635	121.2340	129.4210				
588	124.2632	133.3304	636	121.1684	129.3356				
589	124.2021	133.2537	637	121.1028	129.2502				
590	124.1410	133.1770	638	121.0372	129.1648				
591	124.0799	133.1003	639	120.9716	129.0794				
592	124.0188	133.0236	640	120.9060	128.9940				
593	123.9577	132.9469	641	120.8404	128.9086				
594	123.8966	132.8702	642	120.7748	128.8232				
595	123.8355	132.7935	643	120.7092	128.7378				
596	123.7744	132.7168	644	120.6436	128.6524				
597	123.7133	132.6401	645	120.5780	128.5670				
598	123.6522	132.5634	646	120.5124	128.4816				
599	123.5911	132.4867	647	120.4468	128.3962				
[redacted]			648	120.3812	128.3108				
601	123.4644	132.3246	649	120.3156	128.2254				
602	123.3988	132.2392	[redacted]						
603	123.3332	132.1538				APSRs Out			
604	123.2676	132.0684	651	120.1547	128.1177	APSRs Out			
605	123.2020	131.9830	652	120.0893	128.0453	APSRs Out			
606	123.1364	131.8976	653	120.0240	127.9730	APSRs Out			
607	123.0708	131.8122	654	119.9587	127.9007	APSRs Out			
608	123.0052	131.7268	655	119.8933	127.8283	APSRs Out			
609	122.9396	131.6414	656	119.8280	127.7560	APSRs Out			
610	122.8740	131.5560	657	119.7627	127.6837	APSRs Out			
611	122.8084	131.4706	658	119.6973	127.6113	APSRs Out			
612	122.7428	131.3852	659	119.6320	127.5390	APSRs Out			
613	122.6772	131.2998	660	119.5667	127.4667	APSRs Out			
614	122.6116	131.2144	661	119.5013	127.3943	APSRs Out			
615	122.5460	131.1290	662	119.4360	127.3220	APSRs Out			
616	122.4804	131.0436	663	119.3707	127.2497	APSRs Out			
617	122.4148	130.9582	664	119.3053	127.1773	APSRs Out			
618	122.3492	130.8728	665	119.2400	127.1050	APSRs Out			
619	122.2836	130.7874	666	119.1747	127.0327	APSRs Out			
620	122.2180	130.7020	667	119.1093	126.9603	APSRs Out			
621	122.1524	130.6166	668	119.0440	126.8880	APSRs Out			
622	122.0868	130.5312	669	118.9787	126.8157	APSRs Out			
623	122.0212	130.4458	670	118.9133	126.7433	APSRs Out			

RCS Temperature and Power Deficit from Hot Zero Power

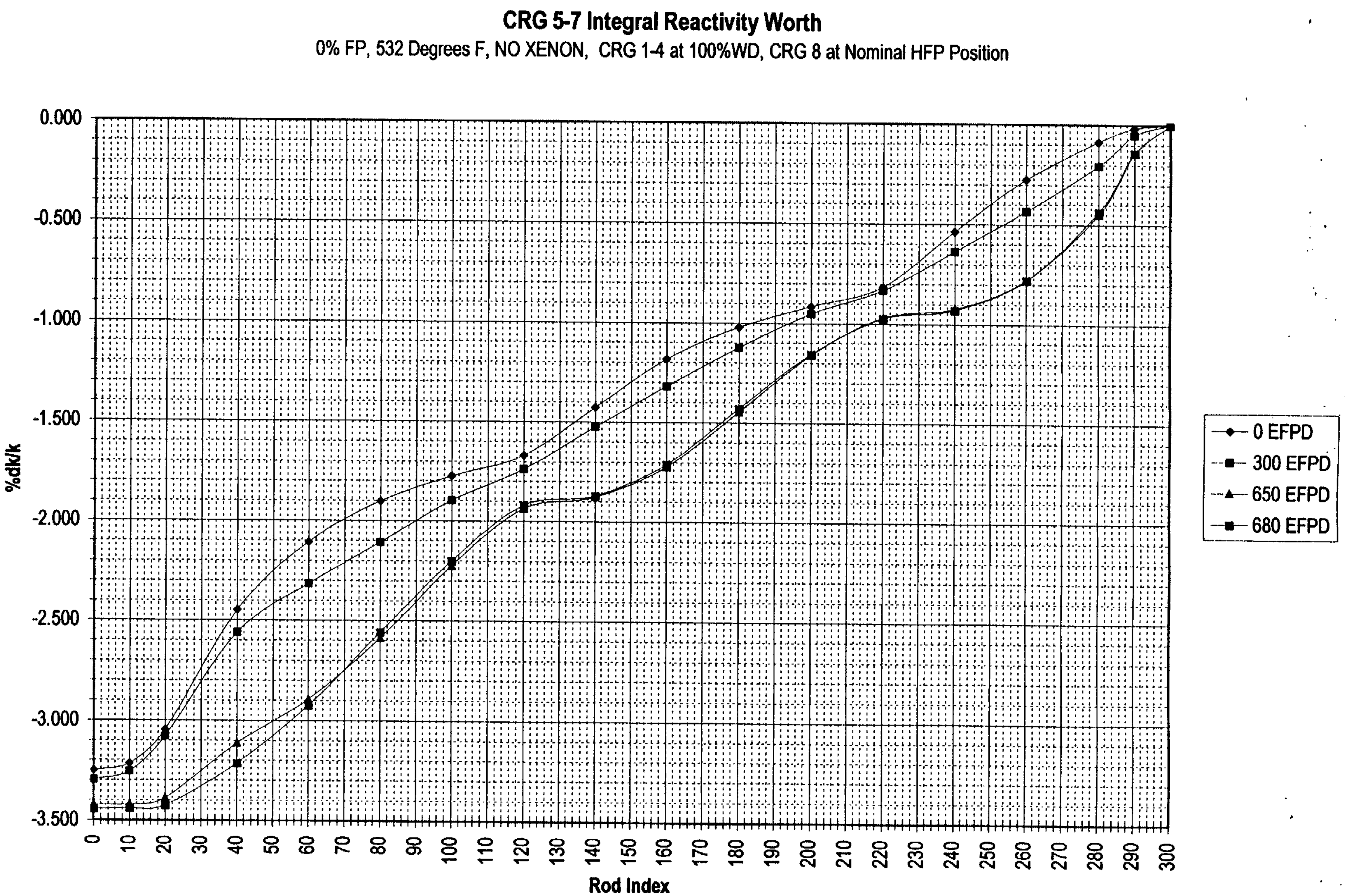
CRG 1-7 at 100% WD, CRG 8 at HFP Nominal Position, Eq Xe, HFP Sm



RCS	Deficit, %dk/k			
Temperature	4 EFPD	300 EFPD	650 EFPD	680 EFPD
F				(Note 2)
533	-0.0112	-0.0185	-0.0345	-0.0344
534	-0.0224	-0.0369	-0.0691	-0.0687
535	-0.0336	-0.0554	-0.1036	-0.1031
536	-0.0448	-0.0739	-0.1381	-0.1374
537	-0.0560	-0.0923	-0.1727	-0.1718
538	-0.0671	-0.1108	-0.2072	-0.2062
539	-0.0783	-0.1293	-0.2417	-0.2405
540	-0.0895	-0.1477	-0.2763	-0.2749
541	-0.1007	-0.1662	-0.3108	-0.3093
542	-0.1119	-0.1847	-0.3453	-0.3436
543	-0.1231	-0.2031	-0.3799	-0.3780
544	-0.1343	-0.2216	-0.4144	-0.4123
545	-0.1455	-0.2401	-0.4489	-0.4467
546	-0.1567	-0.2586	-0.4834	-0.4811
547	-0.1679	-0.2770	-0.5180	-0.5154
548	-0.1791	-0.2955	-0.5525	-0.5498
549	-0.1903	-0.3140	-0.5870	-0.5841
550	-0.2014	-0.3324	-0.6216	-0.6185
551	-0.2126	-0.3509	-0.6561	-0.6529
552	-0.2238	-0.3694	-0.6906	-0.6872
553	-0.2350	-0.3878	-0.7252	-0.7216
554	-0.2462	-0.4063	-0.7597	-0.7560
555	-0.2574	-0.4248	-0.7942	-0.7903
556	-0.2686	-0.4432	-0.8288	-0.8247
557	-0.2798	-0.4617	-0.8633	-0.8590
558	-0.2910	-0.4802	-0.8978	-0.8934
559	-0.3022	-0.4986	-0.9324	-0.9278
560	-0.3134	-0.5171	-0.9669	-0.9621
561	-0.3246	-0.5356	-1.0014	-0.9965
562	-0.3357	-0.5540	-1.0360	-1.0309
563	-0.3469	-0.5725	-1.0705	-1.0652
564	-0.3581	-0.5910	-1.1050	-1.0996
565	-0.3693	-0.6094	-1.1396	-1.1339
566	-0.3805	-0.6279	-1.1741	-1.1683
567	-0.3917	-0.6464	-1.2086	-1.2027
568	-0.4029	-0.6649	-1.2431	-1.2370
569	-0.4141	-0.6833	-1.2777	-1.2714
570	-0.4253	-0.7018	-1.3122	-1.3057
571	-0.4365	-0.7203	-1.3467	-1.3401
572	-0.4477	-0.7387	-1.3813	-1.3745
573	-0.4589	-0.7572	-1.4158	-1.4088
574	-0.4700	-0.7757	-1.4503	-1.4432
575	-0.4812	-0.7941	-1.4849	-1.4776
576	-0.4924	-0.8126	-1.5194	-1.5119
577	-0.5036	-0.8311	-1.5539	-1.5463
578	-0.5148	-0.8495	-1.5885	-1.5806

(1) It is permissible to interpolate between EFPD ranges.
(2) CRG-8 at 100% wd.

Curves 8 and 8A are for 0%FP. The "8" set of curves are for Xenon-free startups and "8A" set of curves are for peak Xenon startups. If core average Xenon (as determined from SAXON) is less than 25% of 100% FP equilibrium Xenon and is decreasing, then use the Xenon-free set of curves. If Xenon exceeds 25% of 100% equilibrium Xenon or is increasing, use the peak Xenon curves.


CRG 5-7 Integral Reactivity Worth
0% FP, 532 Degrees F, NO XENON, CRG 1-4 at 100%WD, CRG 8 at Nominal HFP Position
0.000
-0.500
-1.000
-1.500
-2.000
-2.500
-3.000
-3.500
%dk/k
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
Rod Index
0 EFPD
300 EFPD
650 EFPD
680 EFPD

Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k					Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD		%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
0	-3.250	-3.296	-3.422	-3.443		48	-2.287	-2.447	-3.018	-3.097
1	-3.249	-3.295	-3.422	-3.443		49	-2.270	-2.434	-3.007	-3.082
2	-3.248	-3.293	-3.421	-3.443		50	-2.253	-2.422	-2.997	-3.068
3	-3.246	-3.290	-3.421	-3.443		51	-2.236	-2.410	-2.987	-3.054
4	-3.245	-3.288	-3.421	-3.442		52	-2.221	-2.399	-2.977	-3.041
5	-3.242	-3.285	-3.420	-3.442		53	-2.205	-2.388	-2.967	-3.027
6	-3.239	-3.281	-3.420	-3.442		54	-2.190	-2.377	-2.957	-3.013
7	-3.235	-3.276	-3.420	-3.442		55	-2.175	-2.367	-2.947	-2.999
8	-3.230	-3.271	-3.419	-3.441		56	-2.161	-2.356	-2.937	-2.985
9	-3.224	-3.264	-3.419	-3.441		57	-2.147	-2.346	-2.926	-2.970
10	-3.217	-3.256	-3.419	-3.440		58	-2.133	-2.336	-2.916	-2.955
11	-3.208	-3.247	-3.418	-3.440		59	-2.120	-2.326	-2.905	-2.940
12	-3.198	-3.236	-3.418	-3.439		60	-2.107	-2.316	-2.893	-2.924
13	-3.187	-3.224	-3.417	-3.438		61	-2.093	-2.305	-2.881	-2.907
14	-3.173	-3.209	-3.416	-3.437		62	-2.080	-2.295	-2.868	-2.889
15	-3.158	-3.193	-3.414	-3.436		63	-2.067	-2.284	-2.854	-2.871
16	-3.140	-3.175	-3.411	-3.434		64	-2.054	-2.273	-2.839	-2.851
17	-3.120	-3.155	-3.407	-3.432		65	-2.041	-2.261	-2.823	-2.831
18	-3.098	-3.132	-3.402	-3.430		66	-2.028	-2.249	-2.806	-2.810
19	-3.074	-3.107	-3.396	-3.427		67	-2.016	-2.237	-2.789	-2.788
20	-3.047	-3.080	-3.388	-3.423		68	-2.003	-2.225	-2.772	-2.766
21	-3.018	-3.050	-3.378	-3.419		69	-1.991	-2.213	-2.754	-2.744
22	-2.988	-3.020	-3.368	-3.414		70	-1.980	-2.202	-2.736	-2.723
23	-2.956	-2.988	-3.356	-3.408		71	-1.969	-2.190	-2.719	-2.701
24	-2.923	-2.955	-3.344	-3.402		72	-1.958	-2.179	-2.701	-2.681
25	-2.889	-2.922	-3.331	-3.395		73	-1.948	-2.168	-2.685	-2.661
26	-2.855	-2.890	-3.317	-3.388		74	-1.939	-2.158	-2.669	-2.643
27	-2.821	-2.857	-3.303	-3.380		75	-1.931	-2.148	-2.654	-2.626
28	-2.787	-2.826	-3.288	-3.370		76	-1.924	-2.139	-2.639	-2.610
29	-2.753	-2.795	-3.273	-3.361		77	-1.918	-2.131	-2.626	-2.596
30	-2.721	-2.767	-3.258	-3.350		78	-1.912	-2.123	-2.613	-2.583
31	-2.689	-2.740	-3.243	-3.338		79	-1.907	-2.115	-2.601	-2.570
32	-2.659	-2.715	-3.228	-3.326		80	-1.901	-2.107	-2.588	-2.557
33	-2.629	-2.691	-3.213	-3.313		81	-1.896	-2.099	-2.575	-2.544
34	-2.601	-2.669	-3.198	-3.300		82	-1.891	-2.090	-2.561	-2.530
35	-2.573	-2.648	-3.183	-3.286		83	-1.885	-2.081	-2.546	-2.515
36	-2.546	-2.629	-3.169	-3.272		84	-1.879	-2.071	-2.530	-2.499
37	-2.521	-2.610	-3.154	-3.257		85	-1.872	-2.061	-2.514	-2.483
38	-2.496	-2.593	-3.140	-3.243		86	-1.866	-2.051	-2.496	-2.466
39	-2.472	-2.576	-3.127	-3.228		87	-1.860	-2.040	-2.479	-2.449
40	-2.448	-2.560	-3.113	-3.213		88	-1.853	-2.029	-2.461	-2.431
41	-2.426	-2.544	-3.100	-3.198		89	-1.846	-2.018	-2.442	-2.413
42	-2.404	-2.529	-3.087	-3.183		90	-1.839	-2.007	-2.423	-2.394
43	-2.383	-2.514	-3.075	-3.168		91	-1.833	-1.995	-2.403	-2.375
44	-2.363	-2.500	-3.063	-3.154		92	-1.826	-1.984	-2.384	-2.356
45	-2.343	-2.486	-3.051	-3.139		93	-1.819	-1.973	-2.364	-2.336
46	-2.324	-2.473	-3.040	-3.125		94	-1.812	-1.961	-2.344	-2.317
47	-2.305	-2.459	-3.029	-3.111		95	-1.806	-1.950	-2.324	-2.297

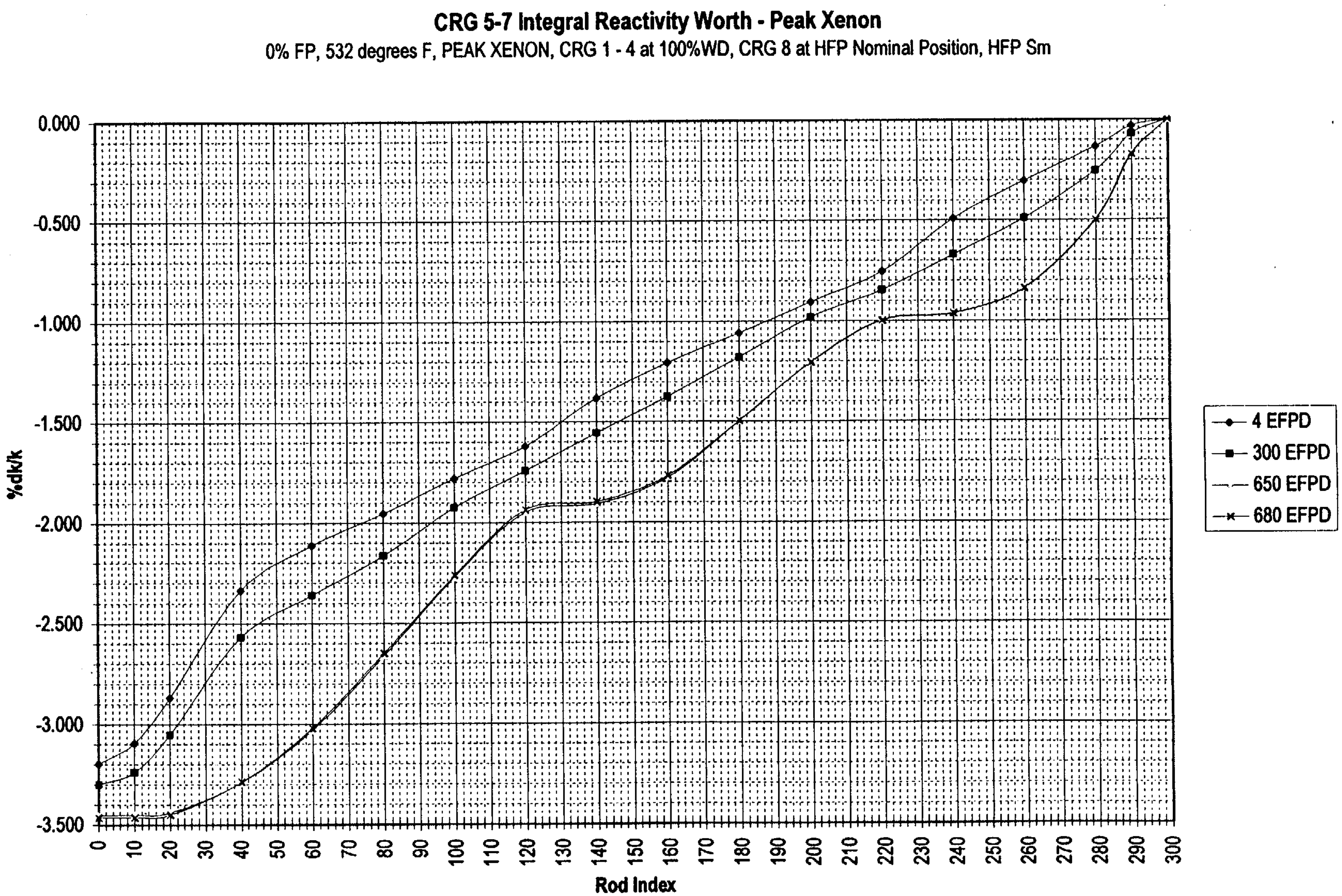
Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
96	-1.799	-1.939	-2.304	-2.277
97	-1.793	-1.928	-2.284	-2.258
98	-1.787	-1.917	-2.264	-2.238
99	-1.781	-1.907	-2.244	-2.219
100	-1.775	-1.896	-2.224	-2.200
101	-1.770	-1.887	-2.205	-2.181
102	-1.765	-1.877	-2.186	-2.162
103	-1.760	-1.868	-2.167	-2.144
104	-1.755	-1.860	-2.149	-2.126
105	-1.751	-1.851	-2.132	-2.109
106	-1.746	-1.843	-2.114	-2.092
107	-1.742	-1.836	-2.097	-2.075
108	-1.737	-1.828	-2.081	-2.060
109	-1.733	-1.820	-2.065	-2.044
110	-1.728	-1.813	-2.050	-2.029
111	-1.724	-1.806	-2.035	-2.015
112	-1.719	-1.798	-2.021	-2.001
113	-1.714	-1.791	-2.008	-1.988
114	-1.709	-1.784	-1.995	-1.976
115	-1.703	-1.776	-1.983	-1.965
116	-1.697	-1.769	-1.972	-1.954
117	-1.691	-1.761	-1.962	-1.944
118	-1.685	-1.753	-1.952	-1.934
119	-1.677	-1.745	-1.943	-1.926
120	-1.670	-1.737	-1.935	-1.918
121	-1.662	-1.729	-1.928	-1.911
122	-1.653	-1.720	-1.922	-1.906
123	-1.644	-1.711	-1.917	-1.901
124	-1.634	-1.702	-1.913	-1.897
125	-1.624	-1.692	-1.909	-1.894
126	-1.613	-1.682	-1.906	-1.891
127	-1.601	-1.671	-1.904	-1.889
128	-1.589	-1.661	-1.903	-1.888
129	-1.577	-1.650	-1.901	-1.887
130	-1.564	-1.639	-1.900	-1.887
131	-1.551	-1.628	-1.899	-1.886
132	-1.538	-1.616	-1.898	-1.885
133	-1.524	-1.605	-1.897	-1.885
134	-1.510	-1.594	-1.896	-1.884
135	-1.496	-1.582	-1.894	-1.883
136	-1.482	-1.571	-1.892	-1.881
137	-1.468	-1.559	-1.889	-1.879
138	-1.454	-1.548	-1.886	-1.876
139	-1.441	-1.536	-1.882	-1.872
140	-1.427	-1.525	-1.877	-1.869
141	-1.413	-1.514	-1.873	-1.865
142	-1.399	-1.502	-1.868	-1.860
143	-1.385	-1.491	-1.862	-1.855

Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
144	-1.372	-1.480	-1.856	-1.849
145	-1.358	-1.469	-1.850	-1.844
146	-1.345	-1.459	-1.844	-1.837
147	-1.332	-1.448	-1.837	-1.831
148	-1.319	-1.438	-1.830	-1.824
149	-1.307	-1.428	-1.823	-1.817
150	-1.294	-1.418	-1.816	-1.809
151	-1.282	-1.408	-1.808	-1.801
152	-1.270	-1.398	-1.800	-1.793
153	-1.259	-1.388	-1.792	-1.784
154	-1.247	-1.378	-1.783	-1.775
155	-1.236	-1.368	-1.774	-1.766
156	-1.225	-1.359	-1.765	-1.756
157	-1.214	-1.349	-1.755	-1.745
158	-1.204	-1.339	-1.745	-1.735
159	-1.193	-1.330	-1.734	-1.723
160	-1.183	-1.320	-1.723	-1.712
161	-1.173	-1.310	-1.711	-1.700
162	-1.164	-1.300	-1.700	-1.687
163	-1.154	-1.290	-1.687	-1.675
164	-1.145	-1.281	-1.675	-1.662
165	-1.136	-1.271	-1.662	-1.648
166	-1.127	-1.261	-1.649	-1.635
167	-1.119	-1.251	-1.636	-1.621
168	-1.110	-1.241	-1.622	-1.607
169	-1.102	-1.231	-1.608	-1.593
170	-1.094	-1.221	-1.594	-1.578
171	-1.086	-1.212	-1.580	-1.563
172	-1.078	-1.202	-1.565	-1.549
173	-1.070	-1.192	-1.551	-1.534
174	-1.063	-1.182	-1.536	-1.519
175	-1.056	-1.172	-1.521	-1.504
176	-1.049	-1.163	-1.506	-1.489
177	-1.042	-1.153	-1.491	-1.474
178	-1.035	-1.143	-1.476	-1.459
179	-1.028	-1.133	-1.461	-1.444
180	-1.021	-1.124	-1.446	-1.429
181	-1.015	-1.114	-1.431	-1.414
182	-1.009	-1.105	-1.416	-1.399
183	-1.002	-1.095	-1.401	-1.385
184	-0.996	-1.086	-1.386	-1.370
185	-0.990	-1.076	-1.371	-1.356
186	-0.984	-1.067	-1.356	-1.342
187	-0.979	-1.058	-1.341	-1.327
188	-0.973	-1.049	-1.326	-1.313
189	-0.967	-1.040	-1.312	-1.299
190	-0.962	-1.031	-1.297	-1.286
191	-0.957	-1.022	-1.283	-1.272

Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
192	-0.952	-1.013	-1.269	-1.259
193	-0.947	-1.005	-1.255	-1.245
194	-0.942	-0.997	-1.241	-1.232
195	-0.937	-0.989	-1.227	-1.219
196	-0.933	-0.981	-1.213	-1.206
197	-0.928	-0.973	-1.200	-1.193
198	-0.924	-0.966	-1.186	-1.181
199	-0.920	-0.959	-1.173	-1.168
200	-0.916	-0.952	-1.160	-1.156
201	-0.912	-0.946	-1.147	-1.144
202	-0.908	-0.939	-1.135	-1.132
203	-0.904	-0.933	-1.123	-1.121
204	-0.901	-0.927	-1.111	-1.109
205	-0.897	-0.921	-1.099	-1.098
206	-0.893	-0.916	-1.088	-1.087
207	-0.890	-0.910	-1.076	-1.076
208	-0.886	-0.905	-1.066	-1.066
209	-0.882	-0.899	-1.055	-1.056
210	-0.877	-0.894	-1.045	-1.046
211	-0.873	-0.888	-1.035	-1.037
212	-0.868	-0.883	-1.026	-1.028
213	-0.863	-0.877	-1.017	-1.019
214	-0.857	-0.871	-1.009	-1.011
215	-0.851	-0.866	-1.001	-1.004
216	-0.845	-0.860	-0.993	-0.996
217	-0.838	-0.853	-0.986	-0.990
218	-0.831	-0.847	-0.980	-0.983
219	-0.823	-0.840	-0.974	-0.978
220	-0.814	-0.833	-0.969	-0.973
221	-0.805	-0.826	-0.964	-0.968
222	-0.795	-0.818	-0.960	-0.964
223	-0.784	-0.810	-0.956	-0.961
224	-0.773	-0.802	-0.953	-0.958
225	-0.761	-0.793	-0.950	-0.955
226	-0.748	-0.784	-0.948	-0.954
227	-0.734	-0.774	-0.947	-0.952
228	-0.720	-0.764	-0.945	-0.951
229	-0.706	-0.754	-0.944	-0.950
230	-0.691	-0.744	-0.943	-0.949
231	-0.676	-0.734	-0.942	-0.948
232	-0.661	-0.723	-0.941	-0.948
233	-0.645	-0.712	-0.940	-0.947
234	-0.630	-0.701	-0.938	-0.945
235	-0.614	-0.690	-0.937	-0.944
236	-0.598	-0.680	-0.935	-0.942
237	-0.582	-0.669	-0.932	-0.940
238	-0.567	-0.658	-0.929	-0.937
239	-0.551	-0.647	-0.926	-0.934

Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
240	-0.536	-0.636	-0.922	-0.930
241	-0.520	-0.625	-0.918	-0.926
242	-0.505	-0.614	-0.914	-0.922
243	-0.490	-0.603	-0.909	-0.917
244	-0.476	-0.592	-0.904	-0.912
245	-0.461	-0.582	-0.899	-0.907
246	-0.447	-0.571	-0.893	-0.901
247	-0.433	-0.561	-0.887	-0.895
248	-0.419	-0.551	-0.881	-0.888
249	-0.406	-0.541	-0.874	-0.881
250	-0.392	-0.531	-0.867	-0.874
251	-0.380	-0.521	-0.860	-0.866
252	-0.367	-0.511	-0.853	-0.858
253	-0.354	-0.501	-0.845	-0.850
254	-0.342	-0.492	-0.837	-0.841
255	-0.330	-0.482	-0.828	-0.832
256	-0.319	-0.472	-0.819	-0.822
257	-0.307	-0.463	-0.810	-0.812
258	-0.296	-0.453	-0.800	-0.801
259	-0.285	-0.444	-0.790	-0.790
260	-0.274	-0.434	-0.779	-0.778
261	-0.263	-0.424	-0.769	-0.766
262	-0.252	-0.414	-0.757	-0.754
263	-0.242	-0.404	-0.745	-0.741
264	-0.232	-0.394	-0.733	-0.728
265	-0.222	-0.384	-0.720	-0.714
266	-0.212	-0.374	-0.707	-0.700
267	-0.202	-0.363	-0.693	-0.685
268	-0.192	-0.353	-0.679	-0.670
269	-0.183	-0.342	-0.664	-0.655
270	-0.173	-0.331	-0.649	-0.639
271	-0.164	-0.320	-0.633	-0.622
272	-0.155	-0.309	-0.616	-0.605
273	-0.146	-0.297	-0.599	-0.587
274	-0.137	-0.285	-0.580	-0.569
275	-0.128	-0.273	-0.561	-0.549
276	-0.119	-0.260	-0.541	-0.529
277	-0.111	-0.247	-0.519	-0.507
278	-0.102	-0.234	-0.497	-0.485
279	-0.094	-0.219	-0.472	-0.461
280	-0.085	-0.205	-0.447	-0.436
281	-0.077	-0.190	-0.420	-0.409
282	-0.069	-0.174	-0.391	-0.381
283	-0.061	-0.158	-0.361	-0.353
284	-0.053	-0.142	-0.330	-0.323
285	-0.046	-0.125	-0.299	-0.292
286	-0.039	-0.110	-0.267	-0.262
287	-0.032	-0.094	-0.236	-0.231

Rod Index	CRG 5-7 Integral Worth, No Xe, %dk/k			
%wd	0 EFPD	300 EFPD	650 EFPD	680 EFPD
288	-0.026	-0.079	-0.204	-0.201
289	-0.021	-0.065	-0.174	-0.171
290	-0.016	-0.052	-0.144	-0.142
291	-0.012	-0.041	-0.115	-0.114
292	-0.008	-0.030	-0.088	-0.087
293	-0.006	-0.021	-0.064	-0.063
294	-0.003	-0.014	-0.042	-0.042
295	-0.002	-0.008	-0.025	-0.024
296	-0.001	-0.003	-0.011	-0.011
297	0.000	0.000	-0.002	-0.002
298	0.000	0.001	0.002	0.002
299	0.000	0.001	0.002	0.002
300	0.000	0.000	0.000	0.000


CRG 5-7 Integral Reactivity Worth - Peak Xenon
0% FP, 532 degrees F, PEAK XENON, CRG 1 - 4 at 100%WD, CRG 8 at HFP Nominal Position, HFP Sm
0.000
-0.500
-1.000
-1.500
-2.000
-2.500
-3.000
-3.500
%dk/k
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300
Rod Index
4 EFPD
300 EFPD
650 EFPD
680 EFPD

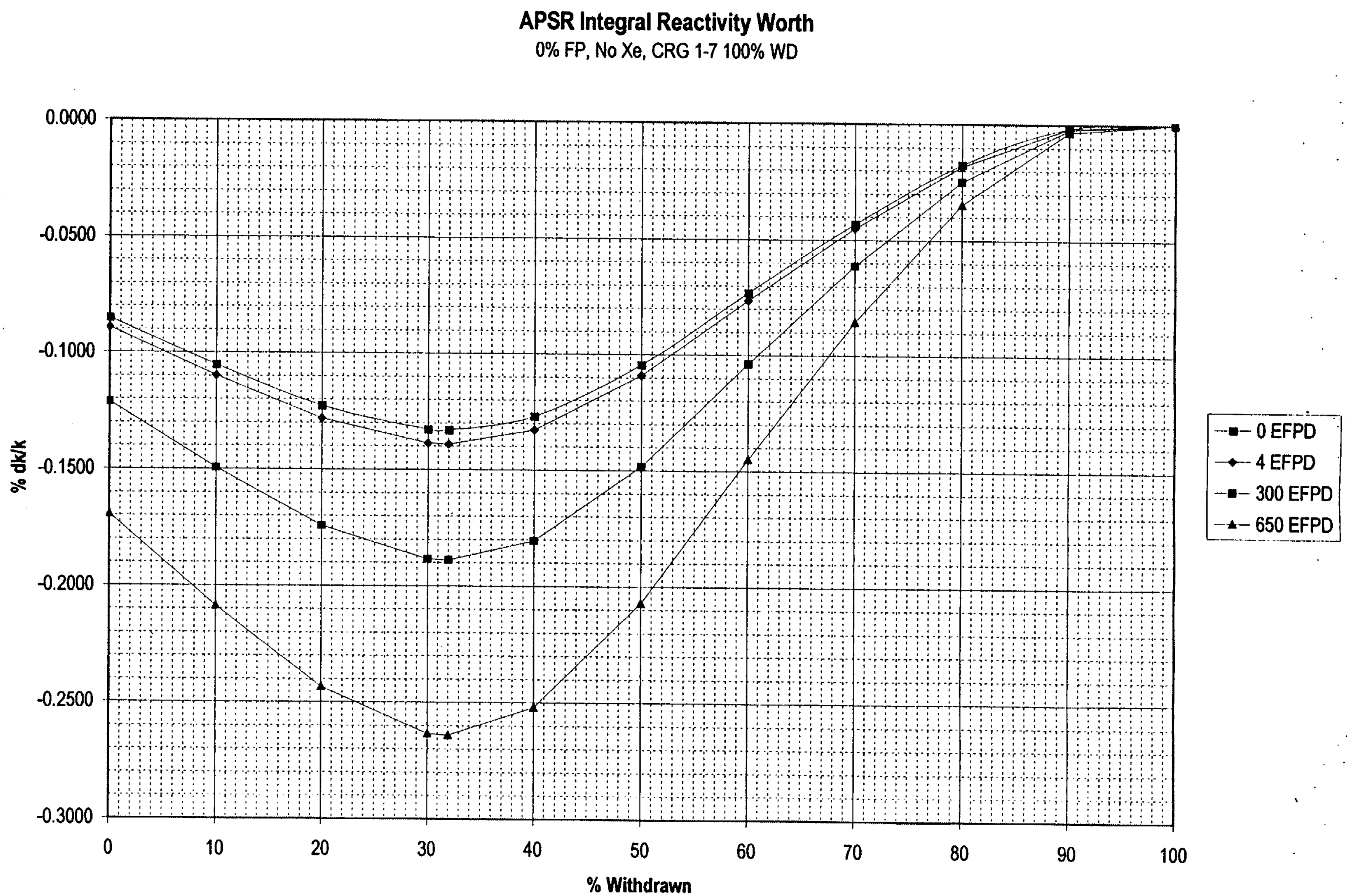
Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k					Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k			
%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD		%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD
0	-3.197	-3.300	-3.452	-3.464		48	-2.229	-2.473	-3.189	-3.184
1	-3.188	-3.295	-3.452	-3.464		49	-2.217	-2.463	-3.176	-3.171
2	-3.180	-3.291	-3.452	-3.464		50	-2.206	-2.452	-3.163	-3.158
3	-3.171	-3.287	-3.452	-3.464		51	-2.196	-2.442	-3.151	-3.145
4	-3.162	-3.282	-3.452	-3.464		52	-2.185	-2.433	-3.138	-3.132
5	-3.152	-3.277	-3.452	-3.464		53	-2.175	-2.423	-3.125	-3.119
6	-3.142	-3.271	-3.452	-3.464		54	-2.166	-2.414	-3.113	-3.106
7	-3.131	-3.264	-3.452	-3.464		55	-2.157	-2.405	-3.100	-3.093
8	-3.120	-3.256	-3.451	-3.464		56	-2.148	-2.396	-3.087	-3.079
9	-3.107	-3.248	-3.451	-3.463		57	-2.139	-2.388	-3.073	-3.065
10	-3.093	-3.238	-3.451	-3.463		58	-2.130	-2.379	-3.060	-3.051
11	-3.078	-3.227	-3.450	-3.462		59	-2.121	-2.370	-3.045	-3.037
12	-3.062	-3.215	-3.450	-3.461		60	-2.113	-2.361	-3.030	-3.021
13	-3.044	-3.201	-3.449	-3.461		61	-2.104	-2.352	-3.014	-3.005
14	-3.025	-3.185	-3.448	-3.460		62	-2.096	-2.343	-2.997	-2.988
15	-3.004	-3.168	-3.447	-3.458		63	-2.087	-2.334	-2.979	-2.970
16	-2.981	-3.149	-3.446	-3.457		64	-2.078	-2.324	-2.960	-2.950
17	-2.957	-3.128	-3.444	-3.455		65	-2.070	-2.313	-2.940	-2.930
18	-2.930	-3.105	-3.443	-3.454		66	-2.061	-2.303	-2.919	-2.909
19	-2.901	-3.080	-3.441	-3.452		67	-2.052	-2.292	-2.898	-2.887
20	-2.870	-3.052	-3.439	-3.449		68	-2.043	-2.281	-2.876	-2.865
21	-2.838	-3.023	-3.436	-3.447		69	-2.034	-2.270	-2.854	-2.843
22	-2.805	-2.993	-3.434	-3.444		70	-2.025	-2.260	-2.832	-2.821
23	-2.770	-2.961	-3.431	-3.440		71	-2.017	-2.249	-2.810	-2.799
24	-2.735	-2.930	-3.427	-3.436		72	-2.009	-2.238	-2.789	-2.778
25	-2.701	-2.898	-3.423	-3.432		73	-2.001	-2.228	-2.769	-2.758
26	-2.666	-2.866	-3.419	-3.427		74	-1.993	-2.218	-2.750	-2.739
27	-2.632	-2.835	-3.414	-3.421		75	-1.986	-2.209	-2.733	-2.721
28	-2.599	-2.805	-3.408	-3.415		76	-1.979	-2.200	-2.717	-2.705
29	-2.568	-2.777	-3.401	-3.408		77	-1.973	-2.191	-2.702	-2.691
30	-2.539	-2.750	-3.394	-3.400		78	-1.967	-2.182	-2.688	-2.677
31	-2.512	-2.725	-3.386	-3.391		79	-1.961	-2.174	-2.674	-2.663
32	-2.486	-2.703	-3.377	-3.382		80	-1.954	-2.165	-2.661	-2.650
33	-2.462	-2.682	-3.368	-3.372		81	-1.948	-2.156	-2.647	-2.636
34	-2.440	-2.662	-3.358	-3.361		82	-1.941	-2.146	-2.632	-2.621
35	-2.420	-2.644	-3.347	-3.350		83	-1.934	-2.136	-2.616	-2.605
36	-2.401	-2.627	-3.336	-3.338		84	-1.926	-2.125	-2.599	-2.589
37	-2.383	-2.612	-3.325	-3.326		85	-1.918	-2.114	-2.582	-2.571
38	-2.366	-2.597	-3.313	-3.314		86	-1.909	-2.102	-2.564	-2.553
39	-2.350	-2.583	-3.301	-3.301		87	-1.901	-2.090	-2.545	-2.535
40	-2.335	-2.569	-3.289	-3.288		88	-1.892	-2.078	-2.525	-2.516
41	-2.320	-2.556	-3.276	-3.275		89	-1.883	-2.065	-2.506	-2.496
42	-2.306	-2.543	-3.264	-3.262		90	-1.874	-2.052	-2.485	-2.476
43	-2.292	-2.531	-3.252	-3.249		91	-1.864	-2.040	-2.464	-2.455
44	-2.278	-2.519	-3.239	-3.236		92	-1.855	-2.026	-2.443	-2.434
45	-2.265	-2.507	-3.226	-3.223		93	-1.845	-2.013	-2.422	-2.413
46	-2.253	-2.496	-3.214	-3.210		94	-1.836	-2.000	-2.400	-2.392
47	-2.240	-2.484	-3.201	-3.197		95	-1.826	-1.987	-2.379	-2.370

Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k				
%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD	
96	-1.817	-1.975	-2.357	-2.349	
97	-1.808	-1.962	-2.335	-2.327	
98	-1.799	-1.949	-2.313	-2.305	
99	-1.790	-1.937	-2.292	-2.284	
100	-1.781	-1.925	-2.270	-2.262	
101	-1.773	-1.914	-2.249	-2.241	
102	-1.764	-1.903	-2.228	-2.220	
103	-1.756	-1.892	-2.208	-2.200	
104	-1.749	-1.882	-2.188	-2.180	
105	-1.741	-1.872	-2.168	-2.160	
106	-1.733	-1.862	-2.148	-2.140	
107	-1.726	-1.853	-2.130	-2.121	
108	-1.719	-1.844	-2.111	-2.103	
109	-1.711	-1.835	-2.094	-2.085	
110	-1.704	-1.826	-2.077	-2.068	
111	-1.697	-1.818	-2.060	-2.051	
112	-1.689	-1.809	-2.045	-2.035	
113	-1.681	-1.801	-2.030	-2.020	
114	-1.674	-1.792	-2.015	-2.006	
115	-1.665	-1.784	-2.002	-1.992	
116	-1.657	-1.776	-1.990	-1.980	
117	-1.649	-1.768	-1.978	-1.968	
118	-1.640	-1.760	-1.967	-1.957	
119	-1.631	-1.752	-1.957	-1.947	
120	-1.621	-1.743	-1.949	-1.938	
121	-1.611	-1.735	-1.941	-1.930	
122	-1.601	-1.726	-1.935	-1.924	
123	-1.590	-1.718	-1.929	-1.918	
124	-1.579	-1.709	-1.925	-1.914	
125	-1.567	-1.700	-1.922	-1.911	
126	-1.555	-1.691	-1.919	-1.908	
127	-1.543	-1.681	-1.918	-1.907	
128	-1.530	-1.672	-1.917	-1.906	
129	-1.517	-1.663	-1.917	-1.905	
130	-1.504	-1.653	-1.916	-1.905	
131	-1.491	-1.643	-1.917	-1.905	
132	-1.478	-1.634	-1.917	-1.906	
133	-1.465	-1.624	-1.917	-1.906	
134	-1.453	-1.614	-1.917	-1.906	
135	-1.440	-1.604	-1.917	-1.906	
136	-1.428	-1.594	-1.916	-1.905	
137	-1.416	-1.584	-1.915	-1.904	
138	-1.404	-1.574	-1.913	-1.902	
139	-1.393	-1.565	-1.911	-1.900	
140	-1.382	-1.555	-1.908	-1.897	
141	-1.371	-1.545	-1.905	-1.894	
142	-1.361	-1.535	-1.902	-1.891	
143	-1.350	-1.526	-1.898	-1.887	

Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k			
%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD
144	-1.340	-1.516	-1.894	-1.883
145	-1.331	-1.507	-1.889	-1.878
146	-1.321	-1.498	-1.885	-1.873
147	-1.312	-1.489	-1.879	-1.868
148	-1.302	-1.480	-1.874	-1.863
149	-1.294	-1.471	-1.868	-1.857
150	-1.285	-1.462	-1.862	-1.851
151	-1.276	-1.453	-1.856	-1.845
152	-1.268	-1.445	-1.849	-1.838
153	-1.259	-1.436	-1.841	-1.831
154	-1.251	-1.428	-1.834	-1.824
155	-1.243	-1.419	-1.826	-1.816
156	-1.235	-1.410	-1.817	-1.807
157	-1.227	-1.402	-1.808	-1.799
158	-1.220	-1.393	-1.798	-1.789
159	-1.212	-1.384	-1.788	-1.779
160	-1.205	-1.375	-1.778	-1.769
161	-1.197	-1.366	-1.766	-1.758
162	-1.190	-1.357	-1.755	-1.747
163	-1.182	-1.347	-1.743	-1.735
164	-1.175	-1.338	-1.730	-1.723
165	-1.168	-1.329	-1.718	-1.711
166	-1.160	-1.319	-1.704	-1.698
167	-1.153	-1.310	-1.691	-1.685
168	-1.146	-1.300	-1.677	-1.671
169	-1.139	-1.290	-1.663	-1.658
170	-1.132	-1.281	-1.649	-1.644
171	-1.125	-1.271	-1.634	-1.629
172	-1.117	-1.261	-1.619	-1.615
173	-1.110	-1.251	-1.604	-1.600
174	-1.103	-1.241	-1.589	-1.586
175	-1.096	-1.231	-1.574	-1.571
176	-1.088	-1.221	-1.559	-1.556
177	-1.081	-1.210	-1.543	-1.541
178	-1.074	-1.200	-1.528	-1.526
179	-1.066	-1.190	-1.512	-1.511
180	-1.059	-1.179	-1.497	-1.495
181	-1.051	-1.169	-1.481	-1.480
182	-1.044	-1.158	-1.466	-1.465
183	-1.036	-1.148	-1.450	-1.450
184	-1.028	-1.137	-1.435	-1.435
185	-1.021	-1.127	-1.420	-1.420
186	-1.013	-1.116	-1.405	-1.406
187	-1.005	-1.106	-1.390	-1.391
188	-0.997	-1.096	-1.375	-1.376
189	-0.989	-1.085	-1.360	-1.362
190	-0.981	-1.075	-1.345	-1.347
191	-0.974	-1.065	-1.330	-1.333

Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k					Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k			
%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD		%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD
192	-0.966	-1.055	-1.316	-1.318		240	-0.491	-0.670	-0.962	-0.964
193	-0.958	-1.045	-1.301	-1.304		241	-0.479	-0.660	-0.959	-0.961
194	-0.950	-1.036	-1.287	-1.290		242	-0.468	-0.650	-0.956	-0.958
195	-0.943	-1.026	-1.273	-1.276		243	-0.457	-0.641	-0.953	-0.954
196	-0.935	-1.017	-1.259	-1.262		244	-0.446	-0.632	-0.949	-0.951
197	-0.928	-1.008	-1.245	-1.248		245	-0.436	-0.622	-0.945	-0.946
198	-0.921	-0.999	-1.231	-1.234		246	-0.426	-0.613	-0.940	-0.942
199	-0.913	-0.991	-1.217	-1.220		247	-0.416	-0.604	-0.935	-0.937
200	-0.906	-0.982	-1.203	-1.207		248	-0.407	-0.595	-0.930	-0.932
201	-0.899	-0.974	-1.190	-1.194		249	-0.397	-0.586	-0.925	-0.926
202	-0.893	-0.967	-1.177	-1.180		250	-0.388	-0.577	-0.919	-0.920
203	-0.886	-0.959	-1.164	-1.167		251	-0.379	-0.569	-0.912	-0.914
204	-0.879	-0.952	-1.151	-1.154		252	-0.370	-0.560	-0.906	-0.907
205	-0.872	-0.945	-1.138	-1.142		253	-0.361	-0.551	-0.899	-0.900
206	-0.866	-0.938	-1.126	-1.129		254	-0.353	-0.543	-0.891	-0.893
207	-0.859	-0.931	-1.114	-1.117		255	-0.344	-0.534	-0.883	-0.885
208	-0.852	-0.925	-1.102	-1.105		256	-0.336	-0.525	-0.875	-0.876
209	-0.846	-0.918	-1.090	-1.094		257	-0.328	-0.516	-0.866	-0.867
210	-0.839	-0.912	-1.079	-1.083		258	-0.320	-0.508	-0.857	-0.858
211	-0.831	-0.906	-1.069	-1.072		259	-0.312	-0.499	-0.847	-0.848
212	-0.824	-0.899	-1.059	-1.062		260	-0.304	-0.490	-0.836	-0.838
213	-0.816	-0.893	-1.049	-1.052		261	-0.296	-0.481	-0.825	-0.827
214	-0.808	-0.887	-1.040	-1.043		262	-0.288	-0.471	-0.814	-0.816
215	-0.800	-0.880	-1.031	-1.034		263	-0.280	-0.462	-0.802	-0.804
216	-0.792	-0.874	-1.023	-1.026		264	-0.272	-0.452	-0.789	-0.791
217	-0.783	-0.867	-1.015	-1.018		265	-0.264	-0.443	-0.776	-0.778
218	-0.773	-0.861	-1.008	-1.011		266	-0.257	-0.433	-0.762	-0.765
219	-0.764	-0.854	-1.002	-1.005		267	-0.249	-0.422	-0.748	-0.751
220	-0.753	-0.847	-0.996	-0.999		268	-0.241	-0.412	-0.733	-0.736
221	-0.743	-0.840	-0.991	-0.994		269	-0.233	-0.401	-0.718	-0.721
222	-0.731	-0.832	-0.986	-0.989		270	-0.224	-0.391	-0.702	-0.705
223	-0.720	-0.825	-0.983	-0.985		271	-0.216	-0.379	-0.686	-0.689
224	-0.707	-0.817	-0.980	-0.982		272	-0.208	-0.368	-0.669	-0.672
225	-0.694	-0.809	-0.978	-0.980		273	-0.199	-0.356	-0.651	-0.655
226	-0.681	-0.800	-0.976	-0.978		274	-0.191	-0.344	-0.632	-0.636
227	-0.667	-0.792	-0.975	-0.977		275	-0.182	-0.331	-0.612	-0.616
228	-0.653	-0.783	-0.974	-0.976		276	-0.173	-0.317	-0.591	-0.596
229	-0.639	-0.774	-0.973	-0.976		277	-0.163	-0.303	-0.569	-0.574
230	-0.624	-0.765	-0.973	-0.975		278	-0.154	-0.288	-0.545	-0.550
231	-0.610	-0.755	-0.973	-0.975		279	-0.144	-0.272	-0.520	-0.525
232	-0.596	-0.746	-0.973	-0.975		280	-0.134	-0.255	-0.493	-0.499
233	-0.581	-0.737	-0.972	-0.975		281	-0.123	-0.238	-0.465	-0.471
234	-0.567	-0.727	-0.972	-0.974		282	-0.113	-0.219	-0.435	-0.441
235	-0.554	-0.718	-0.971	-0.973		283	-0.102	-0.200	-0.404	-0.409
236	-0.540	-0.708	-0.970	-0.972		284	-0.091	-0.180	-0.371	-0.377
237	-0.527	-0.698	-0.969	-0.971		285	-0.080	-0.161	-0.338	-0.344
238	-0.515	-0.689	-0.967	-0.969		286	-0.069	-0.141	-0.304	-0.310
239	-0.503	-0.679	-0.965	-0.967		287	-0.059	-0.122	-0.270	-0.275

Rod Index	CRG 5-7 Integral Worth, Peak Xe, %dk/k									
%wd	4 EFPD	300 EFPD	650 EFPD	680 EFPD						
288	-0.049	-0.104	-0.235	-0.241						
289	-0.040	-0.086	-0.201	-0.207						
290	-0.032	-0.070	-0.168	-0.173						
291	-0.024	-0.054	-0.136	-0.140						
292	-0.018	-0.041	-0.105	-0.108						
293	-0.012	-0.029	-0.076	-0.079						
294	-0.008	-0.019	-0.051	-0.053						
295	-0.004	-0.011	-0.030	-0.031						
296	-0.002	-0.005	-0.013	-0.013						
297	0.000	-0.001	-0.002	-0.002						
298	0.000	0.001	0.003	0.003						
299	0.000	0.001	0.003	0.003						
300	0.000	0.000	0.000	0.000						


APSR Integral Reactivity Worth
0% FP, No Xe, CRG 1-7 100% WD
0.0000
-0.0500
-0.1000
-0.1500
-0.2000
-0.2500
-0.3000
% dk/k
0
10
20
30
40
50
60
70
80
90
100
% Withdrawn
0 EFPD
4 EFPD
300 EFPD
650 EFPD

Rod %WD	0 EFPD %dk/k	4 EFPD %dk/k	300 EFPD %dk/k	650 EFPD %dk/k	Rod %WD	0 EFPD %dk/k	4 EFPD %dk/k	300 EFPD %dk/k	650 EFPD %dk/k
[redacted]					51	-0.1012	-0.1058	-0.1439	-0.2009
1	-0.0873	-0.0912	-0.1240	-0.1732	52	-0.0981	-0.1025	-0.1394	-0.1947
2	-0.0893	-0.0933	-0.1268	-0.1772	53	-0.0950	-0.0993	-0.1350	-0.1885
3	-0.0912	-0.0954	-0.1297	-0.1811	54	-0.0918	-0.0960	-0.1305	-0.1823
4	-0.0932	-0.0974	-0.1325	-0.1850	55	-0.0887	-0.0927	-0.1261	-0.1761
5	-0.0952	-0.0995	-0.1353	-0.1890	56	-0.0856	-0.0894	-0.1216	-0.1699
6	-0.0972	-0.1016	-0.1381	-0.1929	57	-0.0824	-0.0862	-0.1172	-0.1636
7	-0.0992	-0.1036	-0.1409	-0.1969	58	-0.0793	-0.0829	-0.1127	-0.1574
8	-0.1012	-0.1057	-0.1437	-0.2008	59	-0.0762	-0.0796	-0.1082	-0.1512
9	-0.1031	-0.1078	-0.1466	-0.2047	[redacted]				
[redacted]					61	-0.0700	-0.0732	-0.0995	-0.1390
11	-0.1069	-0.1117	-0.1519	-0.2121	62	-0.0670	-0.0701	-0.0953	-0.1331
12	-0.1086	-0.1135	-0.1544	-0.2156	63	-0.0640	-0.0669	-0.0910	-0.1271
13	-0.1104	-0.1154	-0.1569	-0.2191	64	-0.0610	-0.0638	-0.0868	-0.1212
14	-0.1121	-0.1172	-0.1593	-0.2226	65	-0.0580	-0.0607	-0.0825	-0.1152
15	-0.1139	-0.1190	-0.1618	-0.2261	66	-0.0550	-0.0575	-0.0782	-0.1093
16	-0.1156	-0.1208	-0.1643	-0.2295	67	-0.0520	-0.0544	-0.0740	-0.1033
17	-0.1174	-0.1227	-0.1668	-0.2330	68	-0.0491	-0.0513	-0.0697	-0.0974
18	-0.1191	-0.1245	-0.1693	-0.2365	69	-0.0461	-0.0481	-0.0654	-0.0914
19	-0.1209	-0.1263	-0.1718	-0.2400	[redacted]				
[redacted]					71	-0.0405	-0.0423	-0.0575	-0.0804
21	-0.1236	-0.1292	-0.1757	-0.2454	72	-0.0379	-0.0397	-0.0539	-0.0753
22	-0.1247	-0.1303	-0.1771	-0.2474	73	-0.0354	-0.0370	-0.0503	-0.0702
23	-0.1257	-0.1313	-0.1786	-0.2494	74	-0.0328	-0.0343	-0.0467	-0.0652
24	-0.1267	-0.1324	-0.1800	-0.2514	75	-0.0303	-0.0316	-0.0430	-0.0601
25	-0.1277	-0.1334	-0.1814	-0.2534	76	-0.0277	-0.0290	-0.0394	-0.0550
26	-0.1287	-0.1345	-0.1829	-0.2554	77	-0.0252	-0.0263	-0.0358	-0.0500
27	-0.1297	-0.1355	-0.1843	-0.2574	78	-0.0226	-0.0236	-0.0321	-0.0449
28	-0.1307	-0.1366	-0.1857	-0.2594	79	-0.0201	-0.0210	-0.0285	-0.0398
29	-0.1317	-0.1376	-0.1872	-0.2614	[redacted]				
[redacted]					81	-0.0159	-0.0166	-0.0226	-0.0316
30.4	-0.1328	-0.1388	-0.1887	-0.2635	82	-0.0143	-0.0150	-0.0204	-0.0285
31	-0.1329	-0.1388	-0.1888	-0.2637	83	-0.0128	-0.0133	-0.0181	-0.0253
[redacted]					84	-0.0112	-0.0117	-0.0159	-0.0222
33	-0.1322	-0.1382	-0.1879	-0.2625	85	-0.0096	-0.0100	-0.0136	-0.0190
34	-0.1315	-0.1374	-0.1869	-0.2610	86	-0.0080	-0.0084	-0.0114	-0.0159
35	-0.1307	-0.1366	-0.1858	-0.2595	87	-0.0064	-0.0067	-0.0091	-0.0128
36	-0.1300	-0.1358	-0.1847	-0.2580	88	-0.0048	-0.0051	-0.0069	-0.0096
37	-0.1292	-0.1350	-0.1836	-0.2565	89	-0.0033	-0.0034	-0.0046	-0.0065
38	-0.1285	-0.1343	-0.1826	-0.2550	[redacted]				
39	-0.1277	-0.1335	-0.1815	-0.2535	91	-0.0015	-0.0016	-0.0021	-0.0030
[redacted]					92	-0.0013	-0.0014	-0.0019	-0.0027
41	-0.1247	-0.1303	-0.1772	-0.2475	93	-0.0012	-0.0012	-0.0017	-0.0023
42	-0.1224	-0.1280	-0.1740	-0.2430	94	-0.0010	-0.0011	-0.0014	-0.0020
43	-0.1202	-0.1256	-0.1708	-0.2385	95	-0.0008	-0.0009	-0.0012	-0.0017
44	-0.1179	-0.1232	-0.1676	-0.2341	96	-0.0007	-0.0007	-0.0010	-0.0013
45	-0.1157	-0.1209	-0.1644	-0.2296	97	-0.0005	-0.0005	-0.0007	-0.0010
46	-0.1134	-0.1185	-0.1611	-0.2251	98	-0.0003	-0.0004	-0.0005	-0.0007
47	-0.1111	-0.1162	-0.1579	-0.2206	99	-0.0002	-0.0002	-0.0002	-0.0003
48	-0.1089	-0.1138	-0.1547	-0.2161	[redacted]				
49	-0.1066	-0.1114	-0.1515	-0.2116					
[redacted]									

IT IS PERMISSIBLE TO INTERPOLATE BETWEEN EFPD RANGES

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A1b, Perform a Reactor Coolant Boron Change Calculation

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ ______________

REVIEWED BY: ______________________________ Date/ ______________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ______________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ______________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Perform a reactor coolant boron change calculation.

Alternate Path: N/A

JPM #: A1b (modified bank #264)

K/A Rating/Importance: 004A4.04/3.2/3.6 **Task Number/Position:** 0040102002/RO

Task Standard: Perform a reactor coolant boron change calculation using OP-304.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant _____ Admin __X__ Perform __X__ Simulate ______

References:
1. OP-304, Rev 16

Validation Time: 30 min. **Time Critical**: No

Candidate: ________________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ ____________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. N/A

SIMULATOR OPERATOR INSTRUCTIONS:

1. N/A

Tools/Equipment/Procedures Needed:

1. OP-304
2. Calculator

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions: [redacted]

You are the REACTOR OPERATOR.
Current plant conditions are:

3?

Reactor Coolant (RCS) Pressure	2155 psig
RCS Boron Concentration	3 ppm
RCS Temperature	579°F
Pressurizer level	220 inches
Make-up Tank level	75 inches

Initiating Cues:

You are requested to determine the volume of the two feed sources used to change the boron concentration of the reactor coolant in preparation for shutdown and cooldown. The two feed sources are the "B" BAST (12,789 ppm) and Demineralized Water (assume feed source temperature of 150°F) with the final plant conditions:

RCS Pressure	45 psig
RCS Boron Concentration	2900 ppm
RCS Temperature	140°F
Pressurizer level	75 inches
Make-up Tank level	70 inches

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. **EXAMINER NOTE: Provide candidate with a clean copy of OP-304. Calculators will also be provided if the candidate does not have one.** STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___
STEP 2: Candidate should complete OP-304 Enclosures 9 and 10. STANDARD: Candidate completes OP-304 Enclosure 9 and 10. **EXAMINER NOTE: See attached key for answers; each volume should be within ± 20 gallons.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
END OF TASK	

TIME STOP ________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
Current plant conditions are:

Reactor Coolant (RCS) Pressure	2155 psig
RCS Boron Concentration	3 ppm
RCS Temperature	579°F
Pressurizer level	220 inches
Make-up Tank level	75 inches

Initiating Cues:

You are requested to determine the volume of the two feed sources used to change the boron concentration of the reactor coolant in preparation for shutdown and cooldown. The two feed sources are the "B" BAST (12,789 ppm) and Demineralized Water (assume feed source temperature of 150°F) with the final plant conditions:

RCS Pressure	45 psig
RCS Boron Concentration	2900 ppm
RCS Temperature	140°F
Pressurizer level	75 inches
Make-up Tank level	70 inches

BORATION DURING COOLDOWN

1. Record initial plant data.

RCS Temp	RCS Pressure	PZR Level	MUT Level
579 °F	2155 psig	220 in	75 in

2. Record final plant data.

RCS Temp	RCS Pressure	PZR Level	MUT Level
140 °F	45 psig	75 in	70 in

3. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	$C2_{RCS}$ Final RCS boron conc
3 ppm	2900 Ppm

4. Determine $M1_{RCS}$ (Initial mass of RCS)

	$M1_{RCS}$
Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	552004 lbm

5. Determine $M2_{RCS}$ (Final mass of RCS)

	$M2_{RCS}$
Use Enclosure 3 Use Final RCS temp, PZR level, and MUT level	725374 lbm

6. Determine ΔM_{RCS} (Mass change of RCS)

$$\Delta M_{RCS} = M2_{RCS} - M1_{RCS}$$

$$\Delta M_{RCS} = (\ 725374\ lbm) - (\ 552004\ lbm)$$

ΔM_{RCS}: 173370 lbm

7. Determine M_{FEED} (Mass of feed solution)

$$M_{FEED} = \Delta M_{RCS}$$

M_{FEED}: 173370 lbm

Continue calculation on next page

BORON DURING COOLDOWN (cont'd)	
8. Determine υ_{FEED} (Specific volume of feed source).	
Use Enclosure 1 Use temperature of feed source	υ_{FEED} 0.01634 $\frac{ft^3}{lbm}$
9. Determine ΔV_{RCS} (RCS volume change due to contraction during cooldown)	
$\Delta V_{RCS} = M_{FEED}\, \upsilon_{FEED}$ $\Delta V_{RCS} = (173370\ lbm)\ (0.01634\ \frac{ft^3}{lbm})\ (7.48\ \frac{gal}{ft^3})$	ΔV_{RCS} 21190 gal
10. Determine V_{FEED} (Feed volume)	
$V_{FEED} = \Delta V_{RCS}$	V_{FEED} 21190 gal
11. Determine C_{FEED} (Boron concentration of Feed solution)	
$C_{FEED} = \frac{M2_{RCS}\ C2_{RCS} - M1_{RCS}\ C1_{RCS}}{M_{FEED}}$ $C_{FEED} = \frac{(725374\ lbm)(2900\ ppm) - (552004\ lbm)(3\ ppm)}{(173370\ lbm)}$	C_{FEED} 12124 ppm
COMPLETE AND ATTACH ENCLOSURE 10 FOR RATIO OF FEED SOURCES TO BE USED.	
PERFORMED BY Signature	DATE Date
VERIFIED BY ________	DATE ________

DETERMINING RATIO OF TWO FEED SOURCES

Use this enclosure when two addition sources will be used to add a known volume and boron concentration to any location. The higher concentration should be added first.

1. Record addition data. (Enter values from Enclosure 9, if applicable.)

V_{FEED} FEED VOLUME	C_{FEED} BORON CONCENTRATION OF FEED
21190 gal	12124 ppm

2. Record feed source data.

Source of higher boron concentration	C_{FEED1} Higher boron concentration	Source of lower boron concentration	C_{FEED2} Lower boron concentration
"B" BAST	12789 ppm	DW	0 ppm

3. Determine V_{FEED1} (Volume of higher boron source)

$$V_{FEED1} = \frac{(V_{FEED})(C_{FEED} - C_{FEED2})}{(C_{FEED1} - C_{FEED2})}$$

$$V_{FEED1} = \frac{(21190 \text{ gal})(12124 \text{ ppm} - 0 \text{ ppm})}{(12789 \text{ ppm} - 0 \text{ ppm})}$$

V_{FEED1}: 20088 gal

4. Determine V_{FEED2} (Volume of lower boron source to be added)

$$V_{FEED2} = V_{FEED} - V_{FEED1}$$

$$V_{FEED2} = (21190 \text{ gal}) - (20088 \text{ gal})$$

V_{FEED2}: 1102 gal

PERFORMED BY Signature DATE Date

VERIFIED BY ______ DATE ______

Rev. 16

Effective Date 04/20/00

OPERATING PROCEDURE

OP-304

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

SOLUBLE POISON CONCENTRATION CONTROL

APPROVED BY: Procedure Owner

J. W. Smith for JHT
(SIGNATURE ON FILE)

DATE: 04/19/00

PROCEDURE OWNER: Manager Nuclear Operations Support

TABLE OF CONTENTS

ENCLOSURES

1.0 PURPOSE[NOCS 007366]

1.1 Provide a procedure for calculating the boron concentration in the reactor coolant system during heatup, power operation, and cooldown.

1.2 Provide a procedure for calculating the volume requirements for boration or deboration operations.

1.3 Provide a procedure for normal online operations (Tave ≈ 579°F, pzr level ≈ 220") when relatively minor changes in boron concentration are expected (Section 4.1).

1.4 Provide a procedure for any operation when changes in boron concentration are expected (Section 4.2).

<u>2.0</u> <u>REFERENCES</u>

2.1 <u>DEVELOPMENTAL REFERENCES</u>

None

3.0 PERSONNEL INDOCTRINATION

DESCRIPTION		VALUE
3.1	SETPOINTS	
3.1.1	Continuous feed & bleed permit	o Safety Groups at 100%, AND Group 5 $\leq$ 80% OR o Safety groups at 100%, AND Group 5 at 100%, AND Group 6 $\geq$ 95%
3.1.2	Formulas: $C_1V_1 + C_2V_2 = C_fV_f$	Where: C = Concentration of solution (ppm) V = Volume of solution (gals.)

3.2 LIMITS AND PRECAUTIONS

	LIMIT	BASIS
3.2.1	Deboration is prohibited during periods when RCS flow < 2700 gpm	TS 3.4.4 TS 3.4.5 TS 3.4.6 TS 3.4.7 SR 3.9.4.1
3.2.2	At least one RCP must remain running during RCS boration to the concentration for 1% SDM at 73°F OR to the refueling boron concentration, per the Reactor Engineer, if the shutdown is a refueling shutdown	Prevents formation of RCS fluid with relatively low boron concentration [NOCS 062336]
3.2.3	PZR Spray flow must be maintained following changes in RCS boron concentration of >20 ppmb	Allows boron equalization between RCS and PZR [NOCS 062335]
3.2.4	While making boron concentration changes in a subcritical reactor, have Chemistry dept. sample the RCS at approximately every 30 ppmb change OR every 30 minutes if 30 ppmb change cannot be determined	Prevent inadvertent criticality due to deboration

3.2 LIMITS AND PRECAUTIONS (Cont'd)

	LIMIT	BASIS
3.2.5	Stop boration or deboration operations immediately if control rod position indication, neutron count rate, or neutron error behave in an erratic or unexpected manner	Prevent inadvertent boration/ deboration of the RCS
3.2.6	Stop boration or deboration operations if makeup system operation is disrupted (loss of letdown, ES actuation, etc.)	To maintain control of the plant should unexpected conditions arise.
3.2.7	While on DH Cooling with no RCPs in operation, additions to the RCS are to be of a boron concentration greater than or equal to the value required by OP-103C Curve 18, to ensure a 1% SDM at 73°F.	Prevents reduction of SDM while on DH cooling.
3.2.8	If two sources are utilized for boron addition, the higher concentration should be added first.	Prevents deboration.
3.2.9	While on DH Cooling with no RCPs in operation, If two sources are utilized for boron additions and the second source is less than 1% shutdown boron requirements, the second source shall be limited to batch adds of 200 gallons or less.	Prevents deboration.

4.0 INSTRUCTIONS

ACTIONS		DETAILS
4.1	**BORON CONCENTRATION / ADDITION CALCULATION (<10 PPM) (CAT.1)**	
4.1.1	DETERMINE desired boron concentration change	o IF ≥ 20% RTP, THEN COMPLETE Enclosure 4, On-Line Reactivity Management o Enclosure 4 is not required at the recommendation of Reactor Engineer o Enclosure 4 is not required for equilibrium additions o IF <110 gallons of Demin Water added to the RCS, THEN Enclosure 4 is not required AND GO TO Step 4.1.10 _____/_____ Initial/Date
4.1.2	DETERMINE desired feed source(s)	o ____CALL Chemistry to verify current feed source boron concentrations o ____ENSURE statusboard is updated with current boron concentrations _____/_____ Initial/Date
4.1.3	IF the Rods.XLS spreadsheet computer program is available and desired to be used, THEN make necessary entries into the program AND print results	o ATTACH computer printout AND GO TO Step 4.1.10 o IF manual calculation is to be used, THEN N/A this step _____/_____ Initial/Date

4.1 BORON CONCENTRATION / ADDITION CALCULATION (<10 PPM) (CAT. 1) (Cont'd)

ACTIONS	DETAILS

NOTE: In steps 4.1.4 through 4.1.7, multiple steps may be used for combined additions (for example: an equilibrium add and a Demin Water add). Only those steps used need to be filled in (N/As are not necessary).

4.1.4 For a Demin Water boron reduction use:

RCS Volume (gal) __________
Initial boron __________
Final boron __________

DW gal = RCS gal (Δ boron) / Final boron

= (gal)(ppm- ppm) / (ppm) = __________ gal

- o RCS volume from OP-103F, RC System Inventory Vs Tave

OR

- o Use 65,000 gal when at Tave = 579 and pzr level = 220"

4.1.5 For a change in boron concentration using a single borated water source use:

Source (tank) ____________

Borated source ppm _______
RCS boron initial _______
RCS Volume (gal) _________
RCS boron final __________

- o If lowering RCS concentration use a positive value for Δ boron
- o If raising RCS concentration use a negative value for Δ boron
- o RCS volume from OP-103F, RC System Inventory Vs Tave

OR

- o Use 65,000 gal when at T_{ave} = 579 and pzr level = 220"

Borated source gal = RCS volume (RCS ∆ boron) / Final boron - Borated source

= (gal)(ppm- ppm) / (ppm - ppm) = __________ gal

4.1 BORON CONCENTRATION / ADDITION CALCULATION (<10 PPM) (CAT.1) (Cont'd)

ACTIONS		DETAILS
4.1.6	For an equilibrium add (boron source + DW) use: Borated source ppm ______ RCS boron ppm _________ Total add gal _________	o Source (tank) __________

Borated source gal = $\frac{\text{RCS boron (total add gal)}}{\text{Feed source ppm}}$

$= \frac{(\_\_\_\_\_\_ \text{ ppm})(\_\_\_\_\_\_ \text{ gal})}{(\_\_\_\_\_\_ \text{ ppm})} = \_\_\_\_\_\_ \text{ gal}$

DW = Total add gal - Borated source gal

= (______ gal) - (______ gal) = _______ gal

4.1.7	For an equilibrium add (using two borated sources) use: Borated source 1 ppm ____ Borated source 2 ppm ____ RCS boron ppm ________ Total add volume gal ____	o Source 1 (tank) __________ o Source 2 (tank) __________

Borated source 1 gal= $\frac{\text{(Total add vol) (RCS Boron - Source 2 ppm)}}{\text{(Source 1 ppm - Source 2 ppm)}}$

$= \frac{(\_\_\_\_\_\_ \text{ gal})(\_\_\_\_\_\_ \text{ ppm} - \_\_\_\_\_\_ \text{ ppm})}{(\_\_\_\_\_\_ \text{ ppm} - \_\_\_\_\_\_ \text{ ppm})}$

= _______ gal from Tank __________

Borated source 2 gal = Total add volume gal - Borated source 1 gal

= _______ gal - _______ gal

= _______ gal from Tank __________

4.1 BORON CONCENTRATION / ADDITION CALCULATION (<10 PPM) (CAT.1) (Cont'd)

ACTIONS		DETAILS
4.1.8	SIGN for all manual calculations (other than calculations performed using worksheet(s))	____/____ Performer's signature/Date
4.1.9	Independently VERIFY all manual calculations made (other than calculations performed using worksheet(s))	____/____ Independent Verifier/Date
4.1.10	Make necessary additions to the MUT/RCS AND RECORD addition source(s) and volume(s) in the Main Control Room Log	o ____ MAKE additions in accordance with OP-402, Makeup and Purification System, OR o ____ Additions made in accordance with OP-403 series. ____/____ Initial/Date

NOTE: Adjust or re-perform the calculations as required

NOTE: An acid overshoot $\leq$ 3 gallons or a water overshoot $\leq$ 15 gallons does not require reperformance of calculation.

4.1.11	IF the volume(s) of the actual addition(s) recorded per step 4.1.10 in the Main Control Room Log are different than their pre-addition calculations, THEN SUBSTITUTE the actual volume(s) of the addition(s) in the original calculation(s) used to perform the addition(s)	o Re-perform the calculation (s) using the appropriate calculation(s) ____ Step 4.1.3 ____ Step 4.1.4 ____ Step 4.1.5 ____ Step 4.1.6 ____ Step 4.1.7 ____ Enclosure 8, Boron Change Due to Batch Feed o IF no calculation(s) is/are to be reperformed THEN N/A this step ____/____ Initial/Date

4.2 BORON CONCENTRATION CALCULATION FOR A CHANGE IN RCS BORON CONCENTRATION (CAT. 1)

	ACTIONS	DETAILS
4.2.1	DETERMINE desired boron concentration change	o IF ≥ 20% RTP, THEN COMPLETE Enclosure 4, On-Line Reactivity Management o IF <110 gallons of Demin Water is added to the RCS, THEN Enclosure 4 is not required AND GO TO Step 4.2.5 o At recommendation of the Rx Engineer if applicable o Based on required SDM calculations o Based on expected plant conditions (plant C/D, refueling, etc.) Initial/Date Initial/Date
4.2.2	DETERMINE desired Feed Source(s)	o ✓ CALL Chemistry to verify current feed source boron concentrations o ✓ ENSURE statusboard is updated with current boron concentrations Initial / Date Initial/Date
4.2.3	IF the Rods.XLS spreadsheet computer program is available and desired to be used, THEN make necessary entries into the program AND PRINT results.	o NSS verify appropriate data was used to generate the desired Rods.XLS spreadsheet printout(s) o____ATTACH computer printout ____AND GO TO step 4.2.5 o IF manual calculation is to be used, THEN N/A this step N/A / Initial/Date / NSS Verification/Date

4.2 BORON CONCENTRATION CALCULATION FOR A CHANGE IN RCS BORON CONCENTRATION (CAT. 1) (Cont'd)

	ACTIONS	DETAILS
4.2.4	DETERMINE volumes and boron concentrations required for desired change	o ___ PERFORM hand calculation by using the appropriate enclosure ___ Enclosure 5, Continuous Feed and Bleed ___ Enclosure 6, Feed Volumes for Batch Boration or Dilution - Bleed Precedes Feed ___ Enclosure 7, Feed Volumes for Batch Boration or Dilution - Feed Precedes Bleed ___ Enclosure 8, Boron Change Due to Batch Feed ✓ Enclosure 9, Boration During Cooldown ✓ Enclosure 10, Determining Ratio of Two Feed Sources Initials/ Date Initials/Date SSOD / Date SSOD Verification/Date
4.2.5	Make necessary additions to the MUT/RCS <u>AND</u> RECORD addition source(s) and volume(s) in the Main Control Room Log	o ___ MAKE additions in accordance with OP-402, Makeup and Purification System, OR o ___ Additions made in accordance with OP-403 series ___/___ Initial/Date

4.2 BORON CONCENTRATION CALCULATION FOR A CHANGE IN RCS BORON CONCENTRATION (CAT. 1) (Cont'd)

ACTIONS		DETAILS

NOTE: Adjust or re-perform the calculations as required

NOTE: An acid overshoot ≤ 3 gallons or a water overshoot ≤ 15 gallons does not require reperformance of calculation.

4.2.6	IF the volume(s) of the actual addition(s) recorded per step 4.2.5 in the Nuclear Operators logbook are different then the pre-addition calculations, THEN SUBSTITUTE the actual volume(s) of addition in the calculation(s) used to perform the addition(s)	o RE-PERFORM the calculation(s) using the appropriate enclosure(s) ___ Enclosure 5, Continuous Feed and Bleed ___ Enclosure 6, Feed Volumes for Batch Boration or Dilution Bleed Precedes Feed ___ Enclosure 7, Feed Volumes for Batch Boration or Dilution Bleed Precedes Feed ___ Enclosure 8, Boron Change Due to Batch Feed ___ Enclosure 9, Boration During Cooldown ___ Enclosure 10, Determining Ratio of Two Feed Sources o IF no calculation(s) is/are to be reperformed THEN N/A this step ______/______ Initial/Date
4.2.7	COLLECT Data	o ___ATTACH all printouts and Enclosures used in performing this procedure ______/______ Initial/Date

<u>5.0</u> <u>FOLLOW-UP ACTIONS</u>

ACTIONS	DETAILS
5.1 <u>RESTORATION</u>	
None	

SHORT TABLE OF SPECIFIC VOLUME

TEMP °F	15 PSIA (0 PSIG)	2100 PSIA (2085 PSIG)	2170 PSIA (2155 PSIG)	2200 PSIA (2185 PSIG)
620	---	0.02435	0.02429	0.02426
610	---	0.02377	0.02371	0.02369
600	---	0.02326	0.02322	0.02320
590	---	0.02281	0.02377	0.02275
580	---	0.02240	0.02236	0.02235
579	---	0.02236	0.02232	0.02231
570	---	0.02203	0.02200	0.02199
560	---	0.02170	0.02167	0.02166
550	---	0.02139	0.02136	0.02135
540	---	0.02110	0.02108	0.02107
535	---	0.02097	0.02095	0.02094
532	---	0.02088	0.02086	0.02085
530	---	0.02083	0.02081	0.02080
520	---	0.02058	0.02057	0.02056
200	0.01664	---	---	---
190	0.01657	---	---	---
180	0.01651	---	---	---
170	0.01645	---	---	---
160	0.01639	---	---	---
150	0.01634	---	---	---
140	0.01629	---	---	---
130	0.01625	---	---	---
120	0.01620	---	---	---
110	0.01616	---	---	---
100	0.01613	---	---	---
90	0.01610	---	---	---
80	0.01603	---	---	---

DEFINITION OF TERMS		
TERM	UNITS	DEFINITION
M_{RCS}	lbm	MASS OF THE RCS (used when mass does not change)
$M1_{RCS}$	lbm	INITIAL MASS OF THE RCS
$M2_{RCS}$	lbm	FINAL MASS OF THE RCS
ΔM_{RCS}	lbm	CHANGE IN MASS OF THE RCS
M_{FEED}	lbm	TOTAL MASS OF FEED
M_{FEED1}	lbm	MASS OF FIRST FEED SOURCE
M_{FEED2}	lbm	MASS OF SECOND FEED SOURCE
C_{RCS}	ppm	RCS BORON CONCENTRATION (used when concentration does not change)
$C1_{RCS}$	ppm	INITIAL RCS BORON CONCENTRATION
$C2_{RCS}$	ppm	FINAL RCS BORON CONCENTRATION
C_{FEED}	ppm	BORON CONCENTRATION OF FEED SOURCE (when only one will be used)
C_{FEED1}	ppm	BORON CONCENTRATION OF FIRST FEED SOURCE (higher concentration)
C_{FEED2}	ppm	BORON CONCENTRATION OF SECOND FEED SOURCE (lower concentration)
V_{RCS}	gal	VOLUME OF THE RCS (used when volume does not change)
$V1_{RCS}$	gal	INITIAL VOLUME OF THE RCS
$V2_{RCS}$	gal	FINAL VOLUME OF THE RCS
V_{FEED}	gal	VOLUME OF FEED SOURCE (when only one will be used)
V_{FEED1}	gal	VOLUME OF FIRST FEED SOURCE (higher concentration)
V_{FEED2}	gal	VOLUME OF SECOND FEED SOURCE (lower concentration)

DEFINITION OF TERMS		
TERM	UNITS	DEFINITION
υ_{RCS}	ft^3/lbm	SPECIFIC VOLUME OF THE RCS (used when volume does not change)
$\upsilon 1_{RCS}$	ft^3/lbm	INITIAL SPECIFIC VOLUME OF THE RCS
$\upsilon 2_{RCS}$	ft^3/lbm	FINAL SPECIFIC VOLUME OF THE RCS
υ_{FEED}	ft^3/lbm	SPECIFIC VOLUME OF FEED SOURCE (when only one will be used)
υ_{FEED1}	ft^3/lbm	SPECIFIC VOLUME OF FIRST FEED SOURCE
υ_{FEED2}	ft^3/lbm	SPECIFIC VOLUME OF SECOND FEED SOURCE
R_{XE}	$\%\Delta k/k$	REACTIVITY DUE TO XENON
$R1_{XE}$	$\%\Delta k/k$	INITIAL REACTIVITY DUE TO XENON
$R2_{XE}$	$\%\Delta k/k$	FINAL REACTIVITY DUE TO XENON
R_{RP}	$\%\Delta k/k$	REACTIVITY DUE TO REACTOR POWER
$R1_{RP}$	$\%\Delta k/k$	INITIAL REACTIVITY DUE TO REACTOR POWER
$R2_{RP}$	$\%\Delta k/k$	FINAL REACTIVITY DUE TO REACTOR POWER
R_{RI}	$\%\Delta k/k$	REACTIVITY DUE TO ROD POSITION
$R1_{RI}$	$\%\Delta k/k$	INITIAL REACTIVITY DUE TO ROD POSITION
$R2_{RI}$	$\%\Delta k/k$	FINAL REACTIVITY DUE TO ROD POSITION
ΔR	$\%\Delta k/k$	CHANGE IN REACTIVITY
IB	$\frac{ppm}{\%\Delta k/k}$	INVERSE BORON WORTH
ΔB	ppm	CHANGE IN BORON CONCENTRATION

REACTOR COOLANT IN LBM
(140F, 45 PSIG)
MAKEUP TANK LEVEL

PRESSURIZER LEVEL	40	45	50	55	60	65	70	75	80	85	90	95
40	710806	712085	713364	714643	715922	717201	718480	719759	721038	722316	723595	724874
45	711791	713070	714349	715628	716907	718186	719465	720743	722022	723301	724580	725859
50	712776	714055	715334	716613	717892	719171	720449	721728	723007	724286	725565	726844
55	713761	715040	716319	717598	718876	720155	721434	722713	723992	725271	726550	727829
60	714746	716025	717304	718582	719861	721140	722419	723698	724977	726256	727535	728813
65	715731	717009	718288	719567	720846	722125	723404	724683	725962	727241	728519	729798
70	716715	717994	719273	720552	721831	723110	724389	725668	726946	728225	729504	730783
75	717700	718979	720258	721537	722816	724095	725374	726652	727931	729210	730489	731768
80	718685	719964	721243	722522	723801	725079	726358	727637	728916	730195	731474	732753
85	719670	720949	722228	723507	724785	726064	727343	728622	729901	731180	732459	733738
90	720655	721934	723212	724491	725770	727049	728328	729607	730886	732165	733444	734722
95	721640	722918	724197	725476	726755	728034	729313	730592	731871	733149	734428	735707
100	722624	723903	725182	726461	727740	729019	730298	731577	732855	734134	735413	736692
105	723609	724888	726167	727446	728725	730004	731282	732561	733840	735119	736398	737677
110	724594	725873	727152	728431	729710	730988	732267	733546	734825	736104	737383	738662
115	725579	726858	728137	729415	730694	731973	733252	734531	735810	737089	738368	739647
120	726564	727843	729121	730400	731679	732958	734237	735516	736795	738074	739352	740631
125	727548	728827	730106	731385	732664	733943	735222	736501	737780	739058	740337	741616
130	728533	729812	731091	732370	733649	734928	736207	737495	738764	740043	741322	742601
135	729518	730797	732076	733355	734634	735913	737191	738470	739749	741028	742307	743586
140	730503	731782	733061	734340	735618	736897	738176	739455	740734	742013	743292	744571
145	731488	732767	734046	735324	736603	737882	739161	740440	741719	742998	744277	745555
150	732473	733751	735030	736309	737588	738867	740146	741425	742704	743983	745261	746540
155	733457	734736	736015	737294	738573	739852	741131	742410	743688	744967	746246	747525
160	734442	735721	737000	738279	739558	740837	742116	743394	744673	745952	747231	748510
165	735427	736706	737985	739264	740543	741821	743100	744379	745658	746937	748216	749495
170	736412	737691	738970	740249	741527	742806	744085	745364	746643	747922	749201	750480
175	737397	738676	739954	741233	742512	743791	745070	746349	747628	748907	750186	751464
180	738382	739660	740939	742218	743497	744776	746055	747334	748613	749891	751170	752449
185	739366	740645	741924	743203	744482	745761	747040	748319	749597	750876	752155	753434
190	740351	741630	742909	744188	745467	746746	748024	749303	750582	751861	753140	754419
195	741336	742615	743894	745173	746452	747730	749009	750288	751567	752846	754125	755404
200	742321	743600	744879	746157	747436	748715	749994	751273	752552	753831	755110	756389
205	743306	744585	745863	747142	748421	749700	750979	752258	753537	754816	756094	757373
210	744290	745569	746848	748127	749406	750685	751964	753243	754522	755800	757079	758358
215	745275	746554	747833	749112	750391	751670	752949	754227	755506	756785	758064	759343
220	746260	747539	748818	750097	751376	752655	753933	755212	756491	757770	759042	760328
225	747245	748524	749803	751082	752360	753639	754918	756197	757476	758755	760034	761313
230	748230	749509	750788	752066	753345	754624	755903	757182	758461	759740	761019	762297
235	749215	750493	751772	753051	754330	755609	756888	758167	759446	760725	762003	763282
240	750199	751478	752757	754036	755315	756594	757873	759152	760430	761709	762988	764267

TABLE BASED ON RC SP VOL = .016290 FT3/LBM, PZR SP VOL = .016290 FT3/LBM & MU Sys SP VOL = .01613 FT3/LBM

REACTOR COOLANT IN LBM
(300F, 550 PSIG)

MAKEUP TANK LEVEL

PRESSURIZER LEVEL	40	45	50	55	60	65	70	75	80	85	90	95
40	663390	664669	665948	667227	668506	669785	671064	672342	673621	674900	676179	677458
45	664193	665471	666750	668029	669308	670587	671866	673145	674424	675702	676981	678260
50	664995	666274	667553	668831	670110	671389	672668	673947	675226	676505	677784	679063
55	665797	667076	668355	669634	670913	672192	673470	674749	676028	677307	678586	679865
60	666599	667878	669157	670436	671715	672994	674273	675552	676830	678109	679388	670667
65	667402	668681	669960	671238	672517	673796	675075	676354	677633	678912	680912	681469
70	668204	669483	670762	672041	673320	674598	675877	677156	678435	679714	680993	682272
75	669006	670285	671564	672843	674122	675401	676680	677959	679237	680516	681795	683074
80	669809	671088	672366	673645	674924	676203	677482	678761	680040	681319	682597	683876
85	670611	671890	673169	674448	675726	677005	678284	679563	680842	682121	683400	684679
90	671413	672692	673971	675250	676529	677808	679087	680365	681644	682923	684202	685481
95	672216	673494	674773	676052	677331	678610	679889	681168	682447	683725	685004	686283
100	673018	674297	675576	676854	678133	679412	680691	681970	683249	684528	685807	687086
105	673820	675099	676378	677657	678936	680215	681493	682772	684051	685330	686609	687888
110	674622	675901	677180	678459	679738	681017	682296	683575	684853	686132	687411	688690
115	675425	676704	677983	679261	680540	681819	683098	684377	685656	686935	688214	689492
120	676227	677506	678785	680064	681343	682621	683900	685179	686458	687737	689016	690295
125	677029	678308	679587	680866	682145	683424	684703	685982	687260	688539	689818	691097
130	677832	679111	680389	681668	682947	684226	685505	686784	688063	689342	690620	691899
135	678634	679913	681192	682471	683749	685028	686307	687586	688865	690144	691423	692702
140	679436	680715	681994	683273	684552	685831	687110	688388	689667	690946	692225	693504
145	680239	681517	682796	684075	685354	686633	687912	689191	690470	691748	693027	694306
150	681041	682320	683599	684677	686156	687435	688714	689993	691272	692551	693830	695109
155	681843	683122	684401	685680	686959	688238	689516	690795	692074	693353	694632	695911
160	682645	683924	685203	686482	687761	689040	690319	691598	692876	694155	695434	696713
165	683448	684727	686005	687284	688563	689842	691121	692400	693679	694958	696237	697515
170	684250	685529	686808	688087	689366	690644	691923	693202	694481	695760	697039	698318
175	685052	686331	687610	688889	690168	691447	692726	694004	695283	696562	697841	699120
180	685855	687134	688412	689691	690970	692249	693528	694807	696086	697365	698643	699922
185	686657	687936	689215	690494	691772	693051	694330	695609	696888	698167	699446	700725
190	687459	688738	690017	691296	692575	693854	695133	696411	697690	698969	700248	701527
195	688262	689540	690819	692098	693377	694656	695935	697214	698473	699771	701050	702329
200	689064	690343	691622	692900	694179	695458	696737	698016	699295	700574	701853	703132
205	689866	691145	692424	693703	694982	696261	697539	698818	700097	701376	702655	703934
210	690668	691947	693226	694505	695784	697063	698342	699621	700899	702178	703457	704736
215	691471	692750	694028	695307	696586	697865	699144	700423	701702	702981	704260	705538
220	692273	693552	694831	696110	697389	698667	699946	701225	702504	703783	705062	706341
225	693075	694354	695633	696912	698191	699470	700749	702027	703306	704585	705864	707143
230	693878	695157	696435	697714	698993	700272	701551	702830	704109	705388	706666	707945
235	694680	695959	697238	698517	699795	701074	702353	703632	704911	706190	707469	708748
240	695482	696761	698040	699319	700598	701877	703156	704434	705713	706992	708271	709550

TABLE BASED ON RC SP VOL = .017415 FT3/LBM, PZR SP VOL = .019996 FT3/LBM & MU Sys SP VOL = .01613 FT3/LBM

REACTOR COOLANT IN LBM
(532F, 2155 PSIG)
MAKEUP TANK LEVEL

PRESSURIZER LEVEL	40	45	50	55	60	65	70	75	80	85	90	95
40	555506	556785	558064	559343	560622	561901	563180	564458	567737	567016	568295	569574
45	556111	557390	558669	559948	561227	562506	563784	565063	566342	567621	568900	570179
50	556716	557995	559274	560553	561831	563110	564389	565668	566947	568226	569505	570784
55	557321	558600	559879	561157	562436	563715	564994	566273	567552	568831	570110	571388
60	557926	559204	560483	561762	563041	564320	565599	566878	568157	569436	570714	571993
65	558530	559809	561088	562367	563646	564925	566204	567483	568761	570040	571319	572598
70	559135	560414	561693	562972	564251	565530	566808	568087	569366	570645	571924	573203
75	559740	561019	562298	563577	564856	566134	567413	568692	569971	571250	572529	573808
80	560345	561624	562903	564181	565460	566739	568018	569297	570576	571855	573134	574413
85	560950	562229	563507	564786	566065	567344	568623	569902	571181	572460	573738	575017
90	561554	562833	564112	565391	566670	567949	569228	570507	571786	573064	574343	575622
95	562159	563438	564717	565996	567275	568554	569833	571111	572390	573669	574948	576227
100	562764	564043	565322	566601	567880	569159	570437	571716	572995	574274	575553	576832
105	563369	564648	565927	567206	568484	569763	571042	572321	573600	574879	576158	577437
110	563974	565253	566532	567810	569089	570368	571647	572926	574205	575484	576763	578041
115	564579	565857	567136	568415	569694	570973	572252	573531	574810	576088	577367	578646
120	565183	566462	567741	569020	570299	571578	572857	571436	575414	576693	577972	579251
125	565788	567067	568346	569625	570904	572183	573461	574740	576019	577298	578577	579856
130	566393	567672	568951	570230	571509	572787	574066	575345	576624	577903	579182	580461
135	566998	568277	569556	570834	572113	573392	574671	575950	577229	578508	579787	581066
140	567603	568882	570160	571439	572718	573997	575276	576555	577834	579113	580391	581670
145	568207	569486	570765	572044	573323	574602	575881	577160	578439	579717	580996	582275
150	568812	570091	571370	572649	573928	575207	576486	577764	579043	580322	581601	582880
155	569417	570696	571975	573254	574533	575812	577090	578369	579648	580927	582206	583485
160	570022	571301	572580	573859	575137	576416	577695	578974	580253	581532	582811	584090
165	570627	571906	573185	574463	575742	577021	578300	579579	580858	582137	583416	584694
170	571232	572510	573789	575068	576347	577626	578905	580184	581463	582741	584020	585299
175	571836	573115	574394	575673	576952	578231	579510	580789	582067	583346	584625	583904
180	572441	573720	574999	576278	577557	578836	580114	581393	582672	583951	585230	586509
185	573046	574325	575604	576883	578162	579440	580719	581998	583277	584556	585835	587114
190	573651	574930	576209	577487	578766	580045	581324	582603	583882	585161	586440	587719
195	574256	575535	576813	578092	579371	580650	581929	583208	584487	585766	587044	588323
200	574860	576139	577418	578697	579976	581255	582534	583813	585092	586370	587649	588928
205	575465	576744	578023	579302	580581	581860	583139	584417	585696	586975	588254	589533
210	576070	577349	578628	579907	581186	582465	583743	585022	586301	587580	588859	590138
215	576675	577954	579233	580512	581790	583069	584348	585627	586906	588185	589464	590743
220	577280	578559	579837	581116	582395	583674	584953	586232	587511	588790	590069	591347
225	577885	579163	580442	581721	583000	584279	585558	586837	588116	589394	590673	591952
230	578489	579768	581047	582326	583605	584884	586163	587442	588720	589999	591278	592557
235	579094	580373	581652	582931	584210	585489	586767	588046	589325	590604	591883	593162
240	579699	580978	582257	583536	584815	586093	587372	588651	589930	591209	592488	593767

TABLE BASED ON RC SP VOL = .020864 FT3/LBM, PZR SP VOL = .026525 FT3/LBM & MU Sys SP VOL = .01613 FT3/LBM

REACTOR COOLANT IN LBM
(579F, 2155 PSIG)
MAKEUP TANK LEVEL

PRESSURIZER LEVEL	40	45	50	55	60	65	70	75	80	85	90	95
40	521279	522558	523836	525115	526394	527673	528952	530231	531510	532789	534067	535346
45	521884	523162	524441	525720	526999	528278	529557	530836	532115	533393	534672	535951
50	522488	523767	525046	526325	527604	528883	530162	531440	532719	533998	535277	536556
55	523093	524372	525651	526930	528209	529488	530766	532045	533324	534603	535882	537161
60	523698	524977	526256	527535	528813	530092	531371	532650	533929	535208	536487	537766
65	524303	525582	526861	528139	529418	530697	531976	533255	534534	535813	537092	538370
70	524908	526186	527465	528744	530023	531302	532581	533860	535139	536418	537696	538975
75	525512	526791	528070	529349	530628	531907	533186	534465	535743	537022	538301	539580
80	526117	527396	528675	529954	531233	532512	533791	535069	536348	537627	538906	540185
85	526722	528001	529230	530559	531838	533116	534395	535674	536953	538232	539511	540790
90	527327	528606	529885	531163	532442	533721	535000	536279	537558	538837	540116	541395
95	527932	529211	530489	531768	533047	534326	535605	536884	538163	539442	540720	541999
100	528536	529815	531094	532373	533652	534931	536210	537489	538768	540046	541325	542604
105	529141	530420	531699	532978	534257	535536	536815	538093	539372	540651	541930	543209
110	529746	531025	532304	533583	534862	536141	537419	538698	539977	541256	542535	543814
115	530351	531630	532909	534188	535466	536745	538024	539303	540582	541861	543140	544419
120	530956	532235	533514	534792	536071	537350	538629	539908	541187	542466	543745	545023
125	531561	532839	534118	535397	536676	537955	539234	540513	514792	543071	544349	545628
130	532165	533444	534723	536002	537281	538560	539839	541118	542396	543675	544954	546233
135	532770	534049	535328	536607	537886	539165	540443	541722	543001	544280	545559	546838
140	533375	534654	535933	537212	538491	539769	541048	542327	543606	544885	546164	547443
145	533980	535259	536538	537816	539095	540374	541653	542932	544211	545490	546769	548048
150	534585	535864	537142	538421	539700	540979	542258	543537	544816	546095	547373	548652
155	535189	536468	537747	539026	540305	541584	542863	544142	545421	546699	547978	549257
160	535794	537073	538352	539631	540910	542189	543468	544746	546025	547304	548583	549862
165	536399	537678	538957	540236	541515	542794	544072	545351	546630	547909	549188	550467
170	537004	538283	539562	540841	542119	543398	544677	545956	547235	548514	549793	551072
175	537609	538888	540167	541445	542724	544003	545282	546561	547840	549119	550398	551676
180	538214	539492	540771	542050	543329	544608	545887	547166	548445	549723	551002	552281
185	538818	540097	541376	542655	543934	545213	546492	547771	549049	550328	551607	552886
190	539423	540702	541981	543260	544539	545818	547096	548375	549654	550933	552212	553491
195	540028	541307	542586	543865	545144	546422	547701	548980	550259	551538	552817	554096
200	540633	541912	543191	544469	545748	547027	548306	549585	550864	552143	553422	554701
205	541238	542517	543795	545074	546353	547632	548911	550190	551469	552748	554026	555305
210	541842	543121	544400	545679	546958	548237	549516	550795	552074	553352	554631	555910
215	542447	543726	545005	546284	547563	548842	550121	551399	552678	553957	555236	556515
220	543052	544331	545610	546889	548168	549447	550725	552004	553283	554562	555841	557120
225	543657	544936	546215	547494	548772	550051	551330	552609	553888	555167	556446	557725
230	544262	545541	546820	548098	549377	550656	551935	553214	554493	555772	557051	558329
235	544867	546145	547424	548703	549982	551261	552540	553819	555098	556376	557655	558934
240	545471	546750	548029	549308	550587	551866	553145	554424	555702	556981	558260	559539

TABLE BASED ON RC SP VOL = .022330 FT3/LBM, PZR SP VOL = .026525 FT3/LBM & MU Sys SP VOL = .01613 FT3/LBM

REACTOR COOLANT IN LBM (WITH DH LOOP A RUNNING)

PRESSURIZER LEVEL	RC TEMPERATURE 80	100	120	140
0	731358	728728	725400	721438
5	732356	729723	726390	722423
10	733354	730717	727380	723407
15	734353	731712	728371	724392
20	735351	732707	729361	725376
25	736349	733701	730351	726361
30	737347	734696	731341	727346
35	738345	735690	732331	726330
40	739344	736685	733321	729315
45	740342	737680	734311	730300
50	741340	738674	735301	731284
55	742338	739669	736291	732269
60	743336	740663	737281	733254
65	744334	741658	738271	734238
70	745333	742653	739261	735223
75	746331	743647	740251	736208
80	747329	744642	741241	737192
85	748327	745636	742231	738177
90	749325	746631	743221	739161
95	750324	747626	744211	740146
100	751322	748620	745201	741131
105	752320	749615	746191	742115
110	753318	750609	747181	743100
115	754316	751604	748172	744085
120	755314	752599	749162	745069
125	756313	753593	750152	746054
130	757311	754588	751142	747039
135	758309	755582	752132	748023
140	759307	756577	753122	749008
145	760305	757572	754112	749993
150	761304	758566	755102	750977
155	762302	759561	756092	751962
160	763300	760555	757082	752946
165	764298	761550	758072	753931
170	765296	762544	759062	754916
175	766294	763539	760052	755900
180	767293	764534	761042	756885
185	768291	765528	762032	757870
190	769289	766523	763022	758854
195	770287	767517	764012	759839
200	771285	768512	765002	760824
205	772284	769507	765992	761808
210	773282	770501	766983	762793
215	774280	771496	767973	763778
220	775278	772490	768963	764762
225	776276	773485	769953	765747
230	777274	774480	770943	766731
235	778273	775474	771933	767716
240	779271	776469	772923	768701
245	780269	777463	773913	769685
250	781267	778458	774903	770670
255	782265	779453	775893	771655
260	783264	780447	776883	772639
265	784262	781442	777873	773624
270	785260	782436	778863	774609
275	786258	783431	779853	775593
280	787256	784426	780843	776578
285	788254	785420	781833	777563
290	789253	786415	782823	778547
295	790251	787409	783813	779532
300	791249	788404	784803	780516

This table based on DH Volume of 629 Cu. Ft. with DH Loop A Running

REACTOR COOLANT IN LBM
(WITH DH LOOP B RUNNING)

PRESSURIZER LEVEL	RC TEMPERATURE 80	100	120	140
0	728185	725567	722253	718308
5	729183	726561	723243	719292
10	730181	727556	724233	720277
15	731179	728550	725223	721262
20	732178	729545	726213	722246
25	733176	730539	727203	723231
30	734174	731534	728193	724216
35	735172	732529	729183	725200
40	736170	733523	730173	726185
45	737169	734518	731163	727170
50	738167	735512	732154	728154
55	739165	736507	733144	729139
60	740163	737502	734134	730123
65	741161	738496	735124	731108
70	742159	739491	736114	732093
75	743158	740485	737104	733077
80	744156	741480	738094	734062
85	745154	742475	739084	735047
90	746152	743469	740074	736031
95	747150	744464	741064	737016
100	748149	745458	742054	738001
105	749147	746463	743044	738985
110	750145	747448	744034	739970
115	751143	748442	745024	740954
120	752141	749437	746014	741939
125	753139	750431	747004	742924
130	754138	751426	747994	743908
135	755136	752421	748984	744893
140	756134	753415	749974	745878
145	757132	754410	750964	746862
150	758130	755404	751955	747847
155	759129	756399	752945	748832
160	760127	757393	753935	749816
165	761125	758388	754925	750801
170	762123	759383	755915	751786
175	763121	760377	756905	752770
180	764119	761372	757895	753755
185	765118	762366	758885	754739
190	766116	763361	759875	755724
195	767114	764356	760865	756709
200	768112	765350	761855	757693
205	769110	766345	762845	758678
210	770109	767339	763835	759663
215	771107	768334	764825	760647
220	772105	769329	765815	761632
225	773103	770323	766805	762617
230	774101	771318	767795	763601
235	775099	772312	768785	764586
240	776098	773307	769775	766571
245	777096	774302	770765	766555
250	778094	775296	771756	767540
255	779092	776291	772746	768524
260	780090	777285	773736	769509
265	781089	778280	774726	770494
270	782087	779275	775716	771478
275	783085	780269	776706	772463
280	784083	781264	777696	773448
285	785081	782258	778686	774432
290	786079	783253	779676	775417
295	787078	784247	780666	776402
300	788076	785242	781656	777386

This Table based on DH Volume of 578 Cu. Ft. with DH Loop B Running

REACTOR COOLANT IN LBM
(WITH DH LOOP A & B RUNNING)

PRESSURIZER LEVEL	RC TEMPERATURE 80	100	120	140
0	763401	760656	757183	753047
5	764400	761651	758173	754031
10	765398	762646	759163	755016
15	766396	763640	760153	756000
20	767394	764635	761143	756985
25	768392	765629	762133	757970
30	769391	766624	763123	758954
35	770389	767619	764113	759939
40	771387	768613	765103	760924
45	772385	769608	766093	761908
50	773383	770602	767083	762893
55	774381	771597	768073	763878
60	775380	772592	769063	764862
65	776378	773586	770053	765847
70	777376	774581	771043	766832
75	778374	775575	772033	767816
80	779372	776570	773023	768801
85	780371	777564	774014	769785
90	781369	778559	775004	770770
95	782367	779554	775994	771755
100	783365	780548	776984	772739
105	784363	781543	777974	773724
110	785361	782537	778964	774709
115	786360	783532	779954	775693
120	787358	784527	780944	776678
125	788356	755521	781934	777663
130	789354	786516	782924	778647
135	790352	787510	783914	779632
140	791351	788505	784904	780617
145	792349	789500	785894	781601
150	793347	790494	786884	782586
155	794345	791489	787874	783570
160	795343	792483	788864	784555
165	796341	793478	789854	785540
170	797340	794473	790844	786524
175	798338	795467	791834	787509
180	799336	796462	792824	788494
185	800334	797456	793815	789478
190	801332	798451	794805	790463
195	802331	799446	795795	791448
200	803329	800440	796785	792432
205	804327	801435	797775	793417
210	805325	802429	798765	794402
215	806323	803424	799755	795386
220	807321	804418	800745	796371
225	808320	805413	801735	797355
230	809318	806408	802725	789340
235	810316	807402	803715	799325
240	811314	808397	804705	800309
245	812312	809391	805695	801294
250	813311	810386	806685	802279
255	814309	811381	807675	803263
260	815307	812375	808665	804248
265	816305	813370	809655	805233
270	817303	814364	810645	806217
275	818301	815359	811635	807202
280	819300	816354	812625	808187
285	820298	817348	813616	809171
290	821296	818343	814606	810156
295	822294	819337	815596	811140
300	823292	820332	816586	812125

This Table based on DH Volume of 1144 Cu. Ft. with both DH Loops A & B Running

ON-LINE REACTIVITY MANAGEMENT

1. Record initial plant data.

Rx POWER	ROD INDEX	$R1_{XE}$ Saxon	Saxon EFPD
________%	________%	________%Δk/k	________

2. Record final plant data.

Rx POWER	ROD INDEX	USE CAUTION TO ENSURE PROPER SIGNS ARE MAINTAINED DURING ALL CALCULATIONS.	$R2_{XE}$ Saxon
________%	________%		________%Δk/k

3. Determine Reactivity for reactor power $R1_{RP}$ (Initial) and $R2_{RP}$ (Final)

	$R1_{RP}$	$R2_{RP}$
Use OP-103C curve 15	________%Δk/k	________%Δk/k

4. Determine Reactivity for rod index $R1_{RI}$ (Initial) and $R2_{RI}$ (Final)

	$R1_{RI}$	$R2_{RI}$
Use OP-103C curve 14	________%Δk/k	________%Δk/k

5. Determine total reactivity $R1_T$ (Initial) and $R2_T$ (Final)

$$R1_T = R1_{RP} + R1_{RI} + R1_{XE}$$

$$R1_T = \frac{\%\Delta k}{k} + \frac{\%\Delta k}{k} + \frac{\%\Delta k}{k}$$

$$R2_T = R2_{RP} + R2_{RI} + R2_{XE}$$

$$R2_T = \frac{\%\Delta k}{k} + \frac{\%\Delta k}{k} + \frac{\%\Delta k}{k}$$

$R1_T$	$R2_T$
________%Δk/k	________%Δk/k

6. Determine ΔR (Change in reactivity)

$$\Delta R = R2_T - R1_T$$

$$\Delta R = \frac{\%\Delta k}{k} - \frac{\%\Delta k}{k}$$

ΔR

________%Δk/k

Continue calculation on next page

ON-LINE REACTIVITY MANAGEMENT (cont'd)	
7. Determine IB (Inverse Boron worth)	
Use OP-103C curve 4 for current EFPD If reactor power is >18%, use HFP values.	**IB** ______ $\frac{\text{ppm}}{\%\Delta k/k}$
8. Determine ΔB (Change in RCS boron). Raise boron if positive, lower boron if negative.	
$\Delta B = (\Delta R)\ (IB)$ $\Delta B = \left(\underline{\quad\quad} \frac{\%\Delta k}{k}\right)\left(\underline{\quad\quad} \frac{ppm}{\frac{\%\Delta k}{k}}\right)$	**ΔB** ______ ppm
PERFORMED BY ______________________ DATE __________ VERIFIED BY ______________________ DATE __________	

CONTINUOUS FEED AND BLEED

1. Record plant data. (This enclosure assumes initial and final values are the same.)

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

2. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	$C2_{RCS}$ Final RCS boron conc	Feed source ("A" BAST etc.)	C_{FEED} Boron conc of feed source
________ ppm	________ ppm		________ ppm

3. Determine M_{RCS} (Mass of the RCS)

Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	M_{RCS} ________ lbm

4. Determine M_{FEED} (Total mass of feed)

$$M_{FEED} = (M_{RCS})\ \mathrm{LN}\frac{C_{FEED} - C1_{RCS}}{C_{FEED} - C2_{RCS}}$$

$$M_{FEED} = (\qquad \mathrm{lbm})\,\mathrm{LN}\frac{(\qquad \mathrm{ppm}) - (\qquad \mathrm{ppm})}{(\qquad \mathrm{ppm}) - (\qquad \mathrm{ppm})}$$

M_{FEED} ________ lbm

5. Determine υ_{FEED} (Specific volume of feed source)

Use Enclosure 1 Use temperature of feed source	υ_{FEED} ________ $\frac{ft^3}{lbm}$

6. Determine V_{FEED} (Volume of feed source) (Note: Feed volume = Bleed volume)

$$V_{FEED} = (M_{FEED})(\upsilon_{FEED})(7.48)$$

$$V_{FEED} = (\qquad lbm)\ (\qquad \frac{ft^3}{lbm})\ (7.48\ \frac{gal}{ft^3})$$

V_{FEED} ________ gal

PERFORMED BY ______________________________ DATE ____________

VERIFIED BY ______________________________ DATE ____________

FEED VOLUMES FOR BATCH BORATION OR DILUTION
BLEED PRECEDES FEED - NORMAL METHOD

1. Record plant data. (This enclosure assumes initial and final values are the same.)

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

2. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	$C2_{RCS}$ Final RCS boron conc	Feed source ("A" BAST etc.)	C_{FEED} Boron conc of feed source
________ ppm	________ ppm		________ ppm

3. Determine M_{RCS} (Mass of the RCS)

	M_{RCS}
Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	________ lbm

4. Determine M_{FEED} (Mass of feed source)

$$M_{FEED} = M_{RCS} \frac{C2_{RCS} - C1_{RCS}}{C_{FEED} - C1_{RCS}}$$

$$M_{FEED} = (\qquad)\ lbm \frac{(\qquad)\ ppm - (\qquad)\ ppm}{(\qquad)\ ppm - (\qquad)\ ppm}$$

M_{FEED} ________ lbm

5. Determine υ_{FEED} (Specific volume of feed source)

	υ_{FEED}
Use Enclosure 1 Use temperature of feed source	________ $\frac{ft^3}{lbm}$

6. Determine V_{FEED} (feed volume in gal) (Note: Feed volume = Bleed volume)

$$V_{FEED} = (M_{FEED})(\upsilon_{FEED})(7.48)$$

$$V_{FEED} = (\qquad lbm)\ (\qquad \frac{ft^3}{lbm})\ (7.48)$$

V_{FEED} ________ gal

PERFORMED BY ______________________________ DATE ____________

VERIFIED BY ______________________________ DATE ____________

FEED VOLUMES FOR BATCH BORATION OR DILUTION
FEED PRECEDES BLEED - ALTERNATE METHOD

1. Record plant data. (This enclosure assumes initial and final values are the same.)

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

2. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	$C2_{RCS}$ Final RCS boron conc	Feed source ("A" BAST etc.)	C_{FEED} Boron conc of feed source
________ ppm	________ ppm		________ ppm

3. Determine M_{RCS} (Mass of the RCS)

	M_{RCS}
Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	________ lbm

4. Determine M_{FEED} (Mass of feed source)

$$M_{FEED} = M_{RCS} \frac{C2_{RCS} - C1_{RCS}}{C_{FEED} - C2_{RCS}}$$

$$M_{FEED} = (\qquad)\ lbm \frac{(\qquad)\ ppm - (\qquad)\ ppm}{(\qquad)\ ppm - (\qquad)\ ppm}$$

M_{FEED} ________ lbm

5. Determine υ_{FEED} (Specific volume of feed source)

	υ_{FEED}
Use Enclosure 1 Use temperature of feed source	________ $\frac{ft^3}{lbm}$

6. Determine V_{FEED} (feed volume in gal) (Note: Feed volume = Bleed volume)

$$V_{FEED} = (M_{FEED})(\upsilon_{FEED})(7.48)$$

$$V_{FEED} = (\qquad lbm)\ (\qquad \frac{ft^3}{lbm})\ (7.48)$$

V_{FEED} ________ gal

PERFORMED BY ______________________________ DATE __________

VERIFIED BY ______________________________ DATE __________

BORON CHANGE DUE TO BATCH FEED

1. Record plant data.

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

2. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	V_{FEED} Volume of feed	Feed source ("A" BAST etc.)	C_{FEED} Boron conc of feed source
________ ppm	________ gal		________ ppm

3. Determine $M1_{RCS}$ (Initial mass of RCS)

Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	$M1_{RCS}$ ________ lbm

4. Determine υ_{FEED} (Specific volume of feed source)

Use Enclosure 1 Use temperature of feed source	υ_{FEED} ________ $\frac{ft^3}{lbm}$

5. Determine M_{FEED} (Mass of feed source)

$$M_{FEED} = \frac{V_{FEED}}{\upsilon_{FEED}\,(7.48)}$$

$$M_{FEED} = \frac{(\qquad gal)}{(\qquad \frac{ft^3}{lbm})\,(7.48\ \frac{gal}{ft^3})}$$

M_{FEED}

________ lbm

6. Determine $C2_{RCS}$ (Final RCS boron concentration)

$$C2_{RCS} = \frac{M_{FEED}\,C_{FEED} + M1_{RCS}\,C1_{RCS}}{M1_{RCS} + M_{FEED}}$$

$$C2_{RCS} = \frac{(\qquad lbm)(\qquad ppm) + (\qquad lbm)(\qquad ppm)}{(\qquad lbm) + (\qquad lbm)}$$

$C2_{RCS}$

________ ppm

PERFORMED BY ____________________ DATE ________

VERIFIED BY ____________________ DATE ________

BORATION DURING COOLDOWN

1. Record initial plant data.

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

2. Record final plant data.

RCS Temp	RCS Pressure	PZR Level	MUT Level
________ °F	________ psig	________ in	________ in

3. Record boron data.

$C1_{RCS}$ Initial RCS boron conc	$C2_{RCS}$ Final RCS boron conc
________ ppm	________ Ppm

4. Determine $M1_{RCS}$ (Initial mass of RCS)

	$M1_{RCS}$
Use Enclosure 3 Use Initial RCS temp, PZR level, and MUT level	________ lbm

5. Determine $M2_{RCS}$ (Final mass of RCS)

	$M2_{RCS}$
Use Enclosure 3 Use Final RCS temp, PZR level, and MUT level	________ lbm

6. Determine ΔM_{RCS} (Mass change of RCS)

	ΔM_{RCS}
$\Delta M_{RCS} = M2_{RCS} - M1_{RCS}$ $\Delta M_{RCS} = (\qquad lbm) - (\qquad lbm)$	________ lbm

7. Determine M_{FEED} (Mass of feed solution)

	M_{FEED}
$M_{FEED} = \Delta M_{RCS}$	________ lbm

Continue calculation on next page

BORON DURING COOLDOWN (cont'd)

8. Determine υ_{FEED} (Specific volume of feed source).	
Use Enclosure 1 Use temperature of feed source	υ_{FEED} ______ $\frac{ft^3}{lbm}$
9. Determine ΔV_{RCS} (RCS volume change due to contraction during cooldown)	
$\Delta V_{RCS} = M_{FEED}\, \upsilon_{FEED}$ $\Delta V_{RCS} = (\qquad lbm)\ (\qquad \frac{ft^3}{lbm})\ (7.48\ \frac{gal}{ft^3})$	ΔV_{RCS} ______ gal
10. Determine V_{FEED} (Feed volume)	
$V_{FEED} = \Delta V_{RCS}$	V_{FEED} ______ gal
11. Determine C_{FEED} (Boron concentration of Feed solution)	
$C_{FEED} = \frac{M2_{RCS}\ C2_{RCS} - M1_{RCS}\ C1_{RCS}}{M_{FEED}}$ $C_{FEED} = \frac{(\qquad lbm)(\qquad ppm) - (\qquad lbm)(\qquad ppm)}{(\qquad lbm)}$	C_{FEED} ______ ppm
COMPLETE AND ATTACH ENCLOSURE 10 FOR RATIO OF FEED SOURCES TO BE USED.	
PERFORMED BY ______________________	DATE ________
VERIFIED BY ______________________	DATE ________

DETERMINING RATIO OF TWO FEED SOURCES

Use this enclosure when two addition sources will be used to add a known volume and boron concentration to any location. The higher concentration should be added first.

1. Record addition data. (Enter values from Enclosure 9, if applicable.)

V_{FEED} FEED VOLUME	C_{FEED} BORON CONCENTRATION OF FEED
________ gal	________ ppm

2. Record feed source data.

Source of higher boron concentration	C_{FEED1} Higher boron concentration	Source of lower boron concentration	C_{FEED2} Lower boron concentration
	________ ppm		________ ppm

3. Determine V_{FEED1} (Volume of higher boron source)

$$V_{FEED1} = \frac{(V_{FEED})\ (C_{FEED} - C_{FEED2})}{(C_{FEED1} - C_{FEED2})}$$

$$V_{FEED1} = \frac{(\qquad gal)(\qquad ppm - \qquad ppm)}{(\qquad ppm - \qquad ppm)}$$

V_{FEED1} ________ gal

4. Determine V_{FEED2} (Volume of lower boron source to be added)

$$V_{FEED2} = V_{FEED} - V_{FEED1}$$

$$V_{FEED2} = (\qquad gal) - (\qquad gal)$$

V_{FEED2} ________ gal

PERFORMED BY ______________________ DATE ________

VERIFIED BY ______________________ DATE ________

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A2, Perform a Reactor Coolant System Inventory Balance

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ____________________________________ Date/ ____________

REVIEWED BY: ____________________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ____________________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ____________________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Perform a reactor coolant system inventory balance.

Alternate Path: N/A

JPM #: A2 (modified bank #284)

K/A Rating/Importance: G2.2.12/3.0/3.4 **Task Number/Position:** 0020202004/RO

Task Standard: Perform a reactor coolant system inventory balance using SP-317.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant _____ Admin ___X__ Perform __X___ Simulate ______

References:
1. SP-317, Rev 49

Validation Time: 30 min. **Time Critical**: No

Candidate: ______________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. N/A

SIMULATOR OPERATOR INSTRUCTIONS:

1. N/A

Tools/Equipment/Procedures Needed:

1. SP-317
2. Calculator

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
You collect the following plant data at 1830 for performance of SP-317:

Reactor Coolant (RCS) pressure	2150 psig (RC-003A-PIR1, loop A ribbon).
RCS Tave	579°F (RC-12-TAI).
Pressurizer level	220 inches (RC-001-LIR1 ribbon).
Make-up tank level	98 inches (MU-014-LIR1 ribbon).
Reactor Coolant Drain Tank (RCDT) level	94 inches (WD-23-LI1).
RCV-150 is closed.	
All dumpster readings have been reset to 0.	

Initiating Cues:

You are requested to complete SP-317 with the following data collected at 0230 the next day:

Reactor Coolant (RCS) pressure	2150 psig (RC-003A-PIR1, loop A ribbon).
RCS Tave	579°F (RC-12-TAI).
Pressurizer level	220 inches (RC-001-LIR1 ribbon).
Make-up tank level	82 inches (MU-014-LIR1 ribbon).
Reactor Coolant Drain Tank (RCDT) level	100 inches (WD-23-LI1).
No water additions or removals were made.	

All standpipe flush water flow-rates are 0.05 gpm
Dumpster readings are:

RC-134-FZ	136
RC-135-FZ	153
RC-136-FZ	104
RC-137-FZ	201

MUV-27 has a packing leak of 38 drops per minute.
Controlled Bleed-off for the Reactor Coolant pumps:

X922	1.48
X923	1.35
X924	1.47
X925	1.52

Chemistry Department reports Primary-to-Secondary leakage 0.02 gpm.

START TIME: __________

STEP 1: Obtain a copy of appropriate procedure. **EXAMINER NOTE: Provide candidate with a clean copy of SP-317. Calculators will also be provided if the candidate does not have one.** STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___
STEP 2: Candidate should complete SP-317. STANDARD: Candidate completes SP-317. **EXAMINER NOTE: See attached key for answers; section G parts 2, 3 and 4 of the enclosure should have leak rates of ± 0.1 gpm.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
You collect the following plant data at 1830 for performance of SP-317:

Reactor Coolant (RCS) pressure	2150 psig (RC-003A-PIR1, loop A ribbon).
RCS Tave	579°F (RC-12-TAI).
Pressurizer level	220 inches (RC-001-LIR1 ribbon).
Make-up tank level	98 inches (MU-014-LIR1 ribbon).
Reactor Coolant Drain Tank (RCDT) level	94 inches (WD-23-LI1).

RCV-150 is closed.
All dumpster readings have been reset to 0.

Initiating Cues:

You are requested to complete SP-317 with the following data collected at 0230 the next day:

Reactor Coolant (RCS) pressure	2150 psig (RC-003A-PIR1, loop A ribbon).
RCS Tave	579°F (RC-12-TAI).
Pressurizer level	220 inches (RC-001-LIR1 ribbon).
Make-up tank level	82 inches (MU-014-LIR1 ribbon).
Reactor Coolant Drain Tank (RCDT) level	100 inches (WD-23-LI1).

No water additions or removals were made.
All standpipe flush water flow-rates are 0.05 gpm
Dumpster readings are:

RC-134-FZ 136
RC-135-FZ 153
RC-136-FZ 104
RC-137-FZ 201

MUV-27 has a packing leak of 38 drops per minute.
Controlled Bleed-off for the Reactor Coolant pumps:

X922 1.48
X923 1.35
X924 1.47
X925 1.52

Chemistry Department reports Primary-to-Secondary leakage 0.02 gpm.

RCS LEAKAGE CALCULATION

A. TIME:

1) Start date/time — Date / 1830
2) Stop date/time — Date+1 / 0230
3) Run time (time difference between A1 and A2) — 480 min

B. RC DRAIN TANK:

1) Measurement source — WD-23-LI1
2) DVM instrument number (otherwise N/A) — N/A
3) DVM calibration due date (otherwise N/A) — N/A
4) Level at Stop time — 100 in.
5) Level at Start time — - 94 in.
6) Level change (B4 minus B5) — = 6 in.
7) Level change due to pumping: (otherwise N/A)
   a) Level at start of pumping — N/A in.
   b) Level at end of pumping — - N/A in.
   c) Level change due to pumping (B7a minus B7b) = N/A in.
8) Total Level Change (B6 plus B7c) — 6 in.
9) Total inventory change (B8 x 32.9 gal/in) — 197.4 gal.
10) RCDT rate-of-change (B9/A3) — 0.41 gpm

C. RCP SEALS:

1) CONTROLLED BLEED OFF	RCP-1A X922	RCP-1B X923	RCP-1C X924	RCP-1D X925
a) controlled bleed off	1.48	1.35	1.47	1.52
b) total of all pumps	5.82			

2) DUMPSTER FLOWS	RC-134-FZ	RC-135-FZ	RC-136-FZ	RC-137-FZ
a) dumpster reading at stop time	136	153	104	201
b) dumpster reading at start time	0	0	0	0
c) dumpster difference (C2a minus C2b)	136	153	104	201
d) dumpster conversion (gals/click)	0.25	0.25	0.25	0.25
e) dumpster flow-rate (C2c x C2d/A3) gpm	0.07	0.08	0.05	0.10
f) standpipe flush water flow-rate gpm	0.05	0.05	0.05	0.05
g) RCP seal leakage C2e minus C2f) gpm	0.02	0.03	0	0.05
h) total RCP seal leakage gpm (SUM of C2g values for all 4 RCPs)	0.10			

D. RCS INVENTORY CHANGES: (NOTE: If no change is observed, N/A respective correction factor.)

1) PRESSURIZER

a) measurement source		RC-001-LIR1 ribbon		
b) level at start time		220	in.	
c) level at stop time	-	220	in.	
d) level change (D1b minus D1c)	=	0	in.	
e) correction factor	x	12.2	gal/in.	(Enclosure 3)
f) inventory change (D1d x D1e)	=	0	gal.	

2) T_{avg}

a) measurement source		RC-12-TAI		
b) temperature at start time		579	°F	
c) temperature at stop time	-	579	°F	
d) temperature change (D2b minus D2c)	=	0	°F	
e) correction factor	x	98.4	gal/°F	(Enclosure 2)
f) inventory change (D2d x D2e)	=	0	gal.	

3) MAKE-UP TANK

a) measurement source		MU-014-LIR1 ribbon	
b) level at start time		98	in.
c) level at stop time	-	82	in.
d) level change (D3b minus D3c)	=	16	in.
e) correction factor	x	30.8	gal/in.
f) inventory change (D3d x D3e)	=	492.8	gal.

4) RCS PRESSURE (2130 to 2170 psig)

a) measurement source	RC-003A-PIR1 loop A ribbon	
b) average pressure at start time	2150	psig
c) average pressure at stop time	2150	psig

5) WATER ADDITIONS OR REMOVALS

a) additions total

____ + ____ + ____ + ____ + ____ = 0 gal.

b) removals total

____ + ____ + ____ + ____ + ____ = 0 gal.

6) TOTAL INVENTORY RATE-OF-CHANGE

(D1f minus D2f plus D3f plus D5a minus D5b) / A3

(0 - 0 + 492.8 + 0 - 0) / 480 = 1.03 gpm

E. COMPONENT IDENTIFIED LEAKAGE:

NOTE: Multiply leakage drops per minute by 0.00001 (10^{-5}) to obtain leakage in gpm.

Component	Leakage Rate
mvv-27	0.00038 gpm
	gpm
	gpm
	gpm
	gpm
	gpm
	gpm
	gpm

Total component leakage rate 0.00 gpm

F. RCP SEAL LEAKAGE COLLECTION POINT: [NOCS 040486]

1) RB Sump (RCV-150 Closed) (otherwise N/A) (RCDT rate of change plus Total RCP seal leakage) (B10 plus C2h) 0.51 gpm

2) RC Drain Tank (RCV-150 Open) (otherwise N/A) (RCDT rate of change minus Total of RCP standpipe flush water flow-rates) (B10 minus C2f) (C2f = RCP-1A + RCP-1B + RCP-1C + RCP-1D) N/A gpm

G. RCS LEAKAGES [NOCS 000597]

1) Primary-to-Secondary Leakage (from Chem. Dept.) (<0.1 gpm rounded to nearest hundredth) 0.02 gpm

2) Identified Leakage (E plus F plus G1) (<10 gpm rounded to nearest tenth) 0.5 gpm

3) Unidentified Leakage (D6 minus G2) (<1.0 gpm rounded to nearest tenth) 0.5 gpm

4) Controlled Bleed Off (C1b) (<10 gpm rounded to nearest tenth) 5.8 gpm

Performed By (Start) Signature Time 1830 Date Date

Performed By (Stop) Signature Time 0230 Date Date+1

Independently Reviewed By ______ Time ______ Date ______

Rev. 50

Effective Date 6/20/00

SURVEILLANCE PROCEDURE

SP-317

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

RC SYSTEM WATER INVENTORY BALANCE

APPROVED BY: Procedure Owner

John W. Smithf or JHT
(SIGNATURE ON FILE)

DATE: 6/19/00

PROCEDURE OWNER: Manager, Nuclear Plant Operations Support

TABLE OF CONTENTS

1.0 PURPOSE

1.1 INTENT

1.1.1 Reactor coolant system leakages shall be determined and demonstrated to be within the acceptance criteria during the modes and at the frequencies indicated in Section 2.1.1 below. [NOCS 001013, 005528, 062795, 090200]

1.2 CMIS EQUIPMENT

1.2.1 The following tags are listed in CMIS as being affected by this procedure:

None

RC-135-FZ	RCT-1	WDT-4
RC-136-FZ	RCV-8	WDT-5
RC-137-FZ	RCV-9	WDV-60
RCP-1A	RCV-10	WDV-61
RCP-1B	RCV-150	WDV-247
RCP-1C	WD-23-LT1	RC-4A-TE4
RCP-1D	WDP-8	RC-4B-TE1

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 Technical Specification Reference

Applicable References	Surv. Perf. During Modes	LCO/Other Requirements During Modes	Surv. Freq.	Freq. Notes	Mode Notes
3.4.12.1	1 thru 3	1 thru 4	3D		20
FPC	1 thru 3	1 thru 4	M		25

SURVEILLANCE FREQUENCY:

3D - 3 days (at least once per 72 hrs. during steady state operations).

M - At least once per 31 days.

FREQUENCY NOTES:

None

MODE NOTES:

20 - Not required to be performed in Mode 3 until 12 hours of Steady State Operation, but must be performed prior to entry into Mode 2.

25 - RCS pressure at 2150 ± 20 psig.

2.1.2 ASME Steam Tables

2.1.3 Engineering Calculation M93-0009R2

3.0 PERSONNEL INDOCTRINATION

3.1 SETPOINTS

3.1.1 Refer to Technical Specification 3.4.12 for maximum allowed leakage values.

3.2 DESCRIPTION

3.2.1 Calculation Information

3.2.1.1 Leak rates produced by this procedure are time averaged over the time interval chosen to record data. The total inventory rate-of-change will be the amount of indicated leakage from the RCS, i.e., (Δ PZR level + Δ MUT level + Additions -T_{avg} Correction) divided by Run Time (in minutes) to yield gallons per minute.

3.2.1.2 Notations contained in this procedure such as (C.2.a) or (F.2) refer to line items on Enclosure 1 (i.e., C.2.a is Section C, Step 2, line 'a' on Enclosure 1).

3.2.1.3 In all calculations, carry the algebraic sign throughout the calculation except where instructed to use the absolute value.

3.2.1.4 All data recorded in Section G of Enclosure 1, with the exception of item G.1, will be rounded off to the nearest tenth. Item G.1 and all other Sections will use data rounded to the nearest hundredth. [NOCS 000597]

3.2.2 Measurement Sources

3.2.2.1 The following steps describe the measurement sources for leakage calculations. The same instrument must be used for the test duration.

3.2.2.2 Reactor Coolant Drain Tank (RCDT) Level WDT-5 (B.1)

- o WD-23-LI1 (convert to inches) or
- o Calibrated DVM connected to Main Control Board PSA, TB-43-20(+) and TB-43-19(-) [Measured voltage x 16 = level in inches] or
- o Computer Point #X368

3.2.2.3 Pressurizer (PZR) Level RCT-1 (D.1.a)

- o RC-001-LIR1 or RC-001-LIR3 or
- o Computer Point R874

3.2.2.4 T_{avg} (D.2.a)

- o RC-12-TAI (Unit T_{avg} Indicator)

- o IF RC-12-TAI is off scale low
  THEN any of the following computer points may be used:

  RECL-239 T-Hot WR A Loop (RC-4A-TE4)
  RECL-18 T-HoT WR B Loop (RC-4B-TE1)

3.2.2.5 Makeup Tank Level (MUT) MUT-1 (D.3.a)

- o MU-014-LIR1 (MU-14-MS must be maintained in the same position for the duration of the test) or

- o Computer point X359

3.2.2.6 RCS Pressure (D.4.a)

- o RC-003A-PIR1 or

- o RC-003A-PIR2 or

- o Computer Point R762 (Convert to psig)

3.2.3 Pretest Instructions

3.2.3.1 _____ IF the RCDT level will not be acceptable throughout the duration of this procedure,
THEN lower RCDT level to ensure adequate volume will be maintained.

NOTE: **Venting the RCDT through WDV-60 and WDV-61 would permit any increase in pressure or transient within the RCDT to affect the loop seal on WDT-4, Misc. Waste Storage Tank.**

3.2.3.2 _____ ENSURE the RCDT is vented to the waste gas header for the duration of this procedure.

3.2.3.3 _____ IF leakage is detected through RCV-8, -9, or -10,
THEN PLACE the RCDT on recirculation using OP-407J

3.2.3.4 To take credit for RCS Controlled Leakage measurements, RCS pressure must be between 2130 psig and 2170 psig.

3.3 DEFINITIONS AND ABBREVIATIONS

3.3.1 DVM - Digital Volt Meter

3.3.2 MUT - Makeup Tank

3.3.3 RC - Reactor Coolant

3.3.4 RCDT - Reactor Coolant Drain Tank

3.3.5 RCP - Reactor Coolant Pump

3.3.6 RCS - Reactor Coolant System

3.3.7 MU - Make-up and Purification System

3.3.8 CBO - Controlled Bleed Off

3.4 RESPONSIBILITIES

3.4.1 The Manager, Nuclear Operation Support, is responsible for the content of this procedure, shall act as Interpretation Contact for any questions regarding intent, and has final authority regarding the procedure.

3.4.2 This procedure is designed and written to be performed by Nuclear Operators reporting directly to the Shift Supervisor. No additional skills are required.

3.5 LIMITATIONS AND PRECAUTIONS

3.5.1 This leak rate determination, while regularly scheduled to be performed on a 72 hr. basis, shall not be limited to any specific interval, but shall be performed whenever any abnormal or unexpected change (abnormal MUT level shift, excessive makeup flow, etc.) is noted.

3.5.2 To avoid addition or removal of water from the RC or MU systems during or immediately prior to leak rate checks, the following operations should be minimized during leak rate determinations:

- o Makeup or chemical addition to the MU system or RCS from other systems.
- o Sampling of the RCS, MU system, or interconnected systems.
- o Venting or draining from the RC or MU systems.
- o Changing MU demineralizers or filters in service.
- o Boration or Deboration.

3.5.3 The RC, MU System, and interconnected systems should be maintained in a steady state condition during leakage measurements.

3.5.4 The following operations should be minimized during leakage measurements:

- o Variations in reactor power.
- o Variations in RCS pressure and temperature.
- o Operations that affect pressurizer level.
- o RC pump configuration changes.
- o Valve lineups that affect the RC and MU Systems.
- o Change of coolers in service that affect the RC and MU Systems.
- o Change in pumps in service that affect the RC and MU Systems.
- o Other operations which could affect total contained volume or density of the fluid in the operating primary system.

3.5.5 The following is recommended:

- o RC T_{avg} and reactor power be in automatic control.
- o Pressurizer level control and RCP seal injection flow control in automatic with pressurizer level at 220" ± 5" when Tave is 579 F, or between 60" and 125" when in Mode 3, and MUT level between 55" and 100" with enough level such that water will not have to be added during this test.
- o The same signal source be utilized when recording the various parameters. Differences between signal sources could be misinterpreted as RCS leakage when comparing successive readings.

3.6 ACCEPTANCE CRITERIA

3.6.1 RCS leakage shall be limited to the following:

a. 1 gpm unidentified leakage

b. 0.1 gpm primary-to-secondary leakage through any one OTSG. (Since current sampling methods do not provide individual OTSG leak rates, the **total** leak rate shall not exceed 0.1 gpm.)

c. 10 gpm identified leakage from RCS

d. 10 gpm RCP Controlled Bleed Off Flow at a RCS pressure of 2130 to 2170 psig (Non Tech Spec)

3.7 PREREQUISITES

3.7.1 Section 3.0, Personnel Indoctrination, has been read and understood by those performing this procedure.

Initial/ Date

Initial/Date

3.7.2 NOTIFY the Shift Supervisor that the Surveillance Procedure is to be performed and the nature of the test.

3.7.3 For performance of this procedure, a calculator is required.

4.0 INSTRUCTIONS

NOTE: RCDT pressure should be less than 3 psig prior to beginning this procedure.

NOTE: Dumpster readings (C.2.a, C.2.b, C.2.c, C.2.e, C.2.g and C.2.h) are not required if RCV-150 is open.

4.1 INITIAL TEST DATA

4.1.1 RECORD the following data on Enclosure 1:

- RECORD the instruments selected as sources (B.1, D.1.a, D.2.a, D.3.a, D.4.a)
- RECORD DVM Information (B.2, and B.3) if DVM is used
- Start Time (A.1)
- RCDT Level (B.5)
- RCP Seal Leakage (dumpster) integrator readings (C.2.b)
- Pressurizer Level (D.1.b)
- T_{avg} (D.2.b)
- MUT Level (D.3.b)
- RCS Pressure (D.4.b)

4.2 SUPPLEMENTAL DATA

NOTE: RCP CBO Flow may also be calculated using third stage seal cavity pressure (RC-19A-PR1, RC-19A-PR2, RC-19B-PR1 and RC-19B-PR2) and Enclosure 4, Calculated CBO Flow. Linear interpolation of Enclosure 4 is acceptable.

4.2.1 DETERMINE AND RECORD individual RCP Seal Controlled Bleed Off Flow (C.1.a).

4.2.2 OBTAIN the RCP Standpipe Flushwater flow rate from the Control Center Notebook. CONVERT to gpm AND RECORD on Enclosure 1 (C.2.f).

NOTE: To obtain leakage in "gpm", multiply the number of drops per minute times 10^{-5} (0.00001).

4.2.3 RECORD component identified leakage (i.e., valve packing, pump seal, fitting leakage, etc.) (E).

4.2.4 RECORD the latest value for primary to secondary leakage from the Chemistry Department, CH-266 (G.1).

4.3 SPECIAL TEST DATA

4.3.1 IF the RCDT is pumped down during the test interval,
THEN DETERMINE AND RECORD the change in level due to pumping (B.7.a, b, and c).

4.3.2 IF it becomes necessary to sample the RCS during leak rate determination,
THEN DETERMINE from Chemistry the total gallons removed from the RCS AND RECORD the absolute value on Enclosure 1 (D5.b). Otherwise N/A.

4.3.3 IF it becomes necessary to vent or drain from the RCS during leak rate determination,
THEN DETERMINE the total gallons removed from the RCS AND RECORD the absolute value on Enclosure 1 (D.5.b). Otherwise N/A.

4.3.4 IF it becomes necessary to add water to the RCS, MU&P System, or interconnected systems during leak rate determination,
THEN DETERMINE the total gallons added AND RECORD the value on Enclosure 1 (D.5.a). Otherwise N/A.

4.4 FINAL TEST DATA

4.4.1 The test interval should be approximately 8 hours. Plant conditions may exist such that periods of less than 8 hours may be desirable and must be authorized by the Nuclear Shift Supervisor; however, the minimum test interval necessary to satisfy the acceptance criteria shall be 4 hours.

4.4.2 RECORD the following data on Enclosure 1:

- o Stop Time (A.2)
- o RCDT Level (B.4)
- o RCP Seal Leakage (dumpster) integrator readings (C.2.a)
- o Pressurizer Level (D.1.c)
- o T_{avg} (D.2.c)
- o MUT Level (D.3.c)
- o RCS Pressure (D.4.c)

4.5 CALCULATION OF LEAKAGE

4.5.1 CALCULATE the test Run Time (A.3).

4.5.2 COMPLETE Section B of Enclosure 1.

4.5.3 CALCULATE Total Seal Leakage in Section C of Enclosure 1 (C.1.b and C.2.h).

4.5.4 COMPLETE Section D of Enclosure 1.

4.5.5 Total the identified component leakages in Section E of Enclosure 1.

NOTE: If RCV-150 is closed, RCP seal leakage goes to the RB sump (F.1), and if RCV-150 is open, RCP seal leakage goes to the RCDT (F.2).

4.5.6 CALCULATE "RCP Seal Leakage Collection Point" leakage in Section F of Enclosure 1.

4.5.7 CALCULATE "RCS Leakages" in Section G of Enclosure 1.

4.5.8 PERFORM an independent review of all calculations on Enclosure 1.

4.5.9 INFORM the Shift Supervisor of the completion and the results of this procedure.

5.0 FOLLOW-UP ACTIONS

5.1 RESTORATION INSTRUCTIONS

None

5.2 CONTINGENCIES

5.2.1 IF acceptance criteria 3.6.1a, 3.6.1b, and 3.6.1c cannot be met, THEN NOTIFY the Shift Supervisor that Technical Specification 3.4.12 actions apply.

5.2.2 IF acceptance criteria 3.6.1d cannot be met, THEN NOTIFY the Shift Supervisor.

RCS LEAKAGE CALCULATION

A. TIME:

1) Start date/time ________/________
2) Stop date/time ________/________
3) Run time (time difference between A1 and A2) ________min

B. RC DRAIN TANK:

1) Measurement source ________
2) DVM instrument number (otherwise N/A) ________
3) DVM calibration due date (otherwise N/A) ________
4) Level at Stop time ________in.
5) Level at Start time - ________in.
6) Level change (B4 minus B5) = ________in.
7) Level change due to pumping: (otherwise N/A)
   a) Level at start of pumping ________in.
   b) Level at end of pumping - ________in.
   c) Level change due to pumping (B7a minus B7b) = ________in.
8) Total Level Change (B6 plus B7c) ________in.
9) Total inventory change (B8 x 32.9 gal/in) ________gal.
10) RCDT rate-of-change (B9/A3) ________gpm

C. RCP SEALS:

1) CONTROLLED BLEED OFF	RCP-1A X922	RCP-1B X923	RCP-1C X924	RCP-1D X925
a) controlled bleed off				
b) total of all pumps				

2) DUMPSTER FLOWS	RC-134-FZ	RC-135-FZ	RC-136-FZ	RC-137-FZ
a) dumpster reading at stop time				
b) dumpster reading at start time				
c) dumpster difference (C2a minus C2b)				
d) dumpster conversion (gals/click)	0.25	0.25	0.25	0.25
e) dumpster flow-rate (C2c x C2d/A3) gpm				
f) standpipe flush water flow-rate gpm				
g) RCP seal leakage C2e minus C2f) gpm				
h) total RCP seal leakage gpm (SUM of C2g values for all 4 RCPs)				

D. RCS INVENTORY CHANGES: (NOTE: If no change is observed, N/A respective correction factor.)

1) PRESSURIZER

a) measurement source		______		
b) level at start time		______	in.	
c) level at stop time	-	______	in.	
d) level change (D1b minus D1c)	=	______	in.	
e) correction factor	x	______	gal/in.	(Enclosure 3)
f) inventory change (D1d x D1e)	=	______	gal.	

2) T_{avg}

a) measurement source		______		
b) temperature at start time		______	°F	
c) temperature at stop time	-	______	°F	
d) temperature change (D2b minus D2c)	=	______	°F	
e) correction factor	x	______	gal/°F	(Enclosure 2)
f) inventory change (D2d x D2e)	=	______	gal.	

3) MAKE-UP TANK

a) measurement source		______	
b) level at start time		______	in.
c) level at stop time	-	______	in.
d) level change (D3b minus D3c)	=	______	in.
e) correction factor	x	30.8	gal/in.
f) inventory change (D3d x D3e)	=	______	gal.

4) RCS PRESSURE (2130 to 2170 psig)

a) measurement source	______	
b) average pressure at start time	______	psig
c) average pressure at stop time	______	psig

5) WATER ADDITIONS OR REMOVALS

a) additions total

______ + ______ + ______ + ______ + ______ = ______gal.

b) removals total

______ + ______ + ______ + ______ + ______ = ______gal.

6) TOTAL INVENTORY RATE-OF-CHANGE

(D1f minus D2f plus D3f plus D5a minus D5b) / A3

(______ - ______ + ______ + ______ - ______) / ______ = ______ gpm

E. COMPONENT IDENTIFIED LEAKAGE:

NOTE: Multiply leakage drops per minute by 0.00001 (10^{-5}) to obtain leakage in gpm.

Component	Leakage Rate
____	____ gpm
____	____ gpm
____	____ gpm
____	____ gpm
____	____ gpm
____	____ gpm
____	____ gpm
____	____ gpm

Total component leakage rate ____ gpm

F. RCP SEAL LEAKAGE COLLECTION POINT: [NOCS 040486]

1) RB Sump (RCV-150 Closed) (otherwise N/A)
(RCDT rate of change plus Total RCP seal leakage)
(B10 plus C2h) ____ gpm

2) RC Drain Tank (RCV-150 Open) (otherwise N/A)
(RCDT rate of change minus Total of RCP standpipe flush water flow-rates) (B10 minus C2f) ____ gpm
(C2f = RCP-1A + RCP-1B + RCP-1C + RCP-1D)

G. RCS LEAKAGES [NOCS 000597]

1) Primary-to-Secondary Leakage (from Chem. Dept.) ____ gpm
(<0.1 gpm rounded to nearest hundredth)

2) Identified Leakage (E plus F plus G1) ____ gpm
(<10 gpm rounded to nearest tenth)

3) Unidentified Leakage (D6 minus G2) ____ gpm
(<1.0 gpm rounded to nearest tenth)

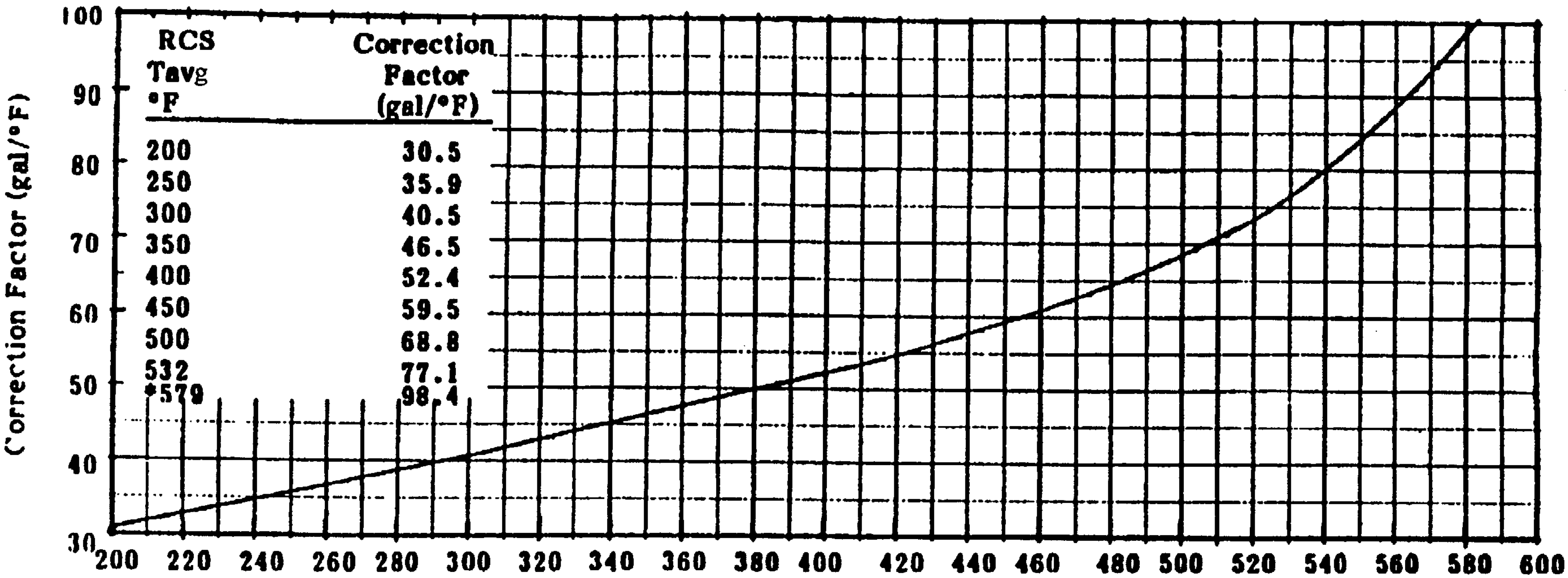
4) Controlled Bleed Off (C1b) ____ gpm
(<10 gpm rounded to nearest tenth)

Performed By (Start) ____ Time ____ Date ____

Performed By (Stop) ____ Time ____ Date ____

Independently Reviewed By ____ Time ____ Date ____

RCS Tavg CORRECTION FACTOR

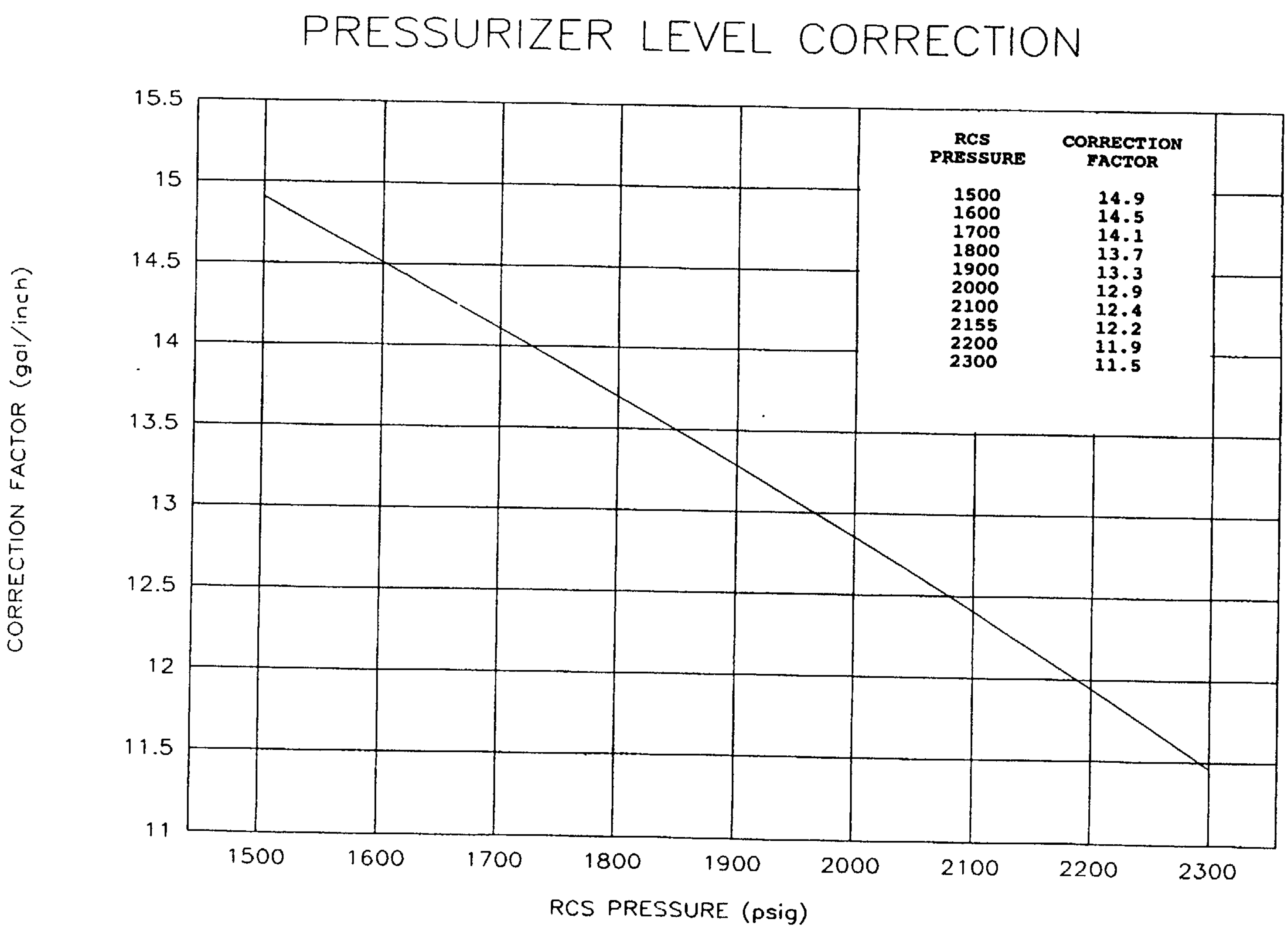


RCS Tavg °F	Correction Factor (gal/°F)
200	30.5
250	35.9
300	40.5
350	46.5
400	52.4
450	59.5
500	68.8
532	77.1
*579	98.4

RCS Tavg (°F) (Average T_{ave} during data interval i.e., $\frac{T_{avg}\ \text{START} + T_{avg}\ \text{STOP}}{2}$)

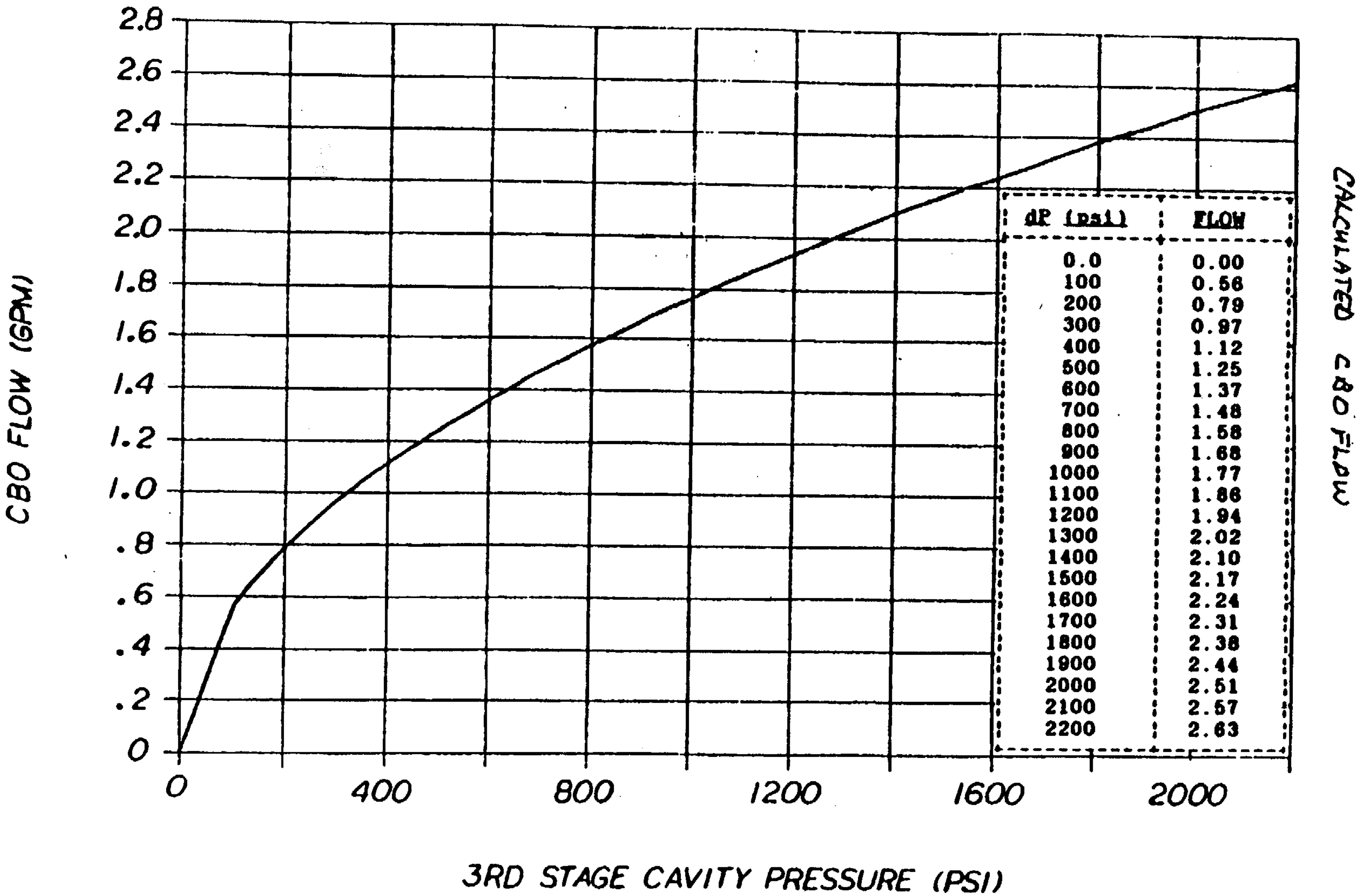
* Normal Operating Temperature

RCS PRESSURE VS. PRESSURIZER LEVEL CORRECTION FACTOR



RCS PRESSURE	CORRECTION FACTOR
1500	14.9
1600	14.5
1700	14.1
1800	13.7
1900	13.3
2000	12.9
2100	12.4
2155	12.2
2200	11.9
2300	11.5

CALCULATED CBO FLOW



dP (psi)	FLOW
0.0	0.00
100	0.56
200	0.79
300	0.97
400	1.12
500	1.25
600	1.37
700	1.48
800	1.58
900	1.68
1000	1.77
1100	1.86
1200	1.94
1300	2.02
1400	2.10
1500	2.17
1600	2.24
1700	2.31
1800	2.38
1900	2.44
2000	2.51
2100	2.57
2200	2.63

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A3, Using Survey Maps Determine Radiation Requirements and Stay Times

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ ______________

REVIEWED BY: ______________________________ Date/ ______________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ______________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ______________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Using survey maps determine radiation requirements and stay times.

Alternate Path: N/A

JPM #: A3 (modified bank #235)

K/A Rating/Importance: G2.3.1/2.6/3.0 **Task Number/Position:** 1190103003/PPO

Task Standard: Using survey maps determine radiation requirements and stay times.

Preferred Evaluation Location: Simulator _____ In-Plant _____ Admin __X__

Preferred Evaluation Method: Perform __X__ Simulate ______

References:
1. HPP-300, Rev 7

Validation Time: 15 min.

Time Critical: No

Candidate: ______________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. N/A

SIMULATOR OPERATOR INSTRUCTIONS:

1. N/A

Tools/Equipment/Procedures Needed:

1. Survey Map
2. Calculator

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at full power.

Initiating Cues:

Using the supplied survey map determine the maximum stay time (including transit time) without exceeding the annual administrative limit or the Health Physics Dose goal for each of the following workers:

Worker 1 has an accumulated annual dose of 3820 mR – WB; his accumulated weekly dose is 170 mR.
Worker 2 has an accumulated annual dose of 3980 mR – WB; his accumulated weekly dose is 40 mR.

These 2 workers will be repairing a drain valve on the WDP-1A's ("A" Waste Gas Compressor) seal water tank. The transit time to the job is 1 minute. Area dose rates for transit are 2 mR/hr.

No extensions have been granted.

START TIME: ________

STEP 1:	Critical Step
EXAMINER NOTE: Provide candidate with survey of the Waste Gas Compressor Area. Calculators will also be provided if the candidate does not have one. Candidate uses survey map to determine stay times. STANDARD: Candidate determines the stay time for worker 1 is 6 hours; for worker 2 the stay time is 4 hours. COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP ________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at full power.

Initiating Cues:

Using the supplied survey map determine the maximum stay time (including transit time) without exceeding the annual administrative limit or the Health Physics Dose goal for each of the following workers:

Worker 1 has an accumulated annual dose of 3820 mR – WB; his accumulated weekly dose is 170 mR.
Worker 2 has an accumulated annual dose of 3980 mR – WB; his accumulated weekly dose is 40 mR.

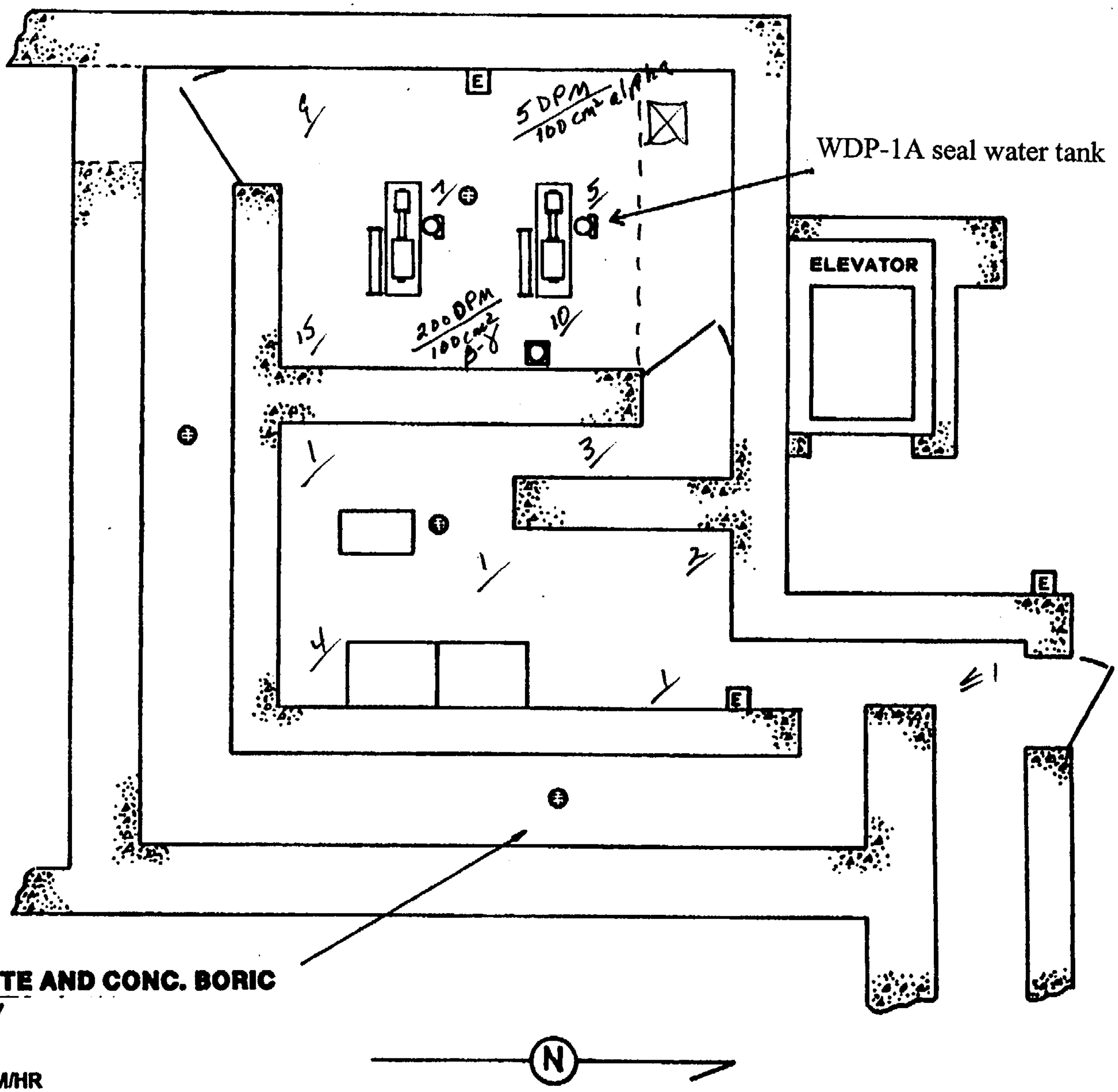
These 2 workers will be repairing a drain valve on the WDP-1A's ("A" Waste Gas Compressor) seal water tank. The transit time to the job is 1 minute. Area dose rates for transit are 2 mR/hr.

No extensions have been granted.

Florida Power CORPORATION

95' EL. AUXILIARY [illegible]DING
SAMPLE AREA "D"
WASTE GAS COMPRESSORS
AND VALVE ALLEY.

SURVEY NO.__________________



RA =RADIATION AREA
HRA=HIGH RADIATION AREA
CA =CONTAMINATED AREA
RMA=RAD MATERIAL AREA
----=BOUNDARY
☒ =STEP OFF PAD
O/H =IN OVERHEAD
H/W =HEAD LEVEL/WAIST LEVEL DOSE RATE

TO EXIT →

95' EL. CONC. WASTE AND CONC. BORIC ACID VALVE ALLEY

DOSE RATES IN MREM/HR
UNLESS OTHERWISE NOTED
NO BETA RADIATION DETECTED
UNLESS OTHERWISE NOTED
***DENOTES CONTACT READING**

NOTE:
SCALE ⅛" : 1'-0"
⊕ : FLOOR DRAIN
E : ELECTRICAL OUTLET

(MC) Rev. 7

Effective Date 02/10/97

HEALTH PHYSICS PROCEDURE

HPP-300

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

FEDERAL DOSE EQUIVALENT LIMITS, ADMINISTRATIVE DOSE EQUIVALENT LEVELS AND HEALTH PHYSICS DOSE GOALS

APPROVED BY: Interpretation Contact

(SIGNATURE ON FILE)

DATE: ______________________

INTERPRETATION CONTACT: Manager Radiation Protection

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to state the Federal/Administrative Dose Equivalent Limits and Health Physics Dose Goals at CR-3.

2.0 REFERENCES

2.1 IMPLEMENTING REFERENCES

2.1.1 HPP-217, "Planned Special Exposures"

2.1.2 HPP-218, "Reportable Events"

2.1.3 CR-3 Radiological Protection Standard

2.2 DEVELOPMENTAL REFERENCES

2.2.1 §10CFR19

2.2.2 §10CFR20.1201

2.2.3 §10CFR20.1206

2.2.4 §10CFR20.1207

2.2.5 §10CFR20.1208

2.2.6 §10CFR20.1301

2.2.7 EM-209, "Re-entry Procedure"

2.2.8 "Radiological Emergency Response Plan"

2.2.9 EPA-400 "EPA Protection Action Guides"

2.2.10 ANI/MAELU "Engineering Inspection Criteria for Nuclear Liability Insurance", section 8.4, "External Dosimetry"

3.0 PERSONNEL INDOCTRINATION

3.1 DESCRIPTION

3.1.1 Administrative dose equivalent levels are necessary to ensure no regulatory dose equivalent limits are exceeded. The regulatory limits for absorbed doses are specified in 10 CFR 20.

3.2 DEFINITIONS

3.2.1 ALARA ("As Low As Reasonably Achievable") - making every reasonable effort to maintain exposures to radiation as far below the dose equivalent limits specified in §§ 10 CFR 20 as is practical, consistent with the state of technology and economic considerations.

3.2.2 Bioassay - the determination of kinds, quantities or concentrations and in some cases the location of radioactive material in the human body.

3.2.3 CEDE (Committed Effective Dose Equivalent) - the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissue.

3.2.4 CDE (Committed Dose Equivalent) - the dose equivalent to organs or tissues that will be received from an intake of radioactive material during the 50 year period following the intake.

3.2.5 Declared Pregnant Woman - a woman who has voluntarily informed her employer (Health Services), in writing, of her pregnancy and estimated date of conception.

3.2.6 DDE (Deep-Dose Equivalent) - external whole-body exposure in which the dose equivalent is taken at a tissue depth of 1 cm (1000 mg/cm^2).

3.2.7 DNPO - Director, Nuclear Plant Operations

3.2.8 Dose Equivalent (DE) or "Dose" - the product of the absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest. Any dose equivalent is expressed in Rems.

3.2.9 Embryo/fetus - the developing human organism from conception to birth.

3.2.10 LDE (Eye Dose Equivalent) - external exposure of the lens of the eye in which the dose equivalent is taken at a tissue depth of 0.3 cm (300 mg/cm^2).

3.2.11 Monitor (monitoring) - For the purpose of this procedure, monitoring means the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

3.2.12 Planned Special Exposure (PSE) - an infrequent exposure to radiation, separate from and in addition to the annual dose limits.

3.2.13 Rad - a special unit of absorbed dose. One (1) Rad is equal to an absorbed dose of 100 ergs/gram.

3.2.14 Radiation (ionizing radiation) - alpha particles, beta particles, gamma-rays, X-rays, neutrons, high-speed electrons and other particles capable of producing ions.

3.2.15 RDMS (computer system) - Radiological Data Management System

3.2.16 Rem - the special unit of any of the quantities expressed as a dose equivalent. The dose equivalent in Rems is equal to the absorbed dose in Rads multiplied by the quality factor.

3.2.17 MRP - Manager Radiation Protection

3.2.18 RWP Dose Margin - a weekly dose allowance assigned by Health Physics, set by means of a Radiation Work Permit via RDMS.

3.2.19 SDE (Shallow Dose Equivalent) - external exposure of the skin or extremity in which the dose equivalent is taken at a tissue depth of 0.007 centimeter (7 mg/cm^2) averaged over an area of 1 square centimeter:

- SDE-WB - shallow dose equivalent, whole body
- SDE-ME - shallow dose equivalent, maximally exposed extremity

3.2.20 TEDE (Total Effective Dose Equivalent) - the sum of the effective deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

3.2.21 TODE (Total Organ Dose Equivalent) - is the sum of the deep-dose equivalent and the committed dose equivalent for the maximally exposed organ or tissue.

3.2.22 UNMONITORED INDIVIDUALS - An Individual that will be allowed RCA access without monitoring as required by 10 CFR 20.1502 and who will not receive dose in excess of the limits stated in section 3.4.8.3 of this procedure.

3.2.23 Week - 7 consecutive days starting on Sunday.

3.2.24 Whole Body - For the purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee.

3.3 RESPONSIBILITIES

3.3.1 All personnel are responsible for maintaining their cumulative radiation dose equivalents ALARA; thus ensuring no radiation exposure limits/levels are exceeded.

3.4 LIMITS AND PRECAUTIONS

3.4.1 Annual External Dose Equivalents for Adult - "complete" NRC Form 5

	FEDERAL LIMIT	ADMINISTRATIVE LIMIT
o TEDE	5.0 Rem	4.0 Rem (or 1 REM if lifetime dose ≥ age).
o LDE	15 Rem	12 Rem
o SDE-WB	50 Rem	40 Rem
o SDE-ME	50 Rem	40 Rem

3.4.1.1 The 4 Rem TEDE administrative limit may be increased to 5 Rem with authorization from the DNPO.

3.4.2 Annual External Dose Equivalents for Adult - "incomplete" NRC Form 5

- o Reduce values listed in 3.4.1 by 25% for each unknown quarter of the current year.

3.4.3 Annual Internal Dose Equivalents for Adult - "complete" NRC Form 5

NOTE: CR-3 does not monitor internal dose due to no workers likely to receive, in 1 year, an intake in excess of 10 percent of the applicable ALIs listed in 10CFR20, appendix B, table 1.

NOTE: CR-3's levels are set at 80% of the Federal limits.

3.4.3.1 The following is a list of the internal dose levels that require monitoring for internal dose:

	FEDERAL	ADMINISTRATIVE
o CEDE	0.5 Rem	0.4 Rem
o CDE	5.0 Rem	4.0 Rem
o ALI	0.1 ALI	.08 ALI
o DAC-Hrs	200 DAC-Hrs	160 DAC-Hrs

3.4.3.2 The following is a list of the internal dose limits:

	FEDERAL	ADMINISTRATIVE
o CEDE	(5 Rem) - (DDE)	(4 Rem) - (DDE)
o CDE	(50 Rem) - (DDE)	(40 Rem) - (DDE)
o ALI	1 ALI	.8 ALI
o DAC-Hrs	2000 DAC-Hrs	1600 DAC-Hrs

3.4.4 Annual Internal Dose Equivalents for Adult - "incomplete" NRC Form 5

- o Reduce values listed in 3.4.3 by 25% for each unknown quarter of the current year.

3.4.5 Health Physics Dose Goals for Adult

NOTE: All Health Physics dose goals are automatically initiated by RDMS.

- o 0.2 Rem/week; or
- o 0.2 to 2.5 Rem/week based upon RWP Margin setpoints;

3.4.6 Dose Equivalent Limits/Levels for Pregnant Women

3.4.6.1 Pregnant workers will be provided the opportunity, without harassment, to voluntarily elect to utilize additional protection to their embryo/fetus as outlined in CR-3's Prenatal Radiation Exposure Policy (Radiological Protection Standard, section 8.0).

NOTE: The outlined limits apply to the gestation period of the embryo/fetus.

3.4.6.2 Federal Dose Equivalent Limits for the embryo/fetus of a "declared" Pregnant Woman:

- o 0.5 Rem TEDE to the embryo/fetus; and
- o proportioned equally over the entire period of pregnancy without substantial variation above a uniform monthly exposure rate.

NOTE: Declared pregnant women will not be routinely assigned work in "airborne radioactivity areas" during pregnancy or after delivery, if the mother is nursing her child.

NOTE: These Health Physics dose goals are not initiated automatically by RDMS.

NOTE: Adult females that have not declared their pregnancy (as outlined in Radiological Protection Standard, 8.1.2) shall have the same dose limits as other radiation workers.

3.4.6.3 Adult female workers that formally declare their pregnancy will have their occupational dose limited by one of the following Administrative Options:

- o Option 1 - Reassignment with no further occupational exposure or
- o Option 2 - 0.4 Rem TEDE, not to exceed 0.040 Rem/month, to the embryo/fetus over the entire gestation period.

3.4.7 Dose Equivalent Limits/Levels for Escorted Radiation Workers

3.4.7.1 The dose equivalent limits/levels for "monitored" Escorted Radiation Workers are the same as those for other radiation workers.

3.4.7.2 The Annual Dose Equivalent Limit for Unmonitored Individuals is 10% of the applicable dose limits listed for radiation workers under 3.4.1.

3.4.7.3 The Health Physics Dose Goal for Unmonitored Individuals is 0.100 Rem/yr.

3.4.8 Dose Equivalent Limits/Levels for Minors

3.4.8.1 All minors must be issued a permanently assigned TLD prior to any entry into an RCA. Minors frequenting the restricted area (but not the RCA) will be evaluated for external dose monitoring in accordance with guidance given in the Radiation Protection Standard.

3.4.8.2 The Annual Dose Equivalent Limit for Minors is 10% of the applicable dose limits for a radiation worker listed under 3.4.1.

3.4.8.3 The Health Physics Dose Goals for Minors is 0.100 Rem/yr.

3.4.9 Emergency Worker Dose Limits

NOTE: Dose limits are for non-pregnant adults only.

NOTE: Emergency worker TEDE limits are implemented by the "Radiological Emergency Response Plan," section 14 and Emergency Procedures (EM-209).

NOTE: Every emergency team member must have a complete NRC Form 4 on file.

3.4.9.1 Dose limits for general emergency activities are:

- o 5 Rem TEDE;
- o 15 Rem LDE;
- o 50 Rem TODE, SDE-WB, SDE-ME.

3.4.9.2 Dose limits for protecting valuable property are:

- o 10 Rem TEDE;
- o 30 Rem LDE;
- o 100 Rem TODE, SDE-WB, SDE-ME.

Exposures at this level should be on a volunteer basis with approval from the Emergency Coordinator.

3.4.9.3 Dose limits for life saving or protection of large populations are:

- o 25 Rem TEDE;
- o 75 Rem LDE;
- o 250 Rem TODE, SDE-WB, SDE-ME.

Exposures at this level should be on a volunteer basis with approval from the Emergency Coordinator.

3.4.9.4 The dose limits for life saving or protection of large populations for persons fully aware of the risk involved are:

- o ≥ 25 Rem TEDE;
- o ≥ 75 Rem LDE;
- o ≥ 250 Rem TODE, SDE-WB, SDE-ME.

Exposures at this level should be on a volunteer basis with approval from the Emergency Coordinator. Volunteers should be healthy, above the age of 45, and preferably be those whose normal duties have trained them for such missions.

3.4.9.5 All exposure received, during an emergency, in excess of the annual limits listed under 3.4.1 must be applied to the individuals allotted dose for Planned Special Exposures.

3.4.10 Planned Special Exposure Dose Equivalents

NOTE: Specific instructions for Planned Special Exposures are outlined in HPP-217.

3.4.10.1 The maximum dose an individual receiving PSEs can receive in 1 year is the most limiting of:

- o 10 Rem, TEDE (5 rem of routine and 5 rem of PSE); or 100 Rem, TODE (50 rem of routine and 50 rem of PSE);
- o 30 Rem, LDE (15 rem of routine and 15 rem of PSE);
- o 100 Rem, SDE-WB (50 rem of routine and 50 rem of PSE);
- o 100 Rem, SDE-ME (50 rem of routine and 50 rem of PSE).

3.4.10.2 The maximum dose an individual can receive in <u>lifetime</u> from PSEs is the most limiting of:

- o 25 Rem, TEDE; or
  250 Rem, TODE;
- o 75 Rem, LDE;
- o 250 Rem, SDE-WB;
- o 250 Rem, SDE-ME.

3.5 PREREQUISITES

None

4.0 INSTRUCTIONS

None

5.0 FOLLOW-UP ACTIONS

5.1 DOCUMENTATION

None

5.2 ADMINISTRATIVE OVEREXPOSURE

5.2.1 IF an administrative dose equivalent level is exceeded, THEN notify a Health Physics Supervisor and the Manager Radiation Protection immediately.

5.3 EXCEEDING HP DOSE GOALS

5.3.1 If an HP Dose Goal is exceeded, notify the HPS.

5.4 FEDERAL OVEREXPOSURE

5.4.1 Refer to HPP-218, "Reportable Events" for instructions.

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A4S, Determine Emergency Action Level and Complete the State of Florida Notification Message Form for Nuclear Plants

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ______________________________ Date/ __________

REVIEWED BY: ______________________________ Date/ __________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ __________
(Operations Representative)

APPROVED BY: ______________________________ Date/ __________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Determine emergency action level and complete the State of Florida Notification Message Form for Nuclear Power Plants.

Alternate Path: N/A

JPM #: A4S (new)

K/A Rating/Importance: G2.4.41/2.3/4.1 **Task Number/Position:** 1150101002/SRO

Task Standard: Determine emergency action level and complete the State of Florida Notification Message Form for Nuclear Power Plants using EM-202.

Preferred Evaluation Location:

Simulator _____ In-Plant _____ Admin ___X__

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:
1. EM-202, Rev. 63

Validation Time: 15 min.

Time Critical: Yes

Candidate: ________________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ ____________________________/_______
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. N/A

SIMULATOR OPERATOR INSTRUCTIONS:

1. N/A

Tools/Equipment/Procedures Needed:

1. EM-202

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the NUCLEAR SHIFT MANAGER.

Initiating Cues:

Determine the emergency action level and complete the State of Florida Notification Message Form for Nuclear Power Plants.

START TIME: ________

STEP 1:	Critical Step
EXAMINER NOTE: This classification is to be made following one of the simulator scenarios. Candidate determines classification and completes Enclosure 2 of EM-202. STANDARD: Candidate determines the classification is an Alert. Candidate completes Enclosure 2, see key. COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP ________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the NUCLEAR SHIFT MANAGER.

Initiating Cues:

Determine the emergency action level and complete the State of Florida Notification Message Form for Nuclear Power Plants.

FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM

1. THIS IS CRYSTAL RIVER UNIT 3. A. ☒ THIS IS A DRILL B. ☐ THIS IS AN ACTUAL EVENT. I HAVE A MESSAGE.
ENSURE: ☒ STATE ☒ CITRUS ☒ LEVY ☒ RAD. CONTROL-ORLANDO (M-F ONLY) ARE ON LINE.

2. A. Time/Date contact made ____________ B. Reported by: (Name/Title) ____________
C. Message Number 1 D. Reported from: ☒ Control Room ☐ TSC ☐ EOF

3. SITE A. ☒ CRYSTAL RIVER UNIT 3 B. ☐ ST LUCIE UNIT 1 D. ☐ TURKEY POINT UNIT 3
C. ☐ ST LUCIE UNIT 2 E. ☐ TURKEY POINT UNIT 4

4. ACCIDENT CLASSIFICATION A. ☐ NOTIFICATION OF UNUSUAL EVENT C. ☐ SITE AREA EMERGENCY
B. ☐ ALERT D. ☐ GENERAL EMERGENCY

5. CURRENT EMERGENCY DECLARATION: TIME: TIME DATE DATE

6. REASON FOR EMERGENCY DECLARATION: SCENARIO #1: RCS LEAK RESULTING IN LOSS OF ASCM
SCENARIO #2: OTSG LEAK REQUIRING ONE OR MORE INJECTION VALVES OR CAUSING ES ACTUATION ON LOW RCS PRESSURE
SCENARIO #3: RPS TRIP SETPOINT EXCEEDED AND NO REACTOR TRIP OCCURRED AND MANUAL REACTOR TRIP FROM CONTROL ROOM WAS SUCCESSFUL AND REACTOR IS SHUTDOWN.

7. ADDITIONAL INFORMATION OR UPDATE:
(BROKEN EQUIPMENT)

8. INJURIES REQUIRING OFFSITE SUPPORT: A. ☐ No ☐ Yes ☐ Unk B. Contaminated: ☐ No ☐ Yes ☐ Unk

9. WEATHER DATA: A. Wind direction from ____ degrees. CURRENT MET DATA
B. Downwind Sectors affected (minimum of 3): ____, ____, ____ SECTORS TO MATCH MET DATA

10. RELEASE STATUS: A. ☒ No Release (Go to item 12) C. ☐ A Release occurred, but stopped
B. ☐ A Release is occurring

11. OFFSITE RELEASE SIGNIFICANCE CATEGORY (at the Site Boundary)
A. ☐ Information not available at this time.
B. ☐ Release within normal operating limits (Tech Specs/ODCM)
C. ☐ Non-Significant Fraction of PAG Range (release is > normal limits and <PAG levels)
D. ☐ PAG Range (Protective Actions required)

12. UTILITY RECOMMENDED PROTECTIVE ACTIONS

A. ☒ NONE B. ☐ SHELTER ZONES/AREAS: ____________
EVACUATE ZONES/AREAS: ____________
OR C. ☐

MILES	NO ACTION	EVACUATE SECTORS	SHELTER SECTORS
0 – 2			
2 – 5			
5 – 10			

13. HAS EVENT BEEN TERMINATED?: A. ☒ NO B. ☐ YES: Time ______ Date ______

14. SUPPLEMENTAL FORM IS ATTACHED?: A. ☒ NO B. ☐ YES:
15. MESSAGE RECEIVED BY: Name ____________ Time ______ Date ______
THIS IS CRYSTAL RIVER UNIT 3. ☒ THIS IS A DRILL ☐ THIS IS AN ACTUAL EMERGENCY. END OF MESSAGE.
EC/EOF DIRECTOR INITIALS: INITIALS

SUPPLEMENTAL DATA SHEET

The following supplemental data is to be completed by the TSC or EOF for an Alert or higher emergency declaration)

Supplement to Message Number ____________

PLANT CONDITIONS INFORMATION

CRITICAL SAFETY FUNCTIONS:

A. REACTOR SHUTDOWN? ☐ YES ☐ NO

B. CORE ADEQUATELY COOLED? ☐ YES ☐ NO

C. ADEQUATE EMERGENCY POWER AVAILABLE (DIESELS) ☐ YES ☐ NO

FISSION PRODUCT BARRIER STATUS: (Check one condition for each barrier)

BARRIER	✓	INTACT	✓	CHALLENGED	✓	LOST	✓	REGAINED
FUEL CLADDING		No indication of clad damage		Clad is intact but losing subcooling, water level, etc.		Clad has failed, indicated by high temps., high containment rad, etc		Cooling restored, no further degradation expected.
PRI. REACTOR COOLANT SYSTEM		Leakage is within normal charging or makeup pump capacity		Leakage is within safety injection capacity		Leakage exceeds safety injection capacity		Leakage reduced to within injection capacity (system repaired)
CONTAINMENT		No evidence of containment leakage or tube rupture release is only through condenser		No leakage but containment pressure is at or above safety system actuation points		Evidence of containment leakage (known release path or rad surveys)		Repair Efforts have isolated leak or reduced containment pressure has reduced to stop leakage

COMPLETED BY:________________________ TIME:__________ DATE:____________

RADIOLOGICAL DOSE ASSESSMENT DATA

1. RELEASE STATUS: A. ☐ No Release (no further data required) C. ☐ A Release occurred, but stopped
   B. ☐ A Release is occurring

2. RELEASE RATE:

A. ☐ NOBLE GASES: __________ Curies per second ☐ Measured ☐ Default

B. ☐ IODINES: __________ Curies per second ☐ Measured ☐ Default

3. TYPE OF RELEASE:

A. ☐ AIRBORNE Time/Date started:__________ B. ☐ LIQUID Time/Date Started:__________

Time /Date Stopped:__________ Time/Date Stopped:__________

4. PROJECTED OFFSITE DOSE RATE:

DISTANCE	THYROID DOSE RATE (CDE)	TOTAL DOSE RATE (TEDE)
1 Mile (Site boundary)	A.______________mrem/hr	B.______________mrem/hr
2 Miles	C.______________mrem/hr	D.______________mrem/hr
5 Miles	E.______________mrem/hr	F.______________mrem/hr
10 Miles	G.______________mrem/hr	H.______________mrem/hr

5. WEATHER DATA (used for the above data):

A. Wind Direction from __________ degrees.

B. Wind Speed ________ MPH (2.24 X meters/sec.)

C. Stability Class________ (Sigma Theta or Wind Range; See page 3 of 5)

COMPLETED BY: ________________________ TIME:__________ DATE:__________

STATE OF FLORIDA NOTIFICATION PROTOCOL
[NOCS 96024]

WITHIN 15 MINUTES of declaration of emergency classification, NOTIFY STATE WARNING POINT TALLAHASSEE. (This also notifies Citrus and Levy counties and the Department of Health, Bureau of Radiation Control (DHBRC)-Orlando. If information is not available, do not delay notification to State Warning Point Tallahassee.

Using one of the following communications networks listed by priority:

- STATE Hot Ringdown (SHRD) - Station 120 or 121
- Commercial Telephone System - 1-850-413-9911 or 1-800-320-0519 or 1-850-413-9900
- Florida Emergency Satellite Communication System - (ESATCOM)
- Local Government Radio (LGR) via Citrus County
- Portable Satellite Phone (Located in TSC cabinet)

If the Commercial Telephone is used for notification, a separate notification to Citrus (746-2555) and Levy County (1-352-486-5212 or 1-352-486-5111 after hours) is required.

When making the initial notification of an emergency condition to SWPT, report the current emergency classification declared at the time the notification is made. If prior to initial notification or since the previous notification conditions were met (even briefly) for a higher classification, explain in Incident Description or Update.

INITIAL NOTIFICATION

Once communications are established with the SWPT Duty Officer and the station roll call is complete, READ the message in its entirety and REPEAT information and answer questions as requested. FAX the State Form by using Group 1 from the Fax machine.

SECTORS AFFECTED

DEGREES	SECTORS	DEGREES	SECTORS	DEGREES	SECTORS
349-11 (349-371)	H J K	102-123 (462-483)	N P Q	214-236	B C D
12-33 (372-393)	J K L	124-146 (484-506)	P Q R	237-258	C D E
34-56 (394-416)	K L M	147-168 (507-528)	Q R A	259-281	D E F
57-78 (417-438)	L M N	169-191 (529-540)	R A B	282-303	E F G
79-101 (439-461)	M N P	192-213	A B C	304-326	F G H
				327-348	G H J

STABILITY CLASS

SIGMA THETA (deg)	WIND RANGE (deg)	STABILITY CLASS
≥ 22.5	≥ 135	A (most dispersed plume)
<22.5 to 17.5	134 to 105	B
<17.5 to 12.5	104 to 75	C
<12.5 to 7.5	74 to 45	D
< 7.5 to 3.8	44 to 23	E
<3.8 to 2.1	< 23 to 12	F
<2.1	<12	G

UPDATE NOTIFICATION

Update SWPT every sixty minutes after initial notification and upgrades of emergency classification.

The use of the FLORIDA NUCLEAR PLANT NOTIFICATION FORM is required for:

- Initial notification that an emergency condition exists (Item 4)
- Any change in emergency classification (Item 4)
- Any change in Protective Action Recommendations (Item 12)
- Termination of an emergency classification (Item 13)

Other updated information not meeting the above criteria does not require the use of the Form.

The sixty minute update notification is still required with a statement there is no change from last update, unless the SWPT agrees to less frequent updates.

GUIDANCE FOR COMPLETING THE FLORIDA NUCLEAR PLANT EMERGENCY NOTIFICATION FORM

1. Select appropriate box based on a drill or actual event. Ensure offsite agencies are on-line. If not, separate notifications to Citrus and Levy County are required.

2. A. Enter the time contact is made with the State Warning Point or Risk County. This time must be within 15 minutes of the "Current Emergency Declaration" time or within 60 minutes of the previous notification if used for an update (Item 5).

   B. Enter name and title of person making the notification.

   C. Enter message number (beginning with #1 and following through sequentially in all facilities).

   D. Enter location from which the notification is made.

3. Check Crystal River Unit 3.

4. Check the classification corresponding to current plant conditions. If, prior to the initial notification or since the previous notification, conditions were met (even briefly) for a higher classification, ensure that classification and condition is noted in Item 7, "Additional Information or Update."

5. Enter the emergency declaration time and date for the current accident classification.

6. Enter wording to indicate what Emergency Action Level or Fission Product Barrier status that was used to declare the event. This information should remain the same throughout update messages unless there is a classification change.

7. Enter additional significant events here, including if conditions briefly existed for a higher emergency classification but no longer exist, or conditions that would have independently warranted declaration of an equal or lower classification (e. g. a fire within the Protected Area during a SITE AREA or GENERAL EMERGENCY).

8. Item "A"; Check "YES" only if there are injuries that require off-site support (EMS, hospital). Check "Unk" if the extent of the injuries is unknown at this time or if it is not yet known if offsite treatment is necessary. Check "Unk" in item "B" if the nature of the injuries has prevented thorough monitoring onsite or if there is any doubt whether contamination is present.

9. Enter the wind direction in degrees in Item "A" and the three downwind sectors in Item "B." The downwind sectors confirm wind direction because of potential confusion with degrees "from" versus degrees "to."

10. Check Item "A" if there are no indications of a release, then go to Item 12. **Check Item "B"** if a release is occurring, even though it may be less than normal operating limits. **Check Item "C"** if a release has occurred but stopped. Specific dose information will be supplied on the supplemental data sheet after the TSC is declared operational at an ALERT or higher. **RELEASE:** any increase in count rate on an effluent monitor that is a direct result of an event that has initiated an emergency declaration, or radioactivity escaping unmonitored from the plant, but detected by environmental monitoring.

11. **Check Item "A"** if Release Significance Category (See page 5 of 5) information is not available at the time of notification and follow up as soon as possible with information. **Check Item "B"** if the current release is or the previous release was within normal operating limits (ITS/ODCM). Releases monitored by RM-A1 or RM-A2 are within normal operating limits if the low-range gas channel is below its high alarm setpoint. **Check Item "C"** if the current release is or the previous was greater than normal operating limits, but less than EPA PAG values. This involves any radiological release that may occur when there is no fuel damage. No PARs are required at this level. **Check Item "D"** if there is any indication of fuel damage (cladding failure or melt) and there is any indication of a release (effluent monitors, surveys, etc.). PARs would be automatically required. This terminology should be easily understood by decision-makers at all levels within the utility and at the State and local levels.

12. **Check Item "A"** if no Protective Actions are necessary. **Check Item "B"** if PARs are necessary and enter Zone designation. (Item "C" is used by other Florida nuclear sites.)

13. Enter the time the event has been terminated or when the transition from the "Emergency Phase" to the "Recovery Phase" has taken place.

14. Check "no" unless a Supplemental Form has been completed for this particular message. If a Supplemental Form is attached, the Form is to be read as part of the emergency notification from the TSC or EOF and faxed.

15. Enter the name of the SWPT Duty Officer or the individual that receives the notification. Enter time and date call is completed or when Form is provided to Deputy State Coordinating Officer at the EOF.

plemental Page – Complete at the TSC or EOF at an Alert Classification or higher and provide to State & cals with Page 1.

RELEASE SIGNIFICANCE CATEGORIES

CORE CONDITION	RELEASE STATUS	RELEASE SIG CATEGORY
No Core Damage	No release	NR
	Release in progress	<NOL, NS
Clad Failure	No release	NR
	Release in progress	PAG
Core Melt	No release	NR
	Release in progress	EHE (PAG* State Form)

NR: NO RELEASE
This category indicates no release is occurring. This category is appropriate regardless of core status, if there are no indications of a release (e.g., unexplained containment pressure decrease, unexplained abnormal radiation levels in Auxiliary Building or Intermediate Building, on the berm, or in the field). Do not assume Design Basis Leakage is occurring if it has not been detected. If a release occurred but has now stopped, maintain the appropriate category below until EPZ doses have dissipated.

<NOL: RELEASE WITHIN NORMAL OPERATING LIMITS (ITS/ODCM)
This category indicates releases that are monitored by RM-A1 or RM-A2, occurring when the fuel is undamaged. These releases are within normal operating limits if the low-range gas channel is below its high alarm setpoint. Do not make this selection for releases not monitored by RM-A1 or RM-A2 unless they have been evaluated per the ODCM.

NS: NON-SIGNIFICANT FRACTION OF PROTECTIVE ACTION GUIDELINE VALUES
This category indicates releases that are occurring when the fuel is undamaged. It includes releases exceeding RM-A1 or RM-A2 high alarm setpoint and releases not monitored by RM-A1 or RM-A2 (e.g., releases due to LOCA, Waste Gas System failures, and steam generator tube ruptures). These releases will not produce site boundary doses that approach the EPA Protective Action Guideline values of 1 REM TEDE and/or 5 REM thyroid. No Protective Action Recommendations are necessary.

PAG: AT OR NEAR PROTECTIVE ACTION GUIDELINE VALUES
This category indicates releases that are occurring after at least some fuel cladding failure has taken place. It includes damage to irradiated fuel stored in the fuel pools. Site Boundary doses greater than the EPA Protective Action Guideline of 1 REM TEDE and/or 5 REM thyroid are possible. The category is appropriate even if only minor offsite doses are detected. Evacuation of at least 5 miles, 360° should be recommended. Shelter or evacuation beyond 5 miles should be determined based on plant status and dose projections.

EHE: EARLY HEALTH EFFECTS (not on State Notification Form, see NOTE below)
This category indicates releases that are occurring after severe core damage has taken place and where containment has failed early in the event. Doses of 25 REM TEDE and/or 2500 RADS thyroid could cause early health effects and these doses are easily possible within three miles from the plant. Evacuation of the Energy Complex should be performed and evacuation of the 10-mile EPZ should be recommended (never sheltering) even if evacuees are exposed to the plume.

* NOTE: This category is not listed on the State Notification Form because the State implements protective actions at the PAG range above. However, it will be posted on status boards in the TSC and EOF.

Rev. 63

Effective Date 5/31/00

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-202

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DUTIES OF THE EMERGENCY COORDINATOR

APPROVED BY: Procedure Owner

John D. Stephenson
(SIGNATURE ON FILE)

DATE: 5/29/00

PROCEDURE OWNER: Radiological Emergency Planning

EMERGENCY CLASSIFICATION TABLE
EMERGENCY ACTION LEVEL INDEX

ABNORMAL RAD LEVELS/ RADIOLOGICAL EFFLUENT				
CATEGORY	UE	ALERT	SAE	GE
Gaseous Effluents	1.1	1.2	1.3	1.4
Liquid Effluents	1.5	1.6		
Unexpected Radiation Levels	1.7	1.8		
Fuel Handling Spent Fuel Pool or Transfer Canal Water Level	1.9	1.10		

NATURAL/MAN-MADE HAZARDS AND EC JUDGMENT				
CATEGORY	UE	ALERT	SAE	GE
Earthquake Experienced	2.1	2.2		
External Flooding	2.3	2.4		
Hurricane	2.5			
Tornado/High Winds	2.6	2.7		
Aircraft/Vehicle Crash	2.8	2.9		
Toxic or Flammable Gases	2.10	2.11		
Explosions/Catastrophic Pressurized Equipment Failure	2.12	2.13		
Fire	2.14	2.15		
Control Room Evacuation		2.16	2.17	
Security Event	2.18	2.19	2.20	2.21
Internal Flooding	2.22	2.23		
Emergency Coordinator Judgment	2.24	2.25	2.26	2.27

SYSTEM MALFUNCTION				
CATEGORY	UE	ALERT	SAE	GE
Loss of Communications	3.1			
Failure of Reactor Protection		3.2	3.3	3.4
Inability to Reach ITS Time Limits	3.5			
Loss of Alarms/Indications	3.6	3.7	3.8	
Fuel Clad Degradation	3.9			
Turbine Failure	3.10	3.11		
RCS Leakage	3.12			
Inability to Maintain Hot Shutdown			3.13	
Inadvertent Criticality	3.14			
Inability to Maintain Plant in Cold Shutdown		3.15		
Loss of Water Level in Reactor Vessel that has Uncovered or Will Uncover Fuel			3.16	

LOSS OF POWER				
CATEGORY	UE	ALERT	SAE	GE
Loss of AC Power	4.1	4.2	4.3	4.4
Loss of AC Power (Shutdown)		4.5		
Loss of Vital DC Power			4.6	
Loss of Vital DC Power (Shutdown)	4.7			

EMERGENCY CLASSIFICATION TABLE
FISSION PRODUCT BARRIER MATRIX
APPLICABLE MODES: 1-4 COMPLETE FOR ALL BARRIERS

FUEL CLAD LOSS FACTOR (+4)		RCS LOSS FACTOR (+4)		CONTAINMENT LOSS FACTOR (+2)	
1. CORE CONDITIONS IN REGION 3 OR SEVERE ACCIDENT REGION OF ICC CURVES		1. RCS LEAK OR OTSG TUBE LEAK RESULTING IN LOSS OF ADEQUATE SUBCOOLING MARGIN		1. RAPID UNEXPLAINED RB PRESSURE DECREASE FOLLOWING INITIAL INCREASE	
2. RCS ACTIVITY >300 μCi/gm I-131		2. RM-G29 OR 30 > 10 R/hr FOR 15 MINUTES OR LONGER		2. CONTAINMENT PRESSURE OR SUMP LEVEL RESPONSE NOT CONSISTENT WITH LOCA CONDITIONS	
3. RM-G29 OR 30 >100 R/hr FOR 15 MINUTES OR LONGER		3. EC DEEMS RCS BARRIER IS LOST		3. AN OTSG HAS > 10 GPM TUBE LEAK AND AN UNISOLABLE STEAM LEAK OUTSIDE RB FROM THE AFFECTED OTSG	
4. EC DEEMS FUEL CLAD BARRIER IS LOST				4. CONTAINMENT ISOLATION IS INCOMPLETE AND RELEASE PATH TO THE ENVIRONMENT EXISTS	
				5. EC DEEMS CONTAINMENT BARRIER IS LOST	
IF ANY ITEM IS CHECKED, BARRIER IS LOST, ENTER 4 FOR FUEL CLAD FACTOR IN CLASSIFICATION TABLE BELOW		**IF ANY ITEM IS CHECKED, BARRIER IS LOST ENTER 4 FOR RCS FACTOR IN CLASSIFICATION TABLE BELOW**		**IF ANY ITEM IS CHECKED, BARRIER IS LOST ENTER 2 FOR CONTAINMENT FACTOR IN CLASSIFICATION TABLE BELOW**	
FUEL CLAD POTENTIAL LOSS FACTOR (+3)		**RCS POTENTIAL LOSS FACTOR (+3)**		**CONTAINMENT POTENTIAL LOSS FACTOR (+1.5)**	
1. RCS CONDITIONS WARRANT ENTRY INTO EOP-07		1. RCS LEAK OR OTSG TUBE LEAK REQUIRING ONE OR MORE INJECTION VALVES		1. RB PRESSURE >54 psig	
2. CORE EXIT THERMOCOUPLES >700°F		2. RCS LEAK OR OTSG TUBE LEAK RESULTS IN ES ACTUATION ON LOW RCS PRESSURE		2. RB HYDROGEN CONCENTRATION >4%	
3. EC DEEMS FUEL CLAD BARRIER IN JEOPARDY		3. RCS PRESSURE/TEMPERATURE RELATIONSHIP VIOLATES NDT LIMITS		3. RB PRESSURE >30 psig WITH NO BUILDING SPRAY AVAILABLE	
		4. HPI/PORV OR HPI/SAFETY VALVE COOLING IS IN PROGRESS		4. RMG-29 OR 30 READINGS >25,000 R/hr	
		5. EC DEEMS RCS BARRIER IN JEOPARDY		5. CORE CONDITIONS IN SEVERE ACCIDENT REGION OF ICC CURVES FOR >15 MINUTES	
				6. EC DEEMS CONTAINMENT BARRIER IN JEOPARDY	
IF ANY ITEM IS CHECKED, BARRIER IS POTENTIALLY LOST , ENTER 3 FOR FUEL CLAD FACTOR IN CLASSIFICATION TABLE BELOW		**IF ANY ITEM IS CHECKED, BARRIER IS POTENTIALLY LOST, ENTER 3 FOR RCS FACTOR IN CLASSIFICATION TABLE BELOW**		**IF ANY ITEM IS CHECKED, BARRIER IS POTENTIALLY LOST , ENTER 1.5 FOR CONTAINMENT FACTOR IN CLASSIFICATION TABLE BELOW**	

CLASSIFICATION TABLE

ENTER LOSS FACTOR OR POTENTIAL LOSS FACTOR OR ZERO FOR EACH BARRIER THEN TOTAL AND DETERMINE CLASS BELOW

FUEL CLAD FACTOR ______ + RCS FACTOR ______ + CONTAINMENT FACTOR ______ = ______

IF TOTAL IS:	RECOMMENDED EVENT CLASSIFICATION IS:
> 0 BUT ≤ 2	UNUSUAL EVENT
> 2 BUT ≤ 4	ALERT
> 4 BUT ≤ 8.5	SITE AREA EMERGENCY
> 8.5	GENERAL EMERGENCY

EMERGENCY CLASSIFICATION TABLE
ACCIDENT CONDITION:

SYSTEM MALFUNCTION

CATEGORY	UNUSUAL EVENT	ALERT	SITE AREA EMERGENCY	GENERAL EMERGENCY
Loss of Communication MODES: ALL	3.1 MODES: ALL (1 or 2) 1. Loss of <u>all</u> the following in-plant communications capability: a. FPC Internal Telephone System b. PAX c. Portable UHF Radios <u>OR</u> 2. Loss of <u>all</u> of the following Offsite Communication capability: a. FPC Telephone System b. State Hot Ringdown (SHRD) c. All FTS 2000 NRC phones (ENS, HPN, etc.) d. State-Wide Emergency Satellite Communication (ESATCOM) System e. Cellular Phones	*Not Applicable*	*Not Applicable*	*Not Applicable*
Failure of Reactor Protection MODES: 1,2,3 for ALERT MODES: 1,2 for SITE AREA and GENERAL Emergencies	*Not Applicable*	3.2 MODES: 1,2,3 **(1 and 2)** 1. RPS Trip setpoint exceeded and no Reactor trip occurred **<u>AND</u>** 2. Manual Reactor trip from Control Room was successful and reactor is shutdown	3.3 MODES: 1,2 **(1 and 2)** 1. RPS Trip setpoint exceeded and no Reactor trip occurred **<u>AND</u>** 2. Manual Reactor trip from Control Room was <u>not</u> successful in shutting down the reactor	3.4 MODES: 1,2 **(1 and 2 and 3)** 1. RPS Trip setpoint exceeded and no Reactor trip occurred **<u>AND</u>** 2. Manual Reactor trip from Control Room was <u>not</u> successful in shutting down the reactor **<u>AND</u>** 3. **(a or b)** a. Core exit thermocouple temperatures > 700°F, as indicated on SPDS. **OR** b. Adequate Secondary Cooling not available

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM A4R, Notify State Warning Point Tallahassee with the State of Florida Notification Message Form for Nuclear Power Plants

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ ____________

REVIEWED BY: ______________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
ADMINISTRATIVE JOB PERFORMANCE MEASURE

Task: Notify State Warning Point Tallahassee with the State of Florida Notification Message Form for Nuclear Power Plants.

Alternate Path: State Hot Ringdown phone will not work.

JPM #: A4R (new)

K/A Rating/Importance: G2.4.43/2.8/3.5 **Task Number/Position:** 1150402005/RO

Task Standard: Notify State Warning Point Tallahassee with the State of Florida Notification Message Form for Nuclear Power Plants using EM-202.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant _____ Admin __X__ Perform __X__ Simulate ______

References:
1. EM-202, Rev. 63

Validation Time: 5 min. **Time Critical**: No

Candidate: ______________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT ______ UNSAT _______ **Performance Time:** _________

Examiner: ________________________ ________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. Fail the State Hot Ringdown phone.

SIMULATOR OPERATOR INSTRUCTIONS:

1. Role-play as State Warning Point Tallahassee.

Tools/Equipment/Procedures Needed:

1. EM-202

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the Reactor Operator.
The Nuclear Shift Manager has just given you a completed Florida Nuclear Plant Emergency Notification Form

Initiating Cues:

You are requested to make notification to the State of Florida.

START TIME: ________

STEP 1: **EXAMINER NOTE: Hand the candidate completed Enclosure 2 of EM-202** Candidate establishes communications with the State of Florida. STANDARD: Candidate uses the State Hot Ringdown phone and is not connected. Candidate uses the Commercial Telephone System and is connected. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 2: Candidate conveys information found on Enclosure 2 of EM-202. STANDARD: Candidate will read the form to State Warning Point Tallahassee by the number and letter, filling in details as listed or as required. Candidate will fill in the following information on the form: 2A, 2B, and 15. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
END OF TASK	

TIME STOP ________

CANDIDATE CUE SHEET

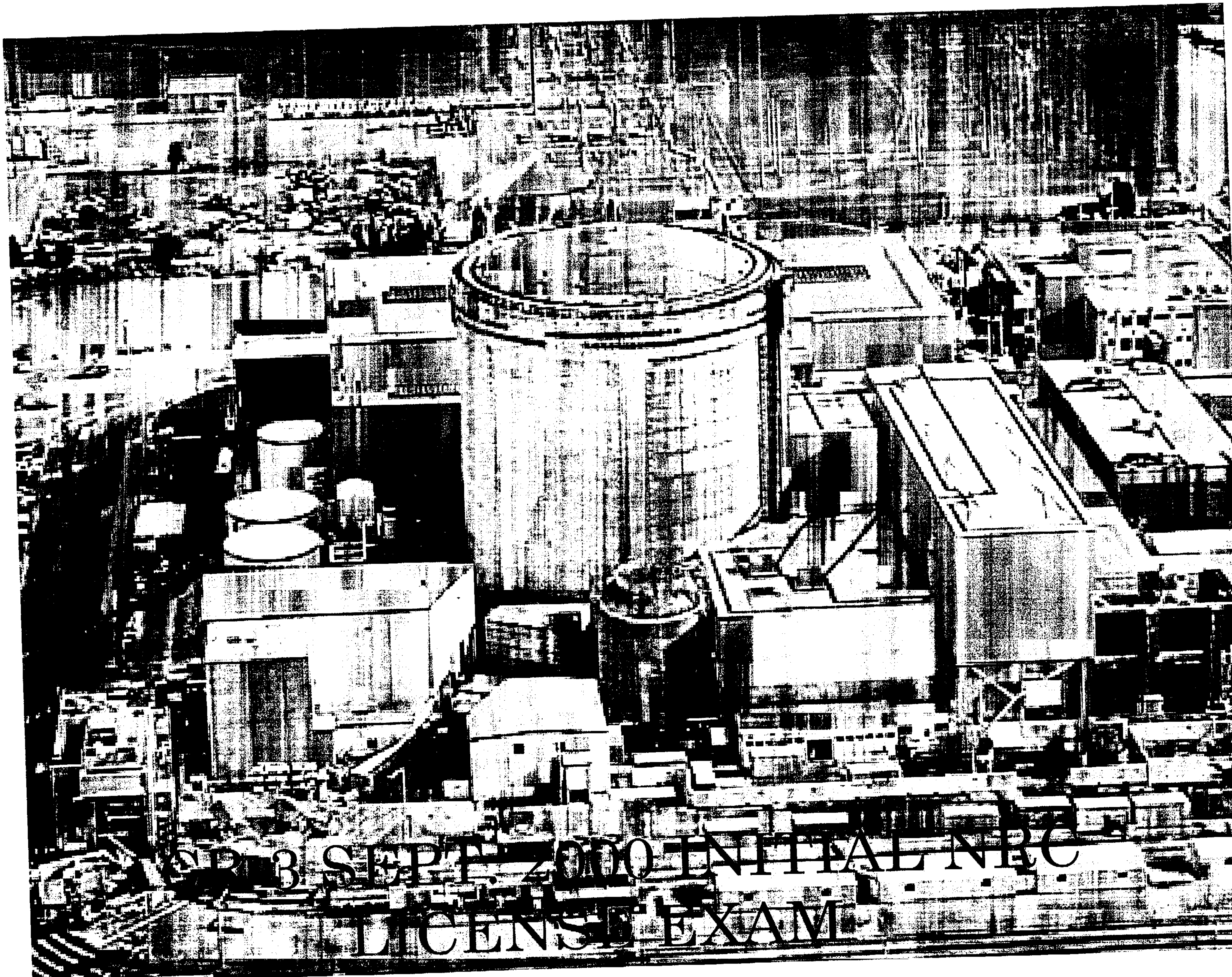
(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the Reactor Operator.
The Nuclear Shift Manager has just given you a completed Florida Nuclear Plant Emergency Notification Form

Initiating Cues:

You are requested to make notification to the State of Florida.


CR 3 SEPT. 2000 INITIAL NRC
LICENSE EXAM

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1a1, Transfer a single rod to the Auxiliary Power Supply

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ ____________

REVIEWED BY: ______________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Transfer a single rod to the Auxiliary Power Supply.

Alternate Path: N/A

JPM #: B1a1 (bank #240)

K/A Rating/Importance: 001A4.03/4.0/3.7 **Task Number/Position:** 0010102010/RO

Task Standard: Transfer a single rod to the Auxiliary Power Supply using OP-502

Preferred Evaluation Location:

Simulator __X__ In-Plant _____ Admin _____

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:
1. OP-502, Rev 41

Validation Time: 10 min.

Time Critical: No

Candidate: ____________________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/_______
Printed Name Signature Date

Comment:

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. Normal 100% power operations.
2. IC #11

SIMULATOR OPERATOR INSTRUCTIONS:

1. None

Tools/Equipment/Procedures Needed:

1. OP-502

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at 100% power.
Control Rod troubleshooting is underway.

Initiating Cues:

You are requested to transfer Rod 5-4 to the Auxiliary Power Supply. Following transfer of the rod, leave the reactor diamond and reactor demand station in manual for further manipulations.

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. EXAMINER CUE: **For purposes of this JPM assume SRO concurs with each rod manipulation.** STANDARD: Candidate obtains a copy of OP-502 COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.16.1) PROCEDURE CAUTION: Tave control may go to Feedwater regulation Place Reactor Diamond in MANUAL 1. _____Depress MANUAL 2. _____Verify Manual light on, Auto. light is OFF _____/___ Initial/Date STANDARD: Candidate locates the Reactor Diamond control station, depresses MANUAL and verifies that the green MAN light is ON and the white AUTO light is OFF. (Annunciator K-6-2) Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 3: (step 4.16.2) Place Reactor Demand control station in HAND 1. _____Depress HAND 2. _____Verify Reactor Demand in Mini Track, AUTO and HAND light on _____/ ___ Initial/Date STANDARD: The candidate will depress the white HAND pushbutton and verify the Reactor Demand control station is in Mini Track by verifying that both red AUTO and white HAND lights are ON. Candidate initials and dates the step in the procedure. COMMENTS:	SAT ____ UNSAT ___
STEP 4: (step 4.16.3) Select GROUP SELECT Switch to desired group _____ Group 1 _____ Group 5 _____ Group 2 _____ Group 6 _____ Group 3 _____ Group 7 _____ Group 4 _____ Group 8 _____/ ___ Initial/Date STANDARD: Candidate rotates GROUP SELECT Switch to Group 5. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 5: (step 4.16.4) Select All or desired rod Use SINGLE SELECT Switch _____/___ Initial/Date STANDARD: Candidate rotates SINGLE SELECT Switch to Rod 4. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 6: (step 4.16.5) Select SEQ OR. _____ Verify SEQ OR. Light On _____ SEQ light On _____/___ Initial/Date STANDARD: Candidate depresses SEQ/SEQ OR pushbutton and verifies amber SEQ OR light ON and green SEQ light ON. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 7: (step 4.16.6) Select AUXIL. _____ Verify AUXIL. Light on, GROUP light off _____ Verify CONTROL ON white light for the group selected in Step 4.16.3 is on _____/___ Initial/Date STANDARD: Candidate depresses GROUP/AUXIL pushbutton and verifies AUXIL white light ON and GROUP green light OFF. The operator will also verify the CONTROL ON white light for group 5 is ON. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 8: (step 4.16.7) Place SPEED SELECTOR switch in JOG Verify SY white light comes on _____/___ Initial/Date STANDARD: Candidate Rotates RUN/JOG switch to JOG and verifies that the white SY light is ON. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 9: (step 4.16.8) Select CLAMP _____ Verify CLAMP light on _____ Verify CLAMP REL. light off _____/___ Initial/Date STANDARD: Candidate depresses CLAMP/CLAMP RELEASE pushbutton and verifies green CLAMP light ON and amber CLAMP REL light OFF. Candidate initials and dates the step in the procedure. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 10: (step 4.16.9)	Critical Step
PROCEDURE CAUTION: If Amber control on lights for more than one group is on, STOP, and notify SSOD. Depress MAN TRANS _____ Verify TR CF light on _____ Verify Amber CONTROL ON light(s) for only the selected Group or rod come on _____/___ Initial/Date STANDARD: Candidate depresses MAN TRANS pushbutton and verifies white TR CF light ON. The operator will also verify that only the amber CONTROL ON light for rod 5-4 is ON. Candidate initials and dates the step in the procedure. COMMENTS:	SAT ____ UNSAT ___
STEP 11: (step 4.16.10) Select CLAMP REL. _____ Verify CLAMP REL. light on _____ Verify CLAMP light off _____/___ Initial/Date STANDARD: Candidate depresses CLAMP/CLAMP RELEASE pushbutton and verifies amber CLAMP REL light ON and green CLAMP light OFF. Candidate initials and dates the step in the procedure. COMMENTS:	Critical Step SAT ____ UNSAT ___

STEP 12: (step 4.16.11)	Critical Step
Select GROUP _____ Verify GROUP light on _____ Verify AUXIL light off _____ Verify SY light off _____/___ Initial/Date STANDARD: Candidate depresses GROUP/AUXIL pushbutton and verifies green GROUP light ON and amber AUXIL light OFF. The operator will also verify the SY white light OFF. Candidate initials and dates the step in the procedure. COMMENTS:	SAT ____ UNSAT ___
STEP 13: (step 4.16.12) If latching Safety Rods in accordance with Section 4.2, return to Section 4.2.3 after completion of this step. Refer to Section 4.2 _____/___ Initial/Date **EXAMINER CUE: Rod 5-4 is on the Auxiliary Power Supply** STANDARD: This step N/A. COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
The plant is at 100% power.
Control Rod troubleshooting is underway.

Initiating Cues:

You are requested to transfer Rod 5-4 to the Auxiliary Power Supply. Following transfer of the rod, leave the reactor diamond and reactor demand station in manual for further manipulations.

4.16 TRANSFERRING A GROUP OR ROD ON TO THE AUXILIARY POWER SUPPLY (CAT. 2) [NOCS 040591]

	ACTIONS	DETAILS

****
CAUTION: Tave control may go to Feedwater regulation.
****

	ACTIONS	DETAILS
4.16.1	Place Reactor Diamond in MANUAL	1. ___ Depress MANUAL 2. ___ Verify Manual light on, Auto. light is OFF ______/______ Initial/Date
4.16.2	Place Reactor Demand control station in HAND	1. ___ Depress HAND 2. ___ Verify Reactor Demand in Mini Track, "AUTO." and "HAND" light on ______/______ Initial/Date
4.16.3	Select "GROUP SELECT" Switch to desired group	___ Group 1 ___ Group 5 ___ Group 2 ___ Group 6 ___ Group 3 ___ Group 7 ___ Group 4 ___ Group 8 ______/______ Initial/Date
4.16.4	Select All or desired rod	o Use "SINGLE SELECT" Switch ______/______ Initial/Date
4.16.5	Select "SEQ OR." [NOCS 001778]	o ___ Verify "SEQ OR." light On o ___ "SEQ" light On ______/______ Initial/Date
4.16.6	Select "AUXIL."	o ___ Verify "AUXIL." light on, "GROUP" light off o ___ Verify "CONTROL ON" white light for the group selected in Step 4.16.3 is on ______/______ Initial/Date

4.16 TRANSFERRING A GROUP OR ROD ON TO THE AUXILIARY POWER SUPPLY (CAT. 2) (Cont'd)

	ACTIONS	DETAILS
4.16.7	Place "SPEED SELECTOR" switch in "JOG"	o VERIFY "SY" light comes on ____/____ Initial/Date
4.16.8	Select "CLAMP"	o ___ VERIFY "CLAMP" light on o ___ VERIFY "CLAMP REL." light off ____/____ Initial/Date

****

CAUTION: If Amber control on lights for more than one group is on, STOP, and notify SSOD.

****

4.16.9	Depress "MAN TRANS"	o ___ VERIFY "TR CF" light on o ___ VERIFY Amber "CONTROL ON" light(s) for only the selected Group or rod come on ____/____ Initial/Date
4.16.10	Select "CLAMP REL."	o ___ VERIFY "CLAMP REL." light on o ___ VERIFY "CLAMP" light off ____/____ Initial/Date
4.16.11	Select "GROUP"	o ___ VERIFY "GROUP" light on o ___ VERIFY "AUXIL" light off o ___ VERIFY "SY" light off ____/____ Initial/Date
4.16.12	If latching Safety Rods in accordance with Section 4.2, return to Section 4.2.3 after completion of this step	o Refer to Section 4.2 ____/____ Initial/Date

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1b1, Supply pressurizer heaters from the B ES 4160V Bus

CANDIDATE____

EXAMINER____

PREPARED/
REVISED BY: ____________________________ Date/__________

REVIEWED BY: ____________________________ Date/__________
(Operations Representative)

VALIDATED BY: ____________________________ Date/__________
(Operations Representative)

APPROVED BY: ____________________________ Date/__________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Supply pressurizer heaters from the B ES 4160V Bus.

Alternate Path: N/A

JPM #: B1b1 (new)

K/A Rating/Importance: 062A2.05/2.9/3.3 **Task Number/Position**: 0620402006/RO

Task Standard: Supply pressurizer heaters from the B ES 4160V Bus using AP-770

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator __X__ In-Plant _____ Admin _____ Perform __X___ Simulate ______

References:
1. AP-770, Rev 28

Validation Time: 10 min. **Time Critical**: No

Candidate: ____________________________________ **Time Start:** ________
Printed Name **Time Finish:**________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/_______
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. The plant is in Mode 3 following a LOOP.
2. Both ES Buses are powered from their respective diesel.
3. The B Emergency Diesel Generator load is $\leq$ 2700 KW.
4. The 480V Reactor Aux Bus 3B must be de-energized.
5. Have RCS pressure slightly lower than the control setpoints of the pressurizer heaters.
6. IC #61 (son 6-9-00)
7. Check SPDS screens
8. Input "enc1"
9. Ensure MUT level is not too high and the pressure alarm is not in

SIMULATOR OPERATOR INSTRUCTIONS:

1. Respond from the booth as SPO for Enclosure 4 of AP-770 using LP #6, JPM B1b1.
2. Opening of PZR HTR MCC3B breakers done from schematic (PZR MCC part of step 4.3).
3. SPO portion of step 4.7 done from schematic (PZR MCC).

Tools/Equipment/Procedures Needed:

1. AP-770, signed up to step 3.31

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the BALANCE OF PLANT OPERATOR.
A Loss of Offsite Power (LOOP) is in progress.
The Reactor Operator is re-establishing letdown.

Initiating Cues:

You are requested to power the pressurizer heaters from the B ES 4160V Bus.

START TIME: __________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of AP-770, completed up to step 3.31. COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.1) If 480V REACTOR AUX BUS 3B is energized, then go to Step 4.7 in this enclosure. STANDARD: Candidate verifies that the 480V REACTOR AUX BUS 3B is not energized and continues on in the procedure COMMENTS:	SAT ____ UNSAT ___
STEP 3: (step 4.2) Ensure 480V feeder and Cross-Tie Bkrs are open. _____ Bkr 3399 _____ Bkr 3393 _____ Bkr 3394 _____ Bkr 3306 _____ Bkr 3396 _____ Bkr 3312 _____ Bkr 3392 STANDARD: Candidate will locate each breaker and for those that are not already open, rotate the control handle to the open position. Breakers 3399, 3393, 3394, 3396, 3312 and 3392 are open. Candidate may match targets for 3312 and 3392. Breaker 3306 will have to be opened. Candidate may verify green target and will verify green light ON and red light OFF for each breaker. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 4: (step 4.3) Prepare 480V Buses for backfeed. Notify SPO to ensure all breakers on the following are open: _____ 480V PLANT AUX BUX 3 _____ 480V REACTOR AUXBUS 3B _____ 480V PZR HTR MCC 3B STANDARD: Candidate contacts and instructs the SPO to perform step 4.3 of Enclosure 4 of AP-770. (Alarms P-2-9, P-2-10 and I-8-2) COMMENTS:	SAT ____ UNSAT ___
STEP 5: (step 4.4) When notified that all Bkrs on the following are open: _____ 480V PLANT AUX BUX 3 _____ 480V REACTOR AUXBUS 3B _____ 480V PZR HTR MCC 3B Then energize 480V PLANT AUX BUS 3 1. _____ Close Bkr 3222 2. _____ Close Bkr 3312 STANDARD: Candidate locates breaker 3222 and rotates the control handle in the CLOSE direction (Candidate may match targets first). Candidate will verify red target and red light ON and green light OFF. Candidate locates breaker 3312 and rotates the control handle in the CLOSE direction (P-2-7 clears). Candidate will verify red target and red light ON and green light OFF. Candidate verifies the 480V PLANT AUX BUS is reading approximately 480V. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

	Critical Step
STEP 6: (step 4.5) Energize 480V Reactor AUX BUS 3B. 1. _____ Close Bkr 3392 2. _____ Close Bkr 3396 STANDARD: Candidate locates breaker 3392 and rotates the control handle in the CLOSE direction. Candidate will verify red target and red light ON and green light OFF. Candidate locates breaker 3396 and rotates the control handle in the CLOSE direction (G-2-2 clears). Candidate will verify red target and red light ON and green light OFF. Candidate verifies the 480V Reactor AUX BUS 3B is reading approximately 480V. COMMENTS:	SAT ____ UNSAT ___
STEP 7: (step 4.6) Energize 480V PZR HTR MCC 3B Notify SPO to close 480V REACTOR AUX BUS 3B-1C BREAKER 3356 FEED TO PZR HTR MCC3B STANDARD: Candidate contacts and instructs the SPO to perform step 4.6 of Enclosure 4 of AP-770. (P-3-9 clears) COMMENTS:	SAT ____ UNSAT ___

STEP 8: (step 4.7) Energize 3 groups of PZR Htrs. 1. _____ Ensure EDG-1B load is $\leq$ 2700 KW. 2. _____ Place all PZR Htr banks in OFF _____ Bank A _____ Bank B _____ Bank C _____ Bank D _____ Back E 3. _____ Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3B _____ 1A PZR HEATER CONTROL TRANSFORMER B-1 _____ 1B PZR HEATER CONTROL TRANSFORMER B-2 4. _____ Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3BB _____ 1D PZR HEATER GROUP 10 _____ 3C PZR HEATER GROUP 12 _____ 4C PZR HEATER GROUP 13 STANDARD: Candidate reads EDG-1B digital load meter to ensure load is $\leq$ 2700 KW. Candidate rotates each pressurizer heater bank control switch to the OFF direction. Candidate contacts and instructs the SPO to perform step 4.7 details 3 and 4 of Enclosure 4 of AP-770. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 9: (step 4.8) If PZR Htrs are desired, then select PZR Htr Bank E to control RCS PRESS. **EXAMINER NOTE: Heaters should not be required at this point because RCS pressure is high (letdown has not been re-established).** STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___

STEP 10: (step 4.9) Exit this enclosure. STANDARD: Candidate exits the enclosure. COMMENTS:	SAT ___ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the BALANCE OF PLANT OPERATOR.
A Loss of Offsite Power (LOOP) is in progress.
The Reactor Operator is re-establishing letdown.

Initiating Cues:

You are requested to power the pressurizer heaters from the B ES 4160V Bus.

EMERGENCY DIESEL GENERATOR ACTUATION

1.0 ENTRY CONDITIONS

IF any ES 4160V Bus UV occurs,

THEN use this procedure.

2.0 IMMEDIATE ACTIONS

NOTE

There are no immediate actions for this procedure.

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3.0 FOLLOW-UP ACTIONS

ACTIONS			DETAILS
3.1	___	Notify personnel of plant conditions.	• ✓ PA announcement • ✓ STA • ✓ Plant operators • ✓ NSM (evaluate plant conditions for entry into the Emergency Plan)
3.2	___	IF Rx is NOT tripped, THEN ensure Rx power is ≤ 100%.	
3.3	___	IF any ES 4160V Bus is energized, THEN **GO TO** Step 3.17 in this procedure.	

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS

STATUS
Both ES 4160V Buses de-energized.

3.4 ___ Prevent MUP Auto start.

1 Ensure ES actuations are bypassed or reset:

___ Auto

___ Manual

2 Ensure all MUPs are selected to normal after stop:

___ MUP-1A

___ MUP-1B

___ MUP-1C

3.5 ___ Select RWP-2B to "PULL TO LOCK".

3.6 ___ Select both Emergency SW Pumps to "PULL TO LOCK".

___ SWP-1A
___ SWP-1B

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ACTIONS	DETAILS
3.7 ___ Ensure at least 1 ES Bus is available for recovery.	1 Notify PPO to verify EDG lockouts are not tripped:

___ "86B-3209 A EDG LOCKOUT RELAY" (A ES 4160V SWGR Room)

___ "86B-3210 B EDG LOCKOUT RELAY" (B ES 4160V SWGR Room)

2 Verify ES 4160V lockouts are not tripped:

A ES Bus	B ES Bus
___ 86B-3205	___ 86B-3206
___ 86B-3207	___ 86B-3208
___ 86B-3211	___ 86B-3212

3 ___ IF a lockout is tripped on both ES 4160V Buses,
THEN **PERFORM** Enclosure 1, Recovery of Faulted ES Bus, in this procedure.

4 ___ IF a lockout is tripped on only 1 ES 4160V Bus,
THEN **CONCURRENTLY PERFORM** Enclosure 1, Recovery of Faulted ES Bus, in this procedure.

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ACTIONS	DETAILS

STATUS

At least 1 ES 4160V Bus available for recovery.

3.8 ___ Ensure all ES 4160V feeder Bkrs are open.

A ES Bus	B ES Bus
___ 3207	___ 3212
___ 3209	___ 3206
___ 3205	___ 3208
___ 3211	___ 3210

3.9 ___ Start efforts to restore ES Bus power source.

- ___ IF EDG is NOT running, THEN notify PPO to **CONCURRENTLY PERFORM** Enclosure 2, Failed EDG Recovery, in this procedure.
- ___ Notify Maintenance to start repair efforts for offsite power restoration.
- ___ Consider 500KV backfeed as offsite power source.

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.10 ___ IF at any time, all of the following occur: ___ ES actuates ___ Any ES Bus de-energized THEN open associated MUP breakers.	1 Ensure ES actuations are bypassed or reset: ___ Auto ___ Manual 2 ___ Place MUP on de-energized bus in normal after stop.
3.11 ___ WHEN any of the following exist: ___ Any EDG running ___ Any offsite power source available THEN continue in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...

ACTIONS	DETAILS
3.12 ___ IF any EDG is running, THEN ensure proper EDG voltage and frequency.	1 ___ IF EDG output voltage is < 4150V, THEN raise EDG output voltage: ___ Select affected "EDG A(B) EXC VOLT ADJ SELECT" to "CONT RM". ___ Ensure EDG voltage is ≈ 4160V using "EDG A(B) EXC VOLT ADJUST". 2 ___ Ensure frequency is ≈ 60 Hz by adjusting "EDG A(B) SPEED". 3 ___ Ensure EDG output Bkr closes.
3.13 ___ IF any ES 4160V Bus is energized, THEN **GO TO** Step 3.17 in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.14 ___ IF at any time, all of the following exist: ___ A ES 4160V BUS de-energized ___ Fault does NOT exist ___ Any offsite power source available THEN energize A ES 4160V BUS.	1 ___ IF "DIESEL GEN A BREAKER CLOSED" annunciator alarm (Q-02-03) is lit, THEN defeat A ES 4160V BUS lockout: ___ Notify PPO to open "AY KNIFE SWITCH A ES 4160V BUS UV RELAY POWER" (4160V ES BUS 3A-13). ___ WHEN AY knife switch is open, THEN depress "4160V ESA UV RESET" push button. ___ Verify "DIESEL GEN A BREAKER CLOSED" annunciator alarm clears. ___ Notify PPO to close "AY KNIFE SWITCH A ES 4160V BUS UV RELAY POWER". 2 ___ Select feeder Bkr from available power source to "CLOSE" until "4KV ES BUS A DEAD" annunciator alarm clears (normally < 10 seconds). 3 ___ Depress "4160V ESA UV RESET" push button.

Applicable carry-over steps:
3.10 <u>IF</u> ES actuates, <u>AND</u> any ES Bus is de-energized, <u>THEN</u> open...
3.14 <u>IF</u> de-energized A ES BUS is <u>NOT</u> faulted, <u>AND</u> offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.15 ___ IF at any time, all of the following exist: ___ B ES 4160V BUS de-energized ___ Fault does NOT exist ___ Any offsite power source available THEN energize B ES 4160V BUS.	1 ___ IF "DIESEL GEN B BREAKER CLOSED" annunciator alarm (Q-05-03) is lit, THEN defeat B ES 4160V BUS lockout: ___ Notify PPO to open "AY KNIFE SWITCH B ES 4160V BUS UV RELAY POWER" (4160V ES BUS 3B-2). ___ WHEN AY knife switch is open, THEN depress "4160V ESB UV RESET" push button for the affected ES 4160V Bus. ___ Verify "DIESEL GEN B BREAKER CLOSED" annunciator alarm clears. ___ Notify PPO to close "AY KNIFE SWITCH B ES 4160V BUS UV RELAY POWER". 2 ___ Select feeder Bkr from available power source to "CLOSE" until "4KV ES BUS B DEAD" annunciator alarm clears (normally $<$ 10 seconds). 3 ___ Depress "4160V ESB UV RESET" push button.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.16 ___ WHEN any ES 4160V Bus is energized, AND adequate SCM exists, THEN continue in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS

STATUS

At least 1 ES 4160V Bus energized.

3.17 ___ Verify letdown flow exists.

✓ IF letdown flow does NOT exist, THEN isolate letdown.

- ✓ Close MUV-49
- ___ IF MUV-49 will NOT close, THEN close:
  - ___ MUV-50
  - ___ MUV-51

3.18 ✓ IF both of the following are de-energized:

✓ 4160V UNIT BUS 3A

✓ 4160V UNIT BUS 3B

THEN notify SPO to **CONCURRENTLY PERFORM** EOP-14, Enclosure 14, Main Generator Purging.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.19 ✓ Verify at least 1 SW pump is running.	___ SWP-1A ✓ SWP-1B ___ SWP-1C
___ IF no SW pumps are running, THEN start an available SW pump.	1 Close SW valves to RCPs: (see table below) 2 ___ Start available SW pump. [Rule 5, EDG Control]

RCP-1A	___ SWV-80	___ SWV-84
RCP-1B	___ SWV-79	___ SWV-83
RCP-1C	___ SWV-82	___ SWV-86
RCP-1D	___ SWV-81	___ SWV-85

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.20 ✓ Ensure at least 1 SW Raw Water pump is running. [Rule 5, EDG Control]	___ RWP-2A ✓ RWP-2B ___ RWP-1
3.21 ✓ Verify at least 1 MUP is running.	___ MUP-1A ✓ MUP-1B ___ MUP-1C
___ IF no MUPs are running, AND MUP restart is desired, THEN **CONCURRENTLY PERFORM** Enclosure 3, MUP Restart, in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.22 ✓ IF running MUP is aligned to DC cooling, THEN ensure cooling pumps are running. [Rule 5, EDG Control]	• ___ IF MUP-1A is running, AND aligned to DC cooling, THEN start cooling pumps: ___ DCP-1A ___ RWP-3A • ___ IF MUP-1C is running, AND aligned to DC cooling, THEN start cooling pumps: ___ DCP-1B ___ RWP-3B
3.23 ✓ Verify ES MCC 3AB is energized.	
___ IF ES MCC 3AB is NOT energized, THEN energize ES MCC 3AB.	1 ___ IF energized ES 480V Bus is powered from EDG, THEN ensure EDG load is ≤ 2975 KW. 2 ___ Depress transfer push button for ES MCC 3AB to energized bus.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.24 ✓ Verify proper CC cooling.	• ___ CC ventilation running • ___ CC chiller running
✓ IF proper CC cooling does NOT exist, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 17, Control Complex Emergency Ventilation and Cooling.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.25 ✓ IF at any time, letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 4, Letdown Recovery.	
3.26 ✓ IF DHR operation is required, THEN **CONCURRENTLY PERFORM** AP-404, Loss of Decay Heat Removal, beginning with Step 3.1	
3.27 ✓ IF both of the following are de-energized: ___ 4160V UNIT BUS 3A ___ 4160V UNIT BUS 3B THEN stop CDT-1 flow to condenser.	1 Select GWPs to "PULL TO LOCK": ✓ GWP-1A ✓ GWP-1B 2 Notify SPO to close the following valves (95 ft TB near GWPs): ✓ GWV-9 "GWP-1A SUCTION ISOLATION" ✓ GWV-10 "GWP-1B SUCTION ISOLATION" ✓ GWV-195 "GWV-196 UPSTREAM ISOLATION"

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.28 ✓ Verify ES 480V UV lockouts are not actuated.	
✓ IF ES 480V UV lockouts are actuated, THEN reset lockouts.	1 ___ IF AB is accessible, THEN notify PPO to perform the following for affected ES 480V Bus (119 ft AB by BASTs): ___ Select CAHE-3A "A BAST HEATER" to "OFF". ___ Select CAHE-3B "B BAST HEATER" to "OFF". 2 ___ IF AB is NOT accessible, THEN derate affected EDG by 50 KW. [Rule 5, EDG Control] 3 ___ Select BWST Htr control switch to "LOCAL". 4 Bypass or reset ES actuations: ___ Auto ___ Manual 5 Reset affected ES 480V UV lockouts:

	480V ES BUS A	480V ES BUS B
1	___ UV LK/OT 8627/ESA	___ UV LK/OT 8627/ESB
2	___ UV LK/OT 86X27/ESA	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.29 ✓ Verify IA PRESS is > 90 psig.	
___ IF IA PRESS is ≤ 90 psig, THEN start all available air compressors.	• Ensure IAP-4 is running. • Notify SPO to start available air compressors: ___ IAP-3A ___ IAP-3B ___ IAP-3C

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**

ACTIONS	DETAILS
3.30 ___ Ensure emergency RB cooling is in service. [Rule 5, EDG Control]	1 At least 1 Emergency SW Pump running: ___ SWP-1A ✓ SWP-1B 2 At least 1 Emergency SW Raw Water Pump running: ___ RWP-2A ✓ RWP-2B 3 ___ IF ES has actuated, THEN only 1 ES selected RB cooling unit running in low speed. 4 ✓ IF ES has NOT actuated, THEN both ES selected RB cooling units running in low speed. 5 CI valves to RB cooling units closed: ✓ SWV-151 ✓ SWV-152 ✓ SWV-355 6 SW valves to RB cooling units open: ✓ SWV-353 ✓ SWV-354

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.31 ✓ IF at any time, PZR Htrs require power, THEN energize PZR Htrs.	1 ✓ IF B ES 4160V BUS is energized from any of the following: ___ Any offsite power source ___ B EDG with ≤ 2700 KW load THEN **CONCURRENTLY PERFORM** Enclosure 4, B ES 4160V BUS Supply to PZR Htrs, in this procedure.
	2 ___ IF B ES 4160V BUS is NOT available, AND A ES 4160V BUS is energized from any of the following: ___ Any offsite power source ___ A EDG with ≤ 2700 KW load THEN **CONCURRENTLY PERFORM** Enclosure 5, A ES 4160V BUS Supply to PZR Htrs, in this procedure.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.32 ___ IF both ES 4160V Buses are energized, THEN **GO TO** Step 3.41 in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.

ACTIONS | DETAILS

STATUS

Only 1 ES 4160V Bus energized.

3.33 ___ Prevent MUP Auto start on de-energized bus.

1 Ensure ES actuations are bypassed or reset:

___ Auto

___ Manual

2 ___ Place MUP on de-energized bus in normal after stop.

3.34 ___ Ensure all ES 4160V feeder Bkrs are open on de-energized bus.

A ES Bus	B ES Bus
___ 3207	___ 3212
___ 3209	___ 3206
___ 3205	___ 3208
___ 3211	___ 3210

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.

ACTIONS	DETAILS
3.35 ___ IF EDG associated with de-energized bus is running, THEN ensure proper EDG voltage and frequency.	1 ___ IF associated EDG output voltage is < 4150V, THEN raise EDG output voltage: ___ Select affected "EDG A(B) EXC VOLT ADJ SELECT" to "CONT RM". ___ Ensure EDG voltage is ≈ 4160V using "EDG A(B) EXC VOLT ADJUST". 2 ___ Ensure frequency is ≈ 60 Hz by adjusting "EDG A(B) SPEED". 3 ___ Ensure EDG output Bkr closes.
3.36 ___ IF both ES 4160V Buses are energized, THEN **GO TO** Step 3.41 in this procedure.	

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.14 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.37 ___ Ensure ES Bus is available for recovery.	1 Notify PPO to verify lockouts are not tripped: ___ "86B-3209 A EDG LOCKOUT RELAY" (A ES 4160V SWGR Room) ___ "86B-3210 B EDG LOCKOUT RELAY" (B ES 4160V SWGR Room) 2 Verify ES 4160V lockouts are not tripped:

A ES Bus	B ES Bus
___ 86B-3205	___ 86B-3206
___ 86B-3207	___ 86B-3208
___ 86B-3211	___ 86B-3212

3 ___ IF any lockout is tripped, THEN **CONCURRENTLY PERFORM** Enclosure 1, Recovery of Faulted ES Bus, in this procedure.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.15 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.38 ___ IF at any time, all of the following exist: ___ A ES 4160V BUS de-energized ___ Fault does NOT exist ___ Any offsite power source available THEN energize A ES 4160V BUS.	1 ___ IF "DIESEL GEN A BREAKER CLOSED" annunciator alarm (Q-02-03) is lit, THEN defeat A ES 4160V BUS lockout: ___ Notify PPO to open "AY KNIFE SWITCH A ES 4160V BUS UV RELAY POWER" (4160V ES BUS 3A-13). ___ WHEN AY knife switch is open, THEN depress "4160V ESA UV RESET" push button. ___ Verify "DIESEL GEN A BREAKER CLOSED" annunciator alarm clears. ___ Notify PPO to close "AY KNIFE SWITCH A ES 4160V BUS UV RELAY POWER". 2 ___ Select feeder Bkr from available power source to "CLOSE" until "4KV ES BUS A DEAD" annunciator alarm clears (normally $<$ 10 seconds). 3 ___ Depress "4160V ESA UV RESET" push button.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...

ACTIONS	DETAILS
3.39 ___ IF at any time, all of the following exist: ___ B ES 4160V BUS de-energized ___ Fault does NOT exist ___ Any offsite power source available THEN energize B ES 4160V BUS.	1 ___ IF "DIESEL GEN B BREAKER CLOSED" annunciator alarm (Q-05-03) is lit, THEN defeat B ES 4160V BUS lockout: ___ Notify PPO to open "AY KNIFE SWITCH B ES 4160V BUS UV RELAY POWER" (4160V ES BUS 3B-2). ___ WHEN AY knife switch is open, THEN depress "4160V ESB UV RESET" push button for the affected ES 4160V Bus. ___ Verify "DIESEL GEN B BREAKER CLOSED" annunciator alarm clears. ___ Notify PPO to close "AY KNIFE SWITCH B ES 4160V BUS UV RELAY POWER". 2 ___ Select feeder Bkr from available power source to "CLOSE" until "4KV ES BUS B DEAD" annunciator alarm clears (normally < 10 seconds). 3 ___ Depress "4160V ESB UV RESET" push button.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.39 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.40 ___ IF at any time, all the following exist: ___ De-energized ES Bus NOT faulted ___ EDG on affected Bus NOT running THEN attempt recovery of failed EDG.	• Notify PPO to **CONCURRENTLY PERFORM** Enclosure 2, Failed EDG Recovery, in this procedure.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.39 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.40 IF a de-energized bus is NOT faulted, AND EDG is NOT running, THEN...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS

STATUS

At least 1 ES 4160V Bus energized.

3.41 ___ IF at any time, heat tracing is desired, THEN restore heat tracing.

1 ___ IF ES 4160V Bus is powered from an EDG, THEN ensure EDG load is ≤ 3028 KW.

2 Notify PPO to depress "RESET" push button on the following:

___ HTCP-5 "DIESEL LOAD SHEDDING PANEL" (119 ft AB by ES MCC 3A2)

___ HTCP-2 "DIESEL LOAD SHEDDING PANEL" (95 ft AB by elevator)

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.39 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.40 IF a de-energized bus is NOT faulted, AND EDG is NOT running, THEN...
3.41 IF heat tracing is desired, THEN restore heat tracing.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.42 ___ Verify SF cooling is in operation.	
___ IF SF cooling is NOT in operation, THEN establish SF cooling. [Rule 5, EDG Control]	1 ___ IF SFP that was previously running is available, THEN start previously running pump. 2 ___ IF SFP that was previously running is NOT available, THEN perform the following: ___ Start available SFP. ___ IF SFHE-1A is in service, THEN notify PPO to ensure SW alignment (119 ft AB by SFPs): ___ Close SWV-22 "SFHE-1B INLET ISO". ___ Open SWV-21 "SFHE-1A INLET ISO". ___ IF SFHE-1B is in service, THEN notify PPO to ensure SW alignment (119 ft AB by SFPs): ___ Close SWV-21 "SFHE-1A INLET ISO". ___ Open SWV-22 "SFHE-1B INLET ISO".

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.39 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.40 IF a de-energized bus is NOT faulted, AND EDG is NOT running, THEN...
3.41 IF heat tracing is desired, THEN restore heat tracing.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.43 ___ IF any EDG is running, THEN notify NSM to order EDG fuel as required.	
3.44 ___ IF all the following exist: ___ A ES 480V BUS energized ___ Fire does NOT exist ___ FSP-2A or FSP-2B running THEN stop running FSPs.	• ___ IF FSP-2A is running, THEN notify SPO to restore FSP-2A to normal in accordance with OP-880, Fire Service System, Section 4.2, FSP-2A Operation. • ___ IF FSP-2B is running, THEN notify SPO to restore FSP-2B to normal in accordance with OP-880, Fire Service System, Section 4.3, FSP-2B Operation.

Applicable carry-over steps:
3.10 IF ES actuates, AND any ES Bus is de-energized, THEN open...
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM**...
3.31 IF PZR Htrs require power, THEN energize PZR Htrs.
3.38 IF de-energized A ES BUS is NOT faulted, AND offsite power exists...
3.39 IF de-energized B ES BUS is NOT faulted, AND offsite power exists...
3.40 IF a de-energized bus is NOT faulted, AND EDG is NOT running, THEN...
3.41 IF heat tracing is desired, THEN restore heat tracing.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS		DETAILS
3.45 ___	IF offsite power is supplying all available ES 4160V Buses, THEN **EXIT** this procedure.	
3.46 ___	IF 230KV switchyard is NOT available, THEN consider 500KV backfeed as a source of offsite power.	
3.47 ___	IF at any time, B EDG load is > 3175 KW for 24 hrs, THEN ensure TBP-2 is stopped.	
3.48 ___	IF at any time, EDG load is > 2825 KW, THEN notify TSC for guidance on maintaining EDGs within 2000 hr or continuous ratings. See Table 1	
3.49 ___	WHEN offsite power is available, THEN continue in this procedure.	

Applicable carry-over steps:
3.25 IF letdown flow restoration is desired, THEN **CONCURRENTLY PERFORM...**
3.41 IF heat tracing is desired, THEN restore heat tracing.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.50 ___ IF A ES 4160V BUS is supplied from A EDG, THEN **PERFORM** Enclosure 6, A EDG Shutdown, in this procedure.	
3.51 ___ IF B ES 4160V BUS is supplied from B EDG, THEN **PERFORM** Enclosure 7, B EDG Shutdown, in this procedure.	
3.52 ___ Notify PPO to restore EDGs to ES standby in accordance with OP-707, Operation of the ES Emergency Diesel Generators, Section 4.12, Operation of EDG.	
3.53 ___ **EXIT** this procedure.	

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4.0 ENCLOSURE 1 RECOVERY OF FAULTED ES BUS

	ACTIONS	DETAILS
1.1 ___	Notify Maintenance to repair fault on affected Bus.	
1.2 ___	WHEN fault is repaired, THEN reset lockouts for affected Bus.	see table below
1.3 ___	IF affected EDG is NOT running, THEN reset affected EDG lockout.	• Notify PPO to reset affected EDG lockout: ___ "86B-3209 A EDG LOCKOUT RELAY" (A ES 4160V SWGR Room) ___ "86B-3210 B EDG LOCKOUT RELAY" (B ES 4160V SWGR Room)

Step 1.2 details:

A ES Bus	B ES Bus
___ 86B-3205	___ 86B-3206
___ 86B-3207	___ 86B-3208
___ 86B-3211	___ 86B-3212

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ACTIONS	DETAILS
1.4 ___ IF affected ES Bus is de-energized, AND EDG is running, THEN reset affected EDG lockout.	1 ___ Dispatch PPO to affected ES 4160V ES Bus SWGR Room. 2 Place and maintain affected EDG output Bkr control switch in the "TRIP" position: ___ Bkr 3209 ___ Bkr 3210 3 Notify PPO to reset affected EDG lockout: ___ "86B-3209 A EDG LOCKOUT RELAY" (A ES 4160V SWGR Room) ___ "86B-3210 B EDG LOCKOUT RELAY" (B ES 4160V SWGR Room) 4 ___ WHEN affected EDG lockout is reset, THEN close affected EDG output Bkr: ___ Bkr 3209 ___ Bkr 3210

1.5 ___ **EXIT** this enclosure.

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4.0 ENCLOSURE 2 FAILED EDG RECOVERY

ACTIONS	DETAILS
2.1 ___ Prevent any failed EDG from starting during recovery efforts.	• Select EDG "CONTROL" switch to "At Engine" for any failed EDG (119 ft AB A(B) EDG Engine Room).
2.2 ___ Ensure condition causing failure of EDG is corrected.	
2.3 ___ WHEN condition causing failure of EDG has been corrected, THEN prepare EDG for start.	1 Ensure 86 lockout is reset for affected EDG: ___ "86B-3209 A EDG LOCKOUT RELAY" (A ES 4160V SWGR Room) ___ "86B-3210 B EDG LOCKOUT RELAY" (B ES 4160V SWGR Room) 2 ___ Reset EDG "86 DG" lockout (119 ft AB A(B) EDG Control Room). 3 ___ Ensure fuel rack is reset (119 ft AB A(B) EDG Engine Room). 4 ___ Depress "RESET" push button (119 ft AB A(B) EDG Engine Room).

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4.0 ENCLOSURE 2 FAILED EDG RECOVERY (CONT'D)

ACTIONS		DETAILS
2.4	___ WHEN at least 2 min have elapsed, THEN start recovered EDG.	1 ___ Notify Control Room EDG is being started. 2 ___ Select EDG "CONTROL" switch to "Normal" (119 ft AB A(B) EDG Engine Room).

2.5 ___ **EXIT** this enclosure.

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4.0 ENCLOSURE 3 MUP RESTART

ACTIONS			DETAILS
3.1	___	IF bus is being supplied by the EDG, THEN ensure adequate EDG margin exists for MUP and required cooling water pumps. [Rule 5 EDG Control]	
3.2	___	Ensure MU control valves are closed.	___ MUV-16 ___ MUV-31
3.3	___	Start required cooling water pumps for affected MUP. [Rule 5, EDG Control]	
3.4	___	Ensure both MUP recirc to MUT valves are open.	___ MUV-53 ___ MUV-257

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4.0 ENCLOSURE 3 MUP RESTART

ACTIONS	DETAILS
3.5 ___ Prepare MUP for restart.	1 Ensure affected MUP main lube oil pump is running: ___ MUP-2A ___ MUP-2B ___ MUP-2C 2 Ensure affected MUP backup lube oil pump is in normal after stop: ___ MUP-3A ___ MUP-3B ___ MUP-3C 3 Ensure affected MUP main gear oil pump is running: ___ MUP-4A ___ MUP-4B ___ MUP-4C 4 Ensure affected MUP backup gear oil pump is selected to "AUTO": ___ MUP-5A ___ MUP-5B ___ MUP-5C

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ACTIONS		DETAILS
3.6 ___	Select all MUPs to normal after stop.	___ MUP-1A ___ MUP-1B ___ MUP-1C
3.7 ___	IF A Train MUP will be started, THEN ensure suction alignment to MUT.	1 ___ IF MUP-1C is NOT ES selected, THEN notify PPO to select "PUMP 3C" on 4160V ES BUS 3B-5 2 ___ Ensure MUV-62 is closed. 3 ___ IF MUT level is $\geq$ 55 in, THEN ensure MUV-73 is closed. 4 ___ IF MUT level is < 55 in, THEN ensure MUV-73 is open. 5 ___ Ensure MUV-69 is open. 6 ___ Ensure MUV-58 is open.

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	ACTIONS	DETAILS
3.8 ___	IF B Train MUP will be started, THEN ensure suction alignment to MUT.	1 ___ IF MUP-1A is NOT ES selected, THEN notify PPO to select "PUMP 3A" on 4160V ES BUS 3A-10
		2 ___ Ensure MUV-69 is closed.
		3 ___ IF MUT level is ≥ 55 in, THEN ensure MUV-58 is closed.
		4 ___ IF MUT level is < 55 in, THEN ensure MUV-58 is open.
		5 ___ Ensure MUV-62 is open.
		6 ___ Ensure MUV-73 is open.

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ACTIONS	DETAILS
3.9 ___ Start ES selected MUP aligned to MUT. [Rule 5, EDG Control]	___ MUP-1A ___ MUP-1B ___ MUP-1C
3.10 ___ Maintain PZR level.	1 ___ Ensure MUV-596 is open. 2 ___ Ensure MUV-27 is open. 3 ___ Control PZR level using MUV-31
3.11 ___ Maintain MUT level ≥ 55 in.	• Cycle appropriate BWST to MUP valve to maintain MUT level: ___ MUV-73 ___ MUV-58

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ACTIONS	DETAILS
3.12 ___ Restore seal injection.	1 ___ Ensure MUV-596 is open.
	2 ___ Ensure MUV-18 is open.
	3 ___ Throttle open MUV-16 to establish total seal injection flow rate of 12 gpm over a 2 min time period. Time 12 gpm established ___ : ___
	4 ___ WHEN ≥ 10 min have elapsed with total seal injection flow rate of 12 gpm, THEN increase seal injection flow rate to 24 gpm. Time 24 gpm established ___ : ___
	5 ___ WHEN ≥ 10 min have elapsed with seal injection flow rate of 24 gpm, THEN increase total seal injection flow rate to 36 gpm (32-40 gpm).

3.13 ___ **EXIT** this enclosure.

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4.0 ENCLOSURE 4 B ES 4160V BUS SUPPLY TO PZR HTRS

ACTIONS		DETAILS
4.1	___ IF 480V REACTOR AUX BUS 3B is energized, THEN **GO TO** Step 4.7 in this enclosure.	
4.2	___ Ensure 480V feeder and Cross-Tie Bkrs are open.	___ Bkr 3399 ___ Bkr 3393 ___ Bkr 3394 ___ Bkr 3306 ___ Bkr 3396 ___ Bkr 3312 ___ Bkr 3392
4.3	___ Prepare 480V Buses for backfeed.	• Notify SPO to ensure all Bkrs on the following are open: ___ 480V PLANT AUX BUS 3 (Unit 480V SWGR Room) ___ 480V REACTOR AUX BUS 3B (Unit 480V SWGR Room) ___ 480V PZR HTR MCC 3B (119 ft IB by East door)

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ACTIONS		DETAILS
4.4 ___	WHEN notified that all Bkrs on the following are open: ___ 480V PLANT AUX BUS 3 ___ 480V REACTOR AUX BUS 3B ___ 480V PZR HTR MCC 3B THEN energize 480V PLANT AUX BUS 3	1 ___ Close Bkr 3222 2 ___ Close Bkr 3312
4.5 ___	Energize 480V REACTOR AUX BUS 3B.	1 ___ Close Bkr 3392 2 ___ Close Bkr 3396
4.6 ___	Energize 480V PZR HTR MCC 3B.	• Notify SPO to close 480V REACTOR AUX BUS 3B-1C "BREAKER 3356 FEED TO PZR HTR MCC 3B" (Unit 480V SWGR Room).

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ACTIONS	DETAILS
4.7 ___ Energize 3 groups of PZR Htrs.	1 ___ Ensure EDG-1B load is ≤ 2700 KW.

2 Place all PZR Htr banks in "OFF":

___ Bank A	___ Bank D
___ Bank B	___ Bank E
___ Bank C	

3 Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3B (119 ft IB by east door):

___ 1A "PZR HEATER CONTROL TRANSFORMER B-1"

___ 1B "PZR HEATER CONTROL TRANSFORMER B-2"

4 Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3B (119 ft IB by east door):

___ 1D "PZR HEATER GROUP 10"

___ 3C "PZR HEATER GROUP 12"

___ 4C "PZR HEATER GROUP 13"

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ACTIONS	DETAILS
4.8 ___ IF PZR Htrs are desired, THEN select PZR Htr Bank E to control RCS PRESS.	
4.9 ___ **EXIT** this enclosure.	

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ACTIONS		DETAILS
5.1 ___	IF 480V REACTOR AUX BUS 3A is energized, THEN **GO TO** Step 5.7 in this enclosure.	
5.2 ___	IF any of the following are running: ___ DHP-1A ___ BSP-1A ___ RWP-3A ___ DCP-1A ___ AHF-15A THEN notify TSC for further guidance and **EXIT** this enclosure.	
5.3 ___	Ensure 480V REACTOR AUX BUS 3A feeder Bkrs are open.	___ Bkr 3305 ___ Bkr 3395

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ACTIONS		DETAILS
5.4	___ Prepare 480V Buses for backfeed.	• Notify SPO to ensure all Bkrs on the following are open: ___ 480V REACTOR AUX BUS 3A (Unit 480V SWGR Room) ___ 480V PZR HTR MCC 3A (119 ft IB by east door)
5.5	___ WHEN notified that all Bkrs on the following are open: ___ 480V REACTOR AUX BUS 3A ___ 480V PZR HTR MCC 3A THEN energize 480V REACTOR AUX BUS 3A.	1 ___ Close Bkr 3321 2 ___ Close Bkr 3395
5.6	___ Energize 480V PZR HTR MCC 3A.	• Notify SPO to close 480V REACTOR AUX BUS 3A-1C "BREAKER 3355 FEED TO PZR HTR MCC 3A" (Unit 480V SWGR Room).

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ACTIONS	DETAILS
5.7 ___ Energize 3 groups of PZR Htrs.	1 ___ Ensure EDG-1A load is ≤ 2700 KW.

2 Place all PZR Htr banks in "OFF":

___ Bank A	___ Bank D
___ Bank B	___ Bank E
___ Bank C	

3 Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3A (119 ft IB by east door):

___ 1A "PZR HEATER CONTROL TRANSFORMER A-1"

___ 2A "PZR HEATER CONTROL TRANSFORMER A-2"

4 Notify SPO to close the following Bkrs on 480V PZR HTR MCC 3A (119 ft IB by east door):

___ 1C "PZR HEATER GROUP 7"

___ 2C "PZR HEATER GROUP 8"

___ 3C "PZR HEATER GROUP 9"

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ACTIONS	DETAILS
5.8 ___ IF PZR Htrs are desired, THEN select PZR Htr Bank D to control RCS PRESS.	
5.9 ___ **EXIT** this enclosure.	

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4.0 ENCLOSURE 6 A EDG SHUTDOWN

ACTIONS	DETAILS
6.1 ___ Prepare A EDG to synchronize with offsite power source.	1 ___ Ensure plant conditions are stable.
	2 ___ Ensure HPI is bypassed or reset.
	3 ___ Depress "4160V ESA UV RESET" push button.
	4 ___ Notify PPO to obtain key 94 from Control Room.
	5 ___ While maintaining frequency, notify PPO to select A EDG "SPEED DROOP" to "60" in increments of 10 (119 ft AB A EDG Engine Room).
	6 ___ Select "EDG A EXC VOLT ADJ SELECT" to "CONT RM".
	7 ___ Notify PPO to select "A EDG Unit-Parallel Switch" to "PAR" (119 ft AB A EDG Control Room).
	8 ___ Adjust "EDG A EXC VOLT ADJUST" to maintain A EDG voltage 4150 to 4250 volts.
	9 Ensure at least 1 of the following breakers is closed: ___ 1691 ___ 1692 ___ 4900 ___ 4902

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ACTIONS	DETAILS
6.2 ___ Synchronize A EDG with offsite power source.	1 ___ Select synchroscope for Bkr to be paralleled to "ON". 2 ___ Adjust "EDG A EXC VOLT ADJUST" to match incoming and running voltages. 3 ___ Adjust "EDG A SPEED" to establish synchroscope moving slow in the "FAST" direction. 4 ___ Close oncoming Bkr at ≈ 11 o'clock. 5 ___ Select synchroscope to "OFF".
6.3 ___ Reduce A EDG load.	1 ___ Maintain -1.5 to +1.5 MVAR by adjusting "EDG A EXC VOLT ADJUST". 2 ___ <u>IF</u> A EDG load is > 1200 KW, <u>THEN</u> adjust "EDG A SPEED" to reduce load to ≈ 1200 KW. 3 ___ <u>WHEN</u> load has been reduced to ≈ 1200 KW for 3 to 5 min, <u>THEN</u> adjust "EDG A SPEED" to reduce load to ≈ 200 KW. 4 ___ Establish ≈ +0.1 MVAR by adjusting "EDG A EXC VOLT ADJUST". 5 ___ Open Bkr 3209

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ACTIONS	DETAILS
6.4 ___ Stop A EDG.	1 ___ Notify PPO to adjust A EDG "SPEED DROOP" to "0" in increments of 10 (119 ft AB A EDG Engine Room).
	2 ___ Notify PPO to select "A EDG Unit-Parallel Switch" to "UNIT" (119 ft AB A EDG Control Room).
	3 ___ Maintain 59.8 to 60.2 Hz by adjusting "EDG A SPEED".
	4 ___ Select "EDG A VOLT ADJUST MODE SELECT" to "MAN".
	5 ___ Maintain EDG voltage at 3933 to 4400V by adjusting "EDG A MANUAL VOLTAGE ADJUST".
	6 ___ Select "EDG A VOLT ADJUST MODE SELECT" to "AUTO".
	7 ___ Select "EDG A EXC VOLT ADJ SELECT" to "DG RM".
	8 ___ Depress A EDG "STOP" push button.

6.5 ___ **EXIT** this enclosure.

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4.0 ENCLOSURE 7 B EDG SHUTDOWN

ACTIONS	DETAILS
7.1 ___ Prepare B EDG to synchronize with offsite power source.	1 ___ Ensure plant conditions are stable.
	2 ___ Ensure HPI is bypassed or reset.
	3 ___ Depress "4160V ESB UV RESET" push button.
	4 ___ Notify PPO to obtain key 94 from Control Room.
	5 ___ While maintaining frequency, notify PPO to select B EDG "SPEED DROOP" to "60" in increments of 10 (119 ft AB B EDG Engine Room).
	6 ___ Select "EDG B EXC VOLT ADJ SELECT" to "CONT RM".
	7 ___ Notify PPO to select "B EDG Unit-Parallel Switch" to "PAR" (119 ft AB B EDG Control Room).
	8 ___ Adjust "EDG B EXC VOLT ADJUST" to maintain B EDG voltage 4150 to 4250 volts.
	9 Ensure at least 1 of the following breakers is closed: ___ 1691 ___ 1692 ___ 4900 ___ 4902

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ACTIONS	DETAILS
7.2 ___ Synchronize B EDG with offsite power source.	1 ___ Select synchroscope for Bkr to be paralleled to "ON". 2 ___ Adjust "EDG B EXC VOLT ADJUST" to match incoming and running voltages. 3 ___ Adjust "EDG B SPEED" to establish synchroscope moving slow in the "FAST" direction. 4 ___ Close oncoming Bkr at ≈ 11 o'clock. 5 ___ Select synchroscope to "OFF".
7.3 ___ Reduce B EDG load.	1 ___ Maintain -1.5 to +1.5 MVAR by adjusting "EDG B EXC VOLT ADJUST". 2 ___ <u>IF</u> B EDG load is > 1200 KW, <u>THEN</u> adjust "EDG B SPEED" to reduce load to ≈ 1200 KW. 3 ___ <u>WHEN</u> load has been reduced to ≈ 1200 KW for 3 to 5 min, <u>THEN</u> adjust "EDG B SPEED" to reduce load to ≈ 200 KW. 4 ___ Establish ≈ +0.1 MVAR by adjusting "EDG B EXC VOLT ADJUST". 5 ___ Open Bkr 3210

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4.0 ENCLOSURE 7 B EDG SHUTDOWN (CONT'D)

ACTIONS	DETAILS
7.4 ___ Stop B EDG.	1 ___ Notify PPO to adjust B EDG "SPEED DROOP" to "0" in increments of 10 (119 ft AB B EDG Engine Room).
	2 ___ Notify PPO to select "B EDG Unit-Parallel Switch" to "UNIT" (119 ft AB B EDG Control Room).
	3 ___ Maintain 59.8 to 60.2 Hz by adjusting "EDG B SPEED".
	4 ___ Select "EDG B VOLT ADJUST MODE SELECT" to "MAN".
	5 ___ Maintain EDG voltage at 3933 to 4400V by adjusting "EDG B MANUAL VOLTAGE ADJUST".
	6 ___ Select "EDG B VOLT ADJUST MODE SELECT" to "AUTO".
	7 ___ Select "EDG B EXC VOLT ADJ SELECT" to "DG RM".
	8 ___ Depress B EDG "STOP" push button.

7.5 ___ **EXIT** this enclosure.

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Table 1:
EDG Ratings

[illegible]	Load range in KW
Maximum load	3474
30 min	3376 to 3474
200 hr	3176 to 3375
2000 hr	2826 to 3175
Continuous	0 to 2825

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1c1, Take Actions required for Loss of RCS Pressure

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ______________________________ Date/ ____________

REVIEWED BY: ______________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Take actions required for loss of Reactor Coolant (RCS) pressure.

Alternate Path: RCV-14 and RCV-13 will not close.

JPM #: B1c1 (bank #238)

K/A Rating/Importance 010A1.07/3.7/3.7 **Task Number/Position:** 00020402013/RO

Task Standard: Take actions required for loss of Reactor Coolant (RCS) pressure using AP-520.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____ Admin _____

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:
1. AP-520, Rev 3

Validation Time: 10 min.

Time Critical: No

Candidate: ____________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: __________________________ __________________________ / _______
Printed Name Signature Date

Comment:

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. The plant is at approximately 67% power.
2. RCV-13 and RCV-14 will not close (failures) (0.2 setting).
3. IC #62 (son 6-9-00).
4. Check SPDS screens.
5. Ensure MUT level is not too high and pressure alarm is cleared.

SIMULATOR OPERATOR INSTRUCTIONS:

1. Booth operator will take the roles for the various operators for notifications.
2. As PPO, if called RCV-13 and RCV-14 cannot be closed from the breakers.

Tools/Equipment/Procedures Needed:

1. AP-520
2. Steam Tables

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
Reactor Coolant System (RCS) pressure is decreasing slowly.
The reason for the RCS pressure decrease is unknown at this time.

Initiating Cues:

You are requested to perform required actions.

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of AP-520 **EXAMINER NOTE: Candidate may take a "prompt and prudent" action, attempting to isolate RCV-13 and RCV-14. They will not close which forces use of the procedure.** COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 3.1) Notify personnel of entry into AP-520 ______ PA announcement ______ STA ______ Plant operators ______ NSM (evaluate plant conditions for potential entry into Emergency Plan) STANDARD: Candidate uses PA system to announce entry into AP-520. Candidate calls by telephone or radios the STA, Plant Operators, and NSM. COMMENTS:	SAT ____ UNSAT ___
STEP 3: (step 3.2) If RB is occupied, then evacuate RB. 1. ______ Depress RB EVACUTION pushbutton. 2. ______ Notify personnel over PA. 3. ______ Repeat PA announcement. **EXAMINER CUE: No one is in the RB** STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___

STEP 4: (step 3.3) Verify OTSG tube leakage has not increased. _____ Notify Chemistry to sample OTSGs. _____ Observe radiation monitors and recorder traces for the following: _____ RM-A12 (Condenser Exh) _____ RM-G26-RI (B1 MS line) _____ RM-G27-RI (A2 MS line) _____ RM-G25-RI (A1 MSV-25) _____ RM-G28-RI (B2 MSV-26) If OTSG tube leak > 1 gpm exists, and DHR is not in operation, then go to EOP-06, Steam Generator Tube Rupture, beginning with step 3.1. STANDARD: Candidate contacts chemistry to sample OTSGs. Operator verifies that there is no increase in OTSG tube leakage by verifying that there are no increasing trends on RM-A12, RM-G26-RI, RM-G27-RI, RM-G25-RI, and RM-G-28-RI. COMMENTS:	SAT ____ UNSAT ___
STEP 5: (step 3.4) If a significant rise in RCS leakage exists, then go to step 3.11 in this procedure. STANDARD: Candidate determines by use of pressurizer, Make-up Tank, sump levels and radiation monitor trending that there is no significant rise in RCS leakage and continues on in AP-520. COMMENTS:	SAT ____ UNSAT ___

STEP 6: (step 3.5) PROCEDURE STATUS: RCS Press lowering. Verify proper operation of PZR hearers. _____ PZR HEATER CONTROL _____ PZR Htr Banks _____ RC-203-JI _____ RC-204-JI If PZR Htrs are not operating properly, then notify Maintenance to initiate repair efforts. STANDARD: Operator verifies that red light for each energized heater is ON. Candidate verifies RC-203-JI and RC-204-JI each have a reading and are approximately equal (KW). COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 7: (step 3.6)	Critical Step
IF RCS PRESS continues to lower, then isolate possible sources of RCS PRESS reduction. Close the following valves: _____ DHV-91 _____ RCV-53 _____ RCV-11 _____ PORV _____ RCV-13 _____ RCV-14 **EXAMINER NOTE: Candidate may spot RCV-14 early and attempt closing RCV-13 and RCV-14 prior to other valves in this step. Candidate may conclude that this is in fact the cause of the RCS pressure decrease and continue to the next step.** STANDARD: Candidate verifies DHV-91 and RCV-53 are closed with green light ON and red light OFF (may hold valves in the closed direction). Candidate rotates control switch for RCV-11 (Alarm I-6-2), PORV (Alarm I-5-2), RCV-13 and RCV-14 to CLOSE and verifies for each valve green light ON and red light OFF. **EXAMINER NOTE: RCV-13 and RCV-14 will not close (RCV-13 light will remain red; RCV-14 amber light remains on). Candidate may call PPO to try and close at breaker; booth operator will call back and say closure is not possible.** COMMENTS:	SAT ____ UNSAT ___

STEP 8: (step 3.7)	Critical Step
If RCS PRESS continues to lower, and RCV-13 is not closed, then stop RCP-1B 1. _____ If Rx power is > 75% then concurrently perform AP-510, Rapid Power Reduction, beginning with step 3.1 2. _____ When Rx power is < 75% then stop RCP-1B STANDARD: Reactor power is at 60%, no power reduction is required. (If power reductions is required, candidate will "bump" down on the ULD toggle.) RCV-13 is not closed. Candidate rotates control handle for RCP 1B to the stop position and verifies green light ON and red light OFF. (Candidate may turn on lift oil pumps for RCP-1B) (Alarms P-8-6 and J-3-3; I-5-2 will also alarm if lift oil pump is not started ahead of RCP-1B shutdown.) **EXAMINER CUE: JPM is terminated (when RCP is shutdown).** COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
Reactor Coolant System (RCS) pressure is decreasing slowly.
The reason for the RCS pressure decrease is unknown at this time.

Initiating Cues:

You are requested to perform required actions.

LOSS OF RCS COOLANT OR PRESSURE

1.0 ENTRY CONDITIONS

IF any of the following occur:

- A significant rise in RCS leakage
- An uncontrolled RCS PRESS reduction

THEN use this procedure.

2.0 IMMEDIATE ACTIONS

NOTE
There are no immediate actions for this procedure.

Approved by MNPO D.M. Porter for M. Annacone Date 11/05/99
(SIGNATURE ON FILE)

3.0 FOLLOW-UP ACTIONS

	ACTIONS	DETAILS
3.1 ___	Notify personnel of entry into AP-520	• ___ PA announcement • ___ STA • ___ Plant operators • ___ NSM (evaluate plant condition for potential entry into Emergency Plan)
3.2 ___	IF RB is occupied, THEN evacuate RB.	1 ___ Depress "RB EVACUATION" push button. 2 ___ Notify personnel over PA. 3 ___ Repeat PA announcement.

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.3 ___ Verify OTSG tube leakage has not increased.	• ___ Notify Chemistry to sample OTSGs. • Observe radiation monitors and recorder traces for the following: ___ RM-A12 (Condenser Exh) ___ RM-G26-RI (B1 MS line) ___ RM-G27-RI (A2 MS line) ___ RM-G25-RI (A1 MSV-25) ___ RM-G28-RI (B2 MSV-26)
___ IF OTSG tube leak > 1 gpm exists, AND DHR is NOT in operation, THEN **GO TO** EOP-06, Steam Generator Tube Rupture, beginning with Step 3.1	
3.4 ___ IF a significant rise in RCS leakage exists, THEN **GO TO** Step 3.11 in this procedure.	

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS

STATUS

RCS PRESS lowering.

3.5 ___ Verify proper operation of PZR heaters.

- ___ "PZR HEATER CONTROL"
- ___ PZR Htr Banks
- ___ RC-203-JI
- ___ RC-204-JI

___ IF PZR Htrs are NOT operating properly, THEN notify Maintenance to initiate repair efforts.

3.6 ___ IF RCS PRESS continues to lower, THEN isolate possible sources of RCS PRESS reduction.

- Close the following valves:

  ___ DHV-91

  ___ RCV-53

  ___ RCV-11

  ___ PORV

  ___ RCV-13

  ___ RCV-14

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS		DETAILS
3.7 ___	IF RCS PRESS continues to lower, AND RCV-13 is NOT closed, THEN stop RCP-1B	1 ___ IF Rx power is > 75%, THEN **CONCURRENTLY PERFORM** AP-510, Rapid Power Reduction, beginning with Step 3.1 2 ___ WHEN Rx power is < 75%, THEN stop RCP-1B
3.8 ___	IF RCS PRESS continues to lower, THEN trip the Rx and **CONCURRENTLY PERFORM** EOP-2, Vital System Status Verification, beginning with Step 2.1	

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1d1, Ensure BS actuation

CANDIDATE____

EXAMINER____

PREPARED/
REVISED BY: ____________________________ Date/__________

REVIEWED BY: ____________________________ Date/__________
(Operations Representative)

VALIDATED BY: ____________________________ Date/__________
(Operations Representative)

APPROVED BY: ____________________________ Date/__________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Ensure Building Spray (BS) actuation.

Alternate Path: BSP-1A will not start in manual. BSV-4 is set on local.

JPM #: B1d1 (bank #247)

K/A Rating/Importance 026A3.01/4.3/4.5 **Task Number/Position:** 0260502001/RO

Task Standard: Initiate Building Spray for high Reactor Building temperature using EM-225C.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____ Admin _____

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:

1. EM-225, Rev 1

Validation Time: 5 min.

Time Critical: No

Candidate: ______________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ __________________________/_______
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. A LOCA is in progress.
2. Reactor Building pressure is < 30 psig.
3. BSP-1A will not start in manual.
4. The BWST level is > 20 ft.
5. Use EOP-03 for setup conditions.
6. IC #63.
7. Input "enc1" and "enc2".
8. Acknowledge SCM alarm.
9. Check CRTs to ensure RB temperatures (if displayed) are high.
10. Activate LP for B1d1.
11. Set BSV-4 to local.

SIMULATOR OPERATOR INSTRUCTIONS:

1. Booth operator will take the roles for the various operators for notifications

Tools/Equipment/Procedures Needed:

1. EM-225C

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
A LOCA is in progress.
The Shift Supervisor has entered EOP-03.
Reactor Building (RB) temperatures are high.
The Emergency Coordinator (EC) has given concurrence to start Building Spray to reduce RB temperatures.

Initiating Cues:

You are requested to start Building Spray (BSP-1A preferred) per section 4.6 of EM-225C.

START TIME: _________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of EM-225C. **EXAMINER NOTE: Provide student a copy of EM-225C** COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.6) If a building spray pump is required and EC concurrence has been obtained, then perform the following: STANDARD: Candidate performs the following steps. COMMENTS:	SAT ____ UNSAT ___
STEP 3: (step 4.6.1) Ensure load is available on the emergency diesel generators per EOP-13, Rule 5. STANDARD: N/A, the emergency diesel generators are not running. COMMENTS:	SAT ____ UNSAT ___

STEP 4: (step 4.6.2) Ensure Building Spray flow controls are set at 1500 gpm and REMOTE if pumps are aligned to BWST, or 1200 gpm and LOCAL if aligned to the RB sump. STANDARD: Candidate verifies suction source to Building Spray pumps and ensures the REMOTE/LOCAL lever on BSV-3 and BSV-4 is set to REMOTE and the 1500 gpm. (BSV-4 is set to LOCAL and must be moved to REMOTE). COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 5: (step 4.6.3) Notify the control room to start one building spray pump. **EXAMINER CUE: (If required) the TSC requests you start Building Spray.** STANDARD: Candidate rotates the control handle for BSP-1A to the start position and notes that the pump did not start (green light remains ON and red light remains OFF). Pump start failure is reported to Shift Supervisor. Candidate repeats the guidance of EM-225C section 4.6 to start BSP-1B (some of the required steps may have been performed in parallel with BSP-1A alignment). **(JPM ends).** **EXAMINER NOTE: Role-play as Shift Supervisor when candidate discovers start problem with BSP-1A. Direct candidate to establish Building Spray with the "B" train.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
END OF TASK	

TIME STOP ________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
A LOCA is in progress.
The Shift Supervisor has entered EOP-03.
Reactor Building (RB) temperatures are high.
The Emergency Coordinator (EC) has given concurrence to start Building Spray to reduce RB temperatures.

Initiating Cues:

You are requested to start Building Spray (BSP-1A preferred) per section 4.6 of EM-225C.

Rev. 1

Effective Date 5/25/00

EMERGENCY PLAN IMPLEMENTING PROCEDURE

EM-225C

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

POST ACCIDENT MONITORING OF REACTOR BUILDING TEMPERATURE
(This Procedure Addresses EQ Components)

APPROVED BY: Procedure Owner

L.K. Clewett
(SIGNATURE ON FILE)

DATE: 5/23/00

PROCEDURE OWNER: Manager, Nuclear Plant Operations

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to provide guidance to the TSC Accident Assessment Team to monitor and take action to ensure Reactor Building (RB) temperatures remain below the qualified threshold limits for environmentally qualified components. If temperatures approach a predetermined limit, then actions will be taken to reduce RB temperatures to acceptable values.

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 ITS 3.6.5 Containment Air Temperature

2.1.2 Environmental and Seismic Qualification Program Manual

2.1.3 IOC NOE 97-2534, Assessment to support EM-225C for SBLOCA EQ Concerns, dated 12/4/97

2.1.4 Calculation M-97-0072, CR-3 Containment Analysis for SBLOCA, Rev. 2

2.1.5 PC 97-7607

2.1.6 IOC NSM 98-0592, Close out of the DR/JCO related to PC 97-7607 - RB EQ Temperatures from a SBLOCA event, dated 4/2/98

2.1.7 Calculation M-97-0132, CR3 Containment Analysis, Rev. 6

2.1.8 PC 00-0830, Enclosure 1 curve in EM-225C appears to be incorrect, dated 3/16/00

2.1.9 Calculation M-90-0021, Building Spray and Decay Heat NPSH, Rev. 11

3.0 PERSONNEL INDOCTRINATION

3.1 DEFINITIONS

None

3.2 RESPONSIBILITIES

The TSC Accident Assessment Team is responsible for monitoring RB temperatures post accident, and to provide recommendations to the Emergency Coordinator to initiate building spray if temperatures reach the limits established in this procedure.

3.3 LIMITS AND PRECAUTIONS

3.3.1 Large break LOCA's and larger small break LOCA's will result in RB Pressures that actuate building spray automatically. Actions to manually start building spray to reduce RB temperatures will not be required in these situations.

3.3.2 Prior to starting any ES powered component, adequate load margin must be available if the ES 4160 volt busses are energized from the emergency diesel generators.

3.3.3 Prior to starting a building spray pump, building spray flow control valves must be set for 1200 gpm if ECCS suction has been transferred to the RB Sump.

3.3.4 If a SGTR is in progress then ensure adequate RB sump level is available prior to transferring or starting a BS pump from the RB Sump. With a SGTR, sufficient RB sump level might not be available due to loss from the SGTR. Reference calculation M-90-0021 for BSP NPSH requirements.

4.0 INSTRUCTIONS

4.1 IF at least one building spray pump is running,
THEN exit this procedure. No further action is required.

4.2 IF an RCS leak is occurring in the reactor building,
THEN begin plotting average RB temperature on Enclosure 1 for at least 1 hour intervals in the beginning of the event. The plotting interval can be changed based on plant conditions.

4.3 RB Temperature is the average of the following four temperature elements:

TEMPERATURE ELEMENT	CONTROL ROOM RECORDER	RECALL POINT	COMPUTER POINT	RB ELEV.
AH-536-TE	AH-536-TIR	RECL-77	S358	102
AH-537-TE		RECL-78	S359	125
AH-538-TE		RECL-80	S382	180
AH-539-TE		RECL-81	S383	235
AVERAGE			S837	

4.4 IF average RB Temperature is in the "Acceptable" Region of Enclosure 1 and decreasing,
THEN exit this procedure.

4.5 IF at any time average RB temperature reaches "Action Required boundary" region of Enclosure 1,
THEN obtain Emergency Coordinator concurrence to start at least one building spray pump.

4.6 IF a building spray pump is required and EC concurrence has been obtained,
THEN perform the following:

4.6.1 Ensure load is available on the emergency diesel generators per EOP-13, Rule 5.

4.6.2 Ensure Building Spray flow controls are set at 1500 GPM and "Remote" if pumps are aligned to BWST, or 1200 GPM and "LOCAL" if aligned to the RB Sump.

4.6.3 Notify the control room to start one building spray pump.

4.7 Continue to monitor RB Temperature.

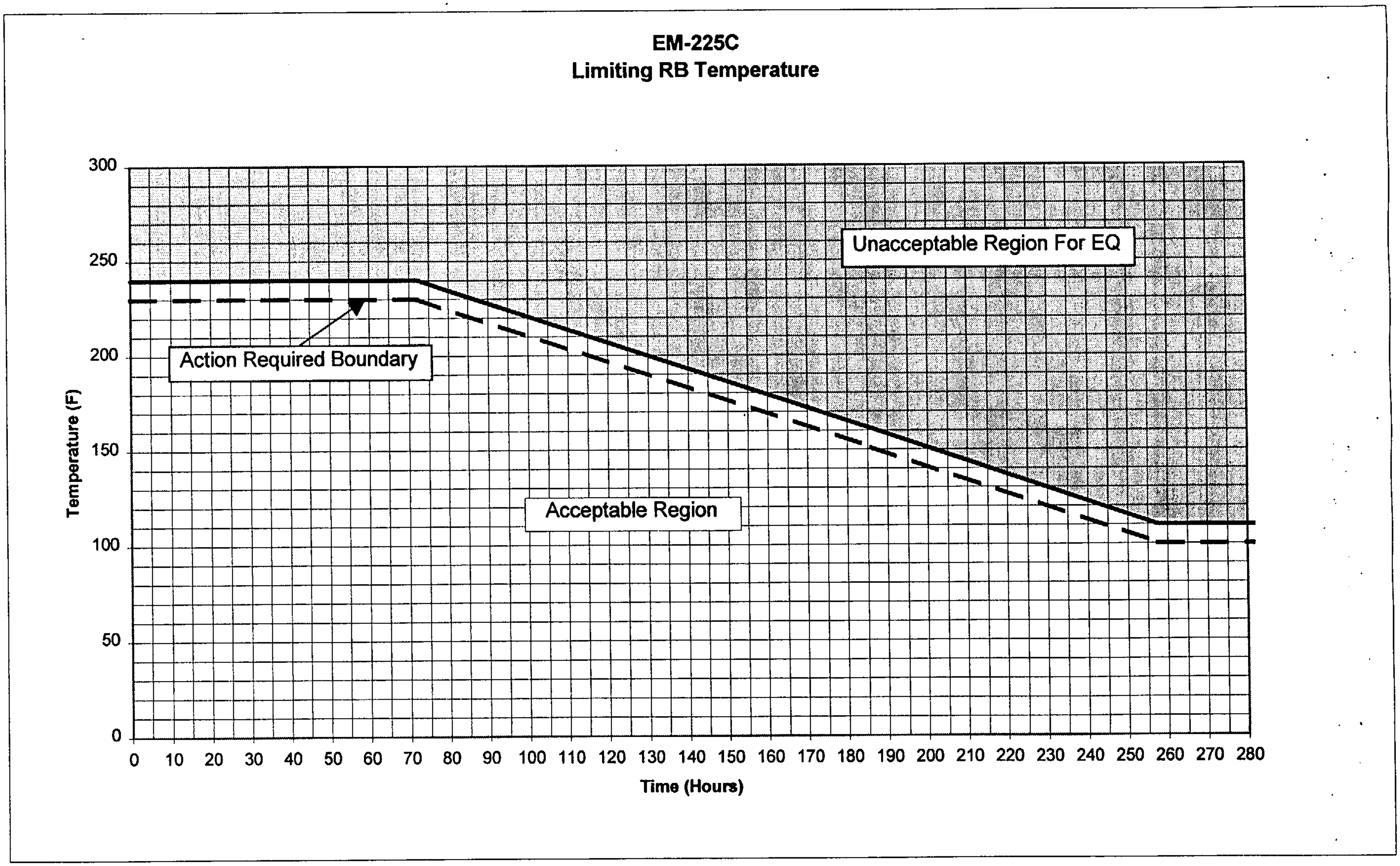
4.8 IF RB Temperature does not lower to the acceptable region of Enclosure 1,
THEN notify control room to start a second building spray pump if available.

NOTE: If building spray pumps are running, Emergency Operating Procedures provide guidance to secure them. If building spray pumps are secured, begin additional monitoring of RB Temperatures until a continuing decreasing trend is achieved.

4.9 WHEN building spray pumps are running,
THEN exit this procedure.

5.0 FOLLOW-UP ACTIONS

None


EM-225C
Limiting RB Temperature
Unacceptable Region For EQ
Action Required Boundary
Acceptable Region
Temperature (F)
300
250
200
150
100
50
0
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280
Time (Hours)

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1e1, Re-establish Letdown

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ______________________________ Date/ __________

REVIEWED BY: ______________________________ Date/ __________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ __________
(Operations Representative)

APPROVED BY: ______________________________ Date/ __________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Re-establish letdown.

Alternate Path: MUV-50 has no power.

JPM #: B1e1 (bank #31)

K/A Rating/Importance: 004A4.05/3.6/3.1 **Task Number/Position:** 0040502004/RO

Task Standard: Re-establish letdown fusing EOP-14 enclosure 4.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____ Admin _____

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:
1. EOP-14 enclosure 4, Rev 7

Validation Time: 10 min.

Time Critical: No

Candidate: __________________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ ____________________________/_______
Printed Name Signature Date

Comment:

____

____

____

____

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. RBIC has occurred due to a steam leak in the RB.
2. The steam leak has been isolated.
3. HPI has been bypassed and is being controlled (rule 2)
4. Letdown is isolated.
5. MUV-50 looses power when the control switch is rotated.
6. IC #64.
7. Input "enc2".

SIMULATOR OPERATOR INSTRUCTIONS:

1. Booth operator will take the roles for the various operators for notifications.
2. Use LP B1e1 to implement PPO steps.

Tools/Equipment/Procedures Needed:

1. EOP-14 enclosure 4
2. EOP-2, signed off to step 3.23

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
A small steam leak in the RB has caused a reactor trip and an ES actuation (RBIC).
Prior to having the symptom of excessive primary to secondary heat transfer, the leak was isolated.
The ES actuation has been reset and associated components controlled.

Initiating Cues:

You are requested to re-establish letdown with the MUDM-1A ("A" makeup demineralizer) in service.

START TIME: __________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of EOP-02 and EOP-14 enclosure 4. COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.1) Ensure letdown is isolated. 1. _____ Close MUV-49 2. _____ If MUV-50 has power, then close MUV-50 3. _____ If MUV-50 does not have power, then notify PPO to close MUV-45 BLOCK ORIFICE OUTLET ISO 4. _____ Close MUV-51 **EXAMINER NOTE: MUV-50 looses control power when the valve attempts to close.** STANDARD: Candidate observes MUV-49 green light ON and red light OFF (ES status light green). Candidate rotates control switch for MUV-50 to close when control power is lost. Candidate calls PPO to perform detail 3 of step 4.1 in enclosure 4 of EOP-14. Candidate rotates knob on MUV-51 controller clockwise to hard stop. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 3: (step 4.2)	Critical Step
If RBIC actuation has occurred, then ensure SW valves to letdown coolers to be placed in service have been reset. o _____ If MUHE-1A, or MUHE-1C is to be placed in service then notify PPO to depress the following OPEN pushbuttons: _____ SWV-47 A & C LETDOWN COOLER SUPPLY _____ SWV-50 A & C LETDOWN COOLER SUPPLY o _____ If MUHE-1B is to be placed in service then notify PPO to depress the following OPEN pushbuttons: _____ SWV-48 B LETDOWN COOLER SUPPLY _____ SWV-49 B LETDOWN COOLER SUPPLY STANDARD: Candidate contacts PPO to perform step 4.2 of Enclosure 4 of EOP-14. COMMENTS:	SAT ____ UNSAT ___
STEP 4: (step 4.3) Ensure SW valves are open for letdown coolers to be placed in service. MUHE-1A: __SWV-47, __SWV-50 MUHE-1B: __SWV-48, __SWV-49 MUHE-1C: __SWV-47, __SWV-50 STANDARD: Candidate will rotate the control switch for each of the following valves: SWV-47, SWV-48, SWV-49 and SWV-50. Candidate verifies red light ON and green light OFF. COMMENTS:	Critical Step SAT ____ UNSAT ___

STEP 5: (step 4.4) Ensure MU valves are open for letdown coolers to be placed in service. MUHE-1A: __MUV-38, __MUV-40, __MUV-567 MUHE-1B: __MUV-39, __MUV-41, __MUV-567 MUHE-1C: __MUV-498, __MUV-567 STANDARD: Candidate will rotate the control switch for each of the following valves: MUV-38, MUV-39, and MUV-567 Candidate verifies red light ON and green light OFF. MUV-40 and MUV-41 are already open, candidate will verify red light ON and green light OFF. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 6: (step 4.5) If power is available to MU Demin bypass valves, then bypass MU Demins. 1. _____ Ensure MUV-124 is open. 2. _____ Open MUV-200. 3. _____ Ensure MUV-117 is open. 4. _____ Close MUV-116. 5. _____ Ensure MUV-133 is closed. STANDARD: Candidate verifies MUV-124 open by red light ON and green light OFF. Candidate rotates control switch for MUV-200 to open and verifies red light ON and green light OFF. Candidate rotates control switch for MUV-117 to open and verifies red light ON and green light OFF. Candidate rotates control switch for MUV-116 to close and verifies green light ON and red light OFF. Candidate verifies MUV-133 closed by green light ON and red light OFF. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 7: (step 4.6) If MU Demins are not bypassed, then notify PPO to open MUV-126 MU DEMIN BYPASS. STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___
STEP 8: (step 4.7) Establish a letdown flowpath. 1. _____ If MUV-194 is NOT open, then ensure a prefilter is in service. 2. _____ Ensure 1 of the following exists: _____ Post-filter in service _____ MUV-100 open STANDARD: Candidate verifies MUV-194 red light is ON and green light OFF. Candidate rotates inlet valve and outlet valve for at least one post-filter, open and verifies red light ON and green light OFF. Candidate verifies post filter(s) are in service. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 9: (step 4.8) Establish letdown flow. 1. _____ If recovering from high temp, then select MUV-49 HIGH TEMP BYPASS switch to BYPASS. 2. _____ Open MUV-49. 3. _____ Throttle open MUV-51 to establish desired letdown flow rate. 4. _____ Open MUV-50. 5. _____ If MUV-45 is closed, then notify PPO to open MUV-45 BLOCK ORIFICE OUTLET ISO. 6. _____ Throttle MUV-51 to obtain desired letdown flow rate. STANDARD: Candidate rotates control switch for MUV-49 to open and verifies red light ON and green light OFF. Candidate rotates knob on MUV-51 controller counter-clockwise until flow is > 0gpm but less than 100 gpm. Candidate contacts PPO to perform step 4.8 detail 5 of enclosure 4 of EOP-14. Candidate may rotate knob on MUV-51 controller to adjust letdown flow. **EXAMINER CUE (if needed): Establish normal letdown flow.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 10: (step 4.9) When letdown TEMP is < 130°F, then ensure MUV-49 HIGH TEMP BYPASS switch is selected to NORM. STANDARD: Candidate observes the MUV-49 HIGH TEMP BYPASS switch and verifies that it is selected to NORM. COMMENTS:	SAT ____ UNSAT ___

STEP 11: (step 4.10)	**Critical Step**
If MUDM-1A is to be placed in service, and power is available, then align MUDM-1A. 1. _____ Ensure MUV-124 is open. 2. _____ Open MUV-116. 3. _____ Close MUV-200. 4. _____ Ensure MUV-201 is closed. 5. _____ Close MUV-117. 6. _____ If MUV-126 MU DEMIN BYPASS was opened in step 4.6, then notify PPO to close MUV-126. STANDARD: Candidate verifies MUV-124 open by red light ON and green light OFF. Candidate rotates control switch for MUV-116 to open and verifies red light ON and green light OFF. Candidate verifies MUV-200 closed by green light ON and red light OFF. Candidate rotates control switch for MUV-201 to close and verifies green light ON and red light OFF. Candidate verifies MUV-117 closes by light ON and red light OFF. **EXAMINER CUE: With letdown restored and the "A" Makeup Demineralizer in service, the JPM has ended.** COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
A small steam leak in the RB has caused a reactor trip and an ES actuation (RBIC).
Prior to having the symptom of excessive primary to secondary heat transfer, the leak was isolated.
The ES actuation has been reset and associated components controlled.

Initiating Cues:

You are requested to re-establish letdown with the MUDM-1A ("A" makeup demineralizer) in service.

ACTIONS	DETAILS
4.1 ___ Ensure letdown is isolated.	1 ___ Close MUV-49 2 ___ IF MUV-50 has power, THEN close MUV-50 3 ___ IF MUV-50 does NOT have power, THEN notify PPO to close MUV-45 "BLOCK ORIFICE OUTLET ISO" (119 ft AB Block Orifice Room). 4 ___ Close MUV-51
4.2 ___ IF RBIC actuation has occurred, THEN ensure SW valves to letdown coolers to be placed in service have been reset.	• ___ IF MUHE-1A, OR MUHE-1C is to be placed in service, THEN notify PPO to depress the following "OPEN" push buttons (95 ft AB Triangle Room): ___ "SWV-47 A & C LETDOWN COOLER SUPPLY" ___ "SWV-50 A & C LETDOWN COOLER RETURN" • ___ IF MUHE-1B is to be placed in service, THEN notify PPO to depress the following "OPEN" push buttons (95 ft AB Triangle Room): ___ "SWV-48 B LETDOWN COOLER SUPPLY" ___ "SWV-49 B LETDOWN COOLER RETURN"

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ACTIONS	DETAILS

4.3 ___ Ensure SW valves are open for letdown coolers to be placed in service.

MUHE-1A	MUHE-1B	MUHE-1C
___ SWV-47	___ SWV-48	___ SWV-47
___ SWV-50	___ SWV-49	___ SWV-50

4.4 ___ Ensure MU valves are open for letdown coolers to be placed in service.

MUHE-1A	MUHE-1B	MUHE-1C
___ MUV-38	___ MUV-39	___ MUV-498
___ MUV-40	___ MUV-41	
___ MUV-567	___ MUV-567	___ MUV-567

4.5 ___ IF power is available to MU Demin bypass valves, THEN bypass MU Demins.

1 ___ Ensure MUV-124 is open.

2 ___ Open MUV-200

3 ___ Ensure MUV-117 is open.

4 ___ Close MUV-116

5 ___ Ensure MUV-133 is closed.

4.6 ___ IF MU Demins are NOT bypassed,
THEN notify PPO to open MUV-126 "MU DEMIN BYPASS" (119 ft AB Block Orifice Room).

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ACTIONS	DETAILS
4.7 ___ Establish a letdown flowpath.	1 ___ IF MUV-194 is NOT open, THEN ensure a prefilter is in service. 2 Ensure 1 of the following exists: ___ Post-filter in service ___ MUV-100 open
4.8 ___ Establish letdown flow.	1 ___ IF recovering from high TEMP, THEN select "MUV-49 HIGH TEMP. BYPASS" switch to "BYPASS". 2 ___ Open MUV-49 3 ___ Throttle open MUV-51 to establish desired letdown flow rate. 4 ___ Open MUV-50 5 ___ IF MUV-45 is closed, THEN notify PPO to open MUV-45 "BLOCK ORIFICE OUTLET ISO" (119 ft AB Block Orifice Room). 6 ___ Throttle MUV-51 to obtain desired letdown flow rate.

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ACTIONS		DETAILS
4.9 ___	WHEN letdown TEMP is $< 130°F$, THEN ensure "MUV-49 HIGH TEMP. BYPASS" switch is selected to "NORM.".	
4.10 ___	IF MUDM-1A is to be placed in service, AND power is available, THEN align MUDM-1A	1 ___ Ensure MUV-124 is open. 2 ___ Open MUV-116 3 ___ Close MUV-200 4 ___ Ensure MUV-201 is closed. 5 ___ Close MUV-117 6 ___ IF MUV-126 "MU DEMIN BYPASS" was opened in Step 4.6, THEN notify PPO to close MUV-126 (119 ft AB Block Orifice Room).

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ACTIONS	DETAILS
4.11 ___ IF MUDM-1B is to be placed in service, AND power is available, THEN align MUDM-1B	1 ___ Open MUV-133 2 ___ Ensure MUV-117 is open. 3 ___ Close MUV-200 4 ___ Ensure MUV-201 is closed. 5 ___ Close MUV-124 6 ___ IF MUV-126 "MU DEMIN BYPASS" was opened in Step 4.6, THEN notify PPO to close MUV-126 (119 ft AB Block Orifice Room).
4.12 ___ IF normal MU flow does NOT exist, AND normal MU flow is desired, THEN establish normal MU flowpath.	1 ___ Open MUV-596 2 ___ Open MUV-27 3 ___ Adjust MUV-31 as desired.
4.13 ___ **EXIT** this enclosure.	

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VITAL SYSTEM STATUS VERIFICATION

1.0 ENTRY CONDITIONS

IF in Modes 1 through 4,

AND NOT on Decay Heat,

AND either of the following:

- Rx trip has occurred
- Rx trip should have occurred

THEN use this procedure.

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2.0 IMMEDIATE ACTIONS

ACTIONS	DETAILS

CAUTION

If Steps 2.1 through 2.3 are not performed prior to subsequent actions, adequate heat removal capability may not exist.

2.1 ✓ Depress Rx trip push button.

2.2 ✓ Verify CRD groups 1 through 7 are fully inserted.

___ IF any CRD group has NOT fully inserted, THEN de-energize CRD system.	1 ___ Open 480V Bkr 3305
	2 ___ Open 480V Bkr 3312
	3 ___ Close 480V Bkr 3305
	4 ___ Close 480V Bkr 3312

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2.0 IMMEDIATE ACTIONS (CONT'D)

ACTIONS	DETAILS
2.3 ✓ Verify NIs indicate Rx is shutdown.	
___ IF Rx is NOT shutdown, THEN start emergency boration and adequate primary to secondary heat transfer.	1 ___ Depress "HPI MAN ACT" push buttons on Trains A and B. 2 ___ Ensure EFIC has actuated. 3 ___ Attempt to match MFW to Rx power. 4 ___ IF MFW is NOT available, THEN trip Main Turbine. 5 ___ Open CAV-60 6 ___ Start CAP-1A and CAP-1B 7 ___ WHEN Rx is shutdown, THEN continue in this procedure.
2.4 ✓ Depress Main Turbine trip push button.	
2.5 ✓ Verify TVs and GVs are closed.	
___ IF any TV, AND any GV are NOT closed, THEN close all MSIVs.	___ MSV-412 ___ MSV-413 ___ MSV-414 ___ MSV-411

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3.0 FOLLOW-UP ACTIONS

ACTIONS	DETAILS
3.1 ✓ Notify personnel of entry into EOP-02	• ✓ PA announcement • ✓ STA • ✓ Plant Operators • ✓ NSM (evaluate plant conditions for potential entry into Emergency Plan)
3.2 ✓ Notify SPO to **CONCURRENTLY PERFORM** EOP-14, Enclosure 1, SPO Post-Trip Actions.	

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3.0 FOLLOW-UP ACTIONS

ACTIONS	DETAILS
3.3 ✓ Verify all control rods are fully inserted.	
___ IF > 1 control rod is NOT fully inserted, THEN start RCS boration.	• ___ IF BASTs are available, THEN use BASTs: ___ Ensure at least 1 post-filter is in service. ___ Open CAV-60 ___ Start CAP-1A or CAP-1B • ___ IF BASTs are NOT available, THEN use BWST: ___ Open MUV-73 ___ Open MUV-58 ___ Align letdown to an RCBT. • ___ **CONCURRENTLY PERFORM** AP-490, Reactor Coolant System Boration, beginning with Step 3.1 (to terminate boration).

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ACTIONS	DETAILS
3.4 ___ Verify MFW is operating.	
✓ IF MFW is NOT operating, THEN ensure EFW or AFW is operating.	• Verify at least 1 of the following pumps are running and flow is controlled: ✓ EFP-3 ___ EFP-2 ✓ EFP-1 ___ FWP-7 [Rule 3, EFW/AFW Control] • ___ IF no EFW or AFW pumps are running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management.

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ACTIONS	DETAILS
3.5 ✓ Verify MFW flow is not excessive.	
___ IF MFW flow is excessive, THEN trip MFWPs and establish EFW to OTSGs.	• Trip both MFWPs: ___ FWP-2A ___ FWP-2B • Ensure at least 1 of the following EFWPs are running and flow is controlled: ___ EFP-3 ___ EFP-2 [Rule 3, EFW/AFW Control] • ___ IF no EFWPs are running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management.

ACTIONS	DETAILS
3.6 ✓ Ensure level in available OTSGs is at or trending toward required level. See Table 1	

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.7 ✓ Adjust MUV-31 setpoint to 100 in.	
3.8 ✓ Verify PZR level is ≥ 50 in.	
___ IF PZR level is < 50 in, THEN restore PZR level.	1 ___ Close MUV-49 2 ___ Open MUV-24 3 Ensure BWST to MUP valves are open: ___ MUV-73 ___ MUV-58 4 ___ IF PZR level does NOT recover, THEN take additional action to restore PZR level: ___ Start a second MUP and required cooling pumps. [Rule 5, EDG Control] Open additional HPI valves: ___ MUV-23 ___ MUV-25 ___ MUV-26

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ACTIONS	DETAILS
3.9 ✓ IF PZR Htrs are required, THEN ensure PZR Htrs are controlling in Auto or Manual.	
3.10 ✓ Verify MSSVs are closed.	
___ IF MSSVs are NOT closed, THEN attempt to reseat MSSVs.	1 ___ IF OTSG PRESS is > desired setpoint, THEN control OTSG PRESS using TBVs (preferred) or ADVs. 2 ___ IF OTSG PRESS is ≤ desired setpoint, AND any MSSV is open, THEN momentarily lower associated OTSG PRESS to reseat MSSV. 3 ___ IF any MSSV has NOT reseated, THEN notify Maintenance to start repair efforts.

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.11 ✓ Verify OTSG PRESS is at desired setpoint.	
___ IF OTSG PRESS is NOT at desired setpoint, THEN check operation of TBVs and ADVs.	1 ___ IF MSSVs are closed, AND OTSG PRESS is NOT at desired setpoint, THEN control OTSG PRESS using TBVs or ADVs. 2 ___ IF TBVs can NOT be controlled, THEN notify SPO to isolate affected TBV (119 ft TB south of hotwell): ___ MSV-21 "MSV-9 UPSTREAM ISO" ___ MSV-22 "MSV-10 UPSTREAM ISO" ___ MSV-23 "MSV-11 UPSTREAM ISO" ___ MSV-24 "MSV-14 UPSTREAM ISO" 3 ___ IF ADVs can NOT be controlled, THEN notify SPO to isolate affected ADV (119 ft IB): ___ MSV-27 "MSV-25 UPSTREAM ISO " ___ MSV-28 "MSV-26 UPSTREAM ISO "

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ACTIONS	DETAILS
3.12 ✓ Ensure Main Generator output Bkrs are open.	✓ Bkr 1661 ✓ Bkr 1662
___ IF any output Bkr is NOT open, THEN attempt to open output Bkr using backup trip coils.	1 Select affected output Bkr to "BACKUP": ___ "BKR 1661 TRIP COIL SELECTOR SWITCH" ___ "BKR 1662 TRIP COIL SELECTOR SWITCH" 2 Select output Bkrs to "TRIP": ___ Bkr 1661 ___ Bkr 1662 3 ___ IF any output Bkr is NOT open, THEN notify System Dispatcher to separate CR-3 from grid.

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.13 ✓ Verify ES buses are energized.	see table below
___ IF both ES 4160V buses are de-energized, THEN **GO TO** EOP-12, Station Blackout, beginning with Step 3.1	

A ES Buses	B ES Buses
✓ 4160V	✓ 4160V
✓ 480V	✓ 480V

3.14 ✓ Verify ES 4160V bus UV has not occurred.

- ✓ 86/27 BTA "RESET" light lit
- ✓ 86/27 BTB "RESET" light lit

___ IF any ES 4160V bus UV has occurred, THEN **CONCURRENTLY PERFORM** AP-770, Emergency Diesel Generator Actuation, beginning with Step 3.1

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3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.15 ✓ IF at any time, ES systems have, OR should have actuated, THEN ensure ES equipment is properly aligned.	1 Ensure applicable ES actuations: ___ HPI (1625 psig RCS PRESS) ___ LPI (500 psig RCS PRESS) ✓ RBIC (4 psig RB PRESS) ___ RB Spray (30 psig RB PRESS) 2 Bypass or reset ES actuation: ✓ Auto ✓ Manual 3 ✓ Control ES systems as required. [Rule 2, HPI Control] [Rule 5, EDG Control] 4 ✓ IF RBIC has actuated, AND adequate SCM exists, THEN stop all RCPs: ✓ RCP-1A ✓ RCP-1C ✓ RCP-1B ✓ RCP-1D

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.16 ✓ Verify ICS power is available.	• "ICS PWR ON" light lit
___ IF ICS power is NOT available, THEN trip MFWPs and control OTSG parameters.	• Trip both MFWPs: ___ FWP-2A ___ FWP-2B • Ensure at least 1 of the following EFWPs are running and flow is controlled: ___ EFP-3 ___ EFP-2 [Rule 3, EFW/AFW Control] • ___ IF no EFWPs are running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management. • Ensure ADVs control OTSG PRESS: ___ MSV-25 ___ MSV-26

Applicable carry-over steps:
3.15 <u>IF</u> ES systems have, <u>OR</u> should have actuated, <u>THEN</u> ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.17 ✓ Verify IA PRESS > 90 psig.	
___ IF IA PRESS is ≤ 90 psig, THEN **CONCURRENTLY PERFORM** AP-470, Loss of Instrument Air, beginning with Step 3.1	
3.18 ✓ Select MBVs to "MAN" and "CLOSE".	✓ FWV-30 ✓ FWV-29
___ IF any MBV is NOT closed, THEN trip MFWPs and establish EFW to OTSGs.	• Trip both MFWPs: ___ FWP-2A ___ FWP-2B • Ensure at least 1 of the following EFWPs are running and flow is controlled: ___ EFP-3 ___ EFP-2 [Rule 3, EFW/AFW Control] • ___ IF no EFWPs are running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management.

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.19 ___ Select LLBVs to "CLOSE".	___ FWV-31 ___ FWV-32
___ IF any LLBV is NOT closed, THEN close associated LLCV.	• Select associated LLCV to "HAND" and demand to "0": ___ FWV-37 ___ FWV-38
3.20 ___ Ensure MSR high PRESS bundle isolation valves are closed.	___ MSV-29 ___ MSV-30 ___ MSV-31 ___ MSV-32
3.21 ___ IF CR-3 is separated from grid, THEN shutdown Main Generator.	• ___ Open field Bkr. • ___ Select voltage regulator to "OFF".

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.22 ___ Verify at least 1 RCP is running.	
✓ IF no RCPs are running, THEN ensure EFW or AFW is operating.	• Verify at least 1 of the following pumps are running and flow is controlled: ✓ EFP-3 ___ EFP-2 ✓ EFP-1 ___ FWP-7 [Rule 3, EFW/AFW Control] • ___ IF no EFW or AFW pumps are running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management.
3.23 ___ Verify letdown flow exists.	
✓ IF letdown flow does NOT exist, AND restoration is desired, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 4, Letdown Recovery (if accessible).	

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS		DETAILS
3.24 ___	Verify adequate SCM exists.	
___	IF adequate SCM does NOT exist, THEN **GO TO** EOP-03, Inadequate Subcooling Margin, beginning with Step 2.1	
	[Rule 1, Loss of SCM]	
3.25 ___	Maintain MUT level ≥ 55 in.	• Cycle appropriate BWST to MUP valve to raise MUT level: ___ MUV-73 ___ MUV-58

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

ACTIONS	DETAILS
3.26 ___ Verify acceptable primary to secondary heat transfer exists.	
___ IF inadequate primary to secondary heat transfer exists, THEN **GO TO** EOP-04, Inadequate Heat Transfer, beginning with Step 3.1	
___ IF excessive primary to secondary heat transfer exists, THEN **GO TO** EOP-05, Excessive Heat Transfer, beginning with Step 3.1	

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.27 ___ Verify OTSG tube leakage has not increased.	• ___ Notify Chemistry to sample OTSGs. • Observe radiation monitors and recorder traces for the following: ___ RM-A12 (Condenser Exh) ___ RM-G26-RI (B1 MS line) ___ RM-G27-RI (A2 MS line) ___ RM-G25-RI (A1 MSV-25) ___ RM-G28-RI (B2 MSV-26)
___ IF OTSG tube leakage > 1 gpm exists, THEN **GO TO** EOP-06, Steam Generator Tube Rupture, beginning with Step 3.1	

Applicable carry-over steps:
3.15 IF ES systems have, OR should have actuated, THEN ensure...

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.28 ___ Verify RCS leakage has not increased.	
___ IF RCS leakage has increased, THEN **CONCURRENTLY PERFORM** AP-520, Loss of RCS Coolant or Pressure, beginning with Step 3.1	
___ IF RCS leakage is > 100 gpm, THEN **GO TO** EOP-08, LOCA Cooldown, beginning with Step 3.1	
3.29 ___ **GO TO** EOP-10, Post-Trip Stabilization, beginning with Step 3.1	

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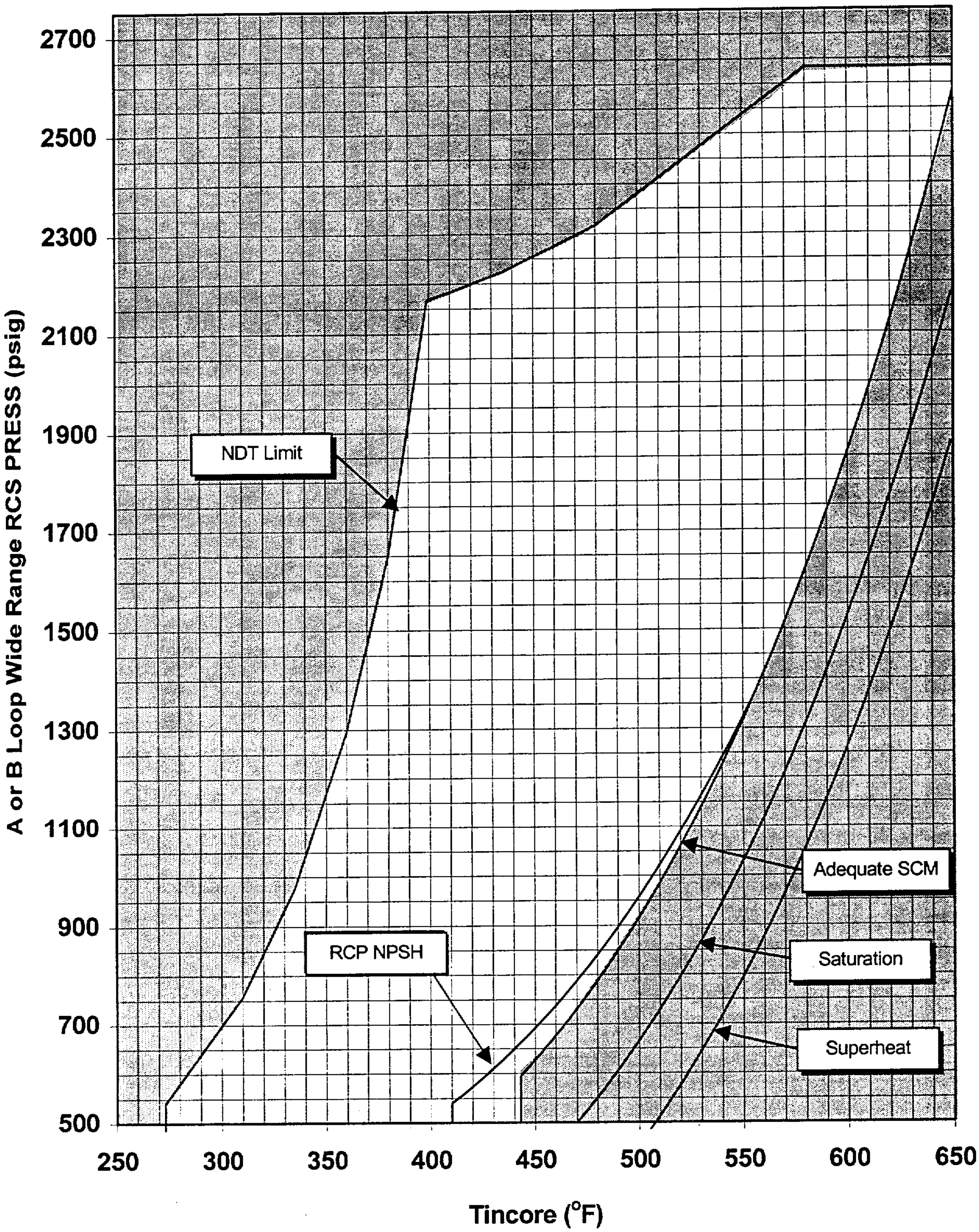
4.0 FIGURE 1 RCS PRESS AND TEMP (WIDE RANGE)



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4.0 FIGURE 2 RCS PRESS AND TEMP (LOW RANGE)

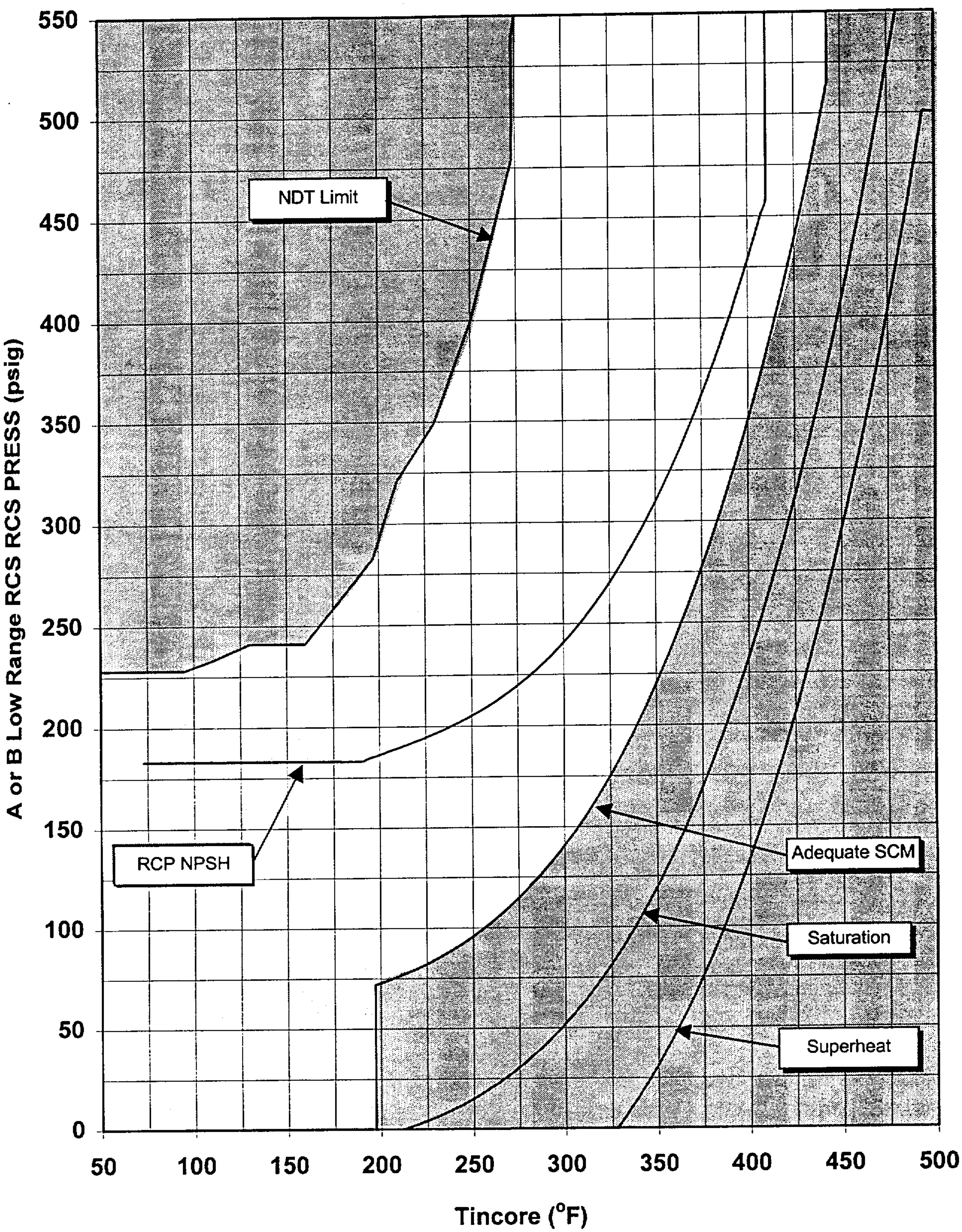

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Table 1:
Required OTSG levels

"LLL"	> 20 in	≥ 1 RCP running with adequate SCM
"NAT CIRC"	> 70%	No RCPs running with adequate SCM
"ISCM"	> 90%	Inadequate SCM

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1f1, Perform ECCS Suction Transfer

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ______________________________ Date/ ____________

REVIEWED BY: ______________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
SIMULATOR JOB PERFORMANCE MEASURE

Task: Perform ECCS Suction Transfer

Alternate Path: N/A

JPM #: B1f1 (bank #173)

K/A Rating/Importance: 009EK3.21/4.2/4.5 **Task Number/Position:** 0050502005/RO

Task Standard: While aligning DHR the BWST decreases below 15 ft, perform ECCS Suction Transfer using EOP-14 Enclosure 19.

Preferred Evaluation Location:

Simulator __X__ In-Plant _____ Admin _____

Preferred Evaluation Method:

Perform __X___ Simulate ______

References:
1. EOP-14 Enclosure 19
2. EOP-08

Validation Time: 15 min.

Time Critical: No

Candidate: ______________________________
Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ Printed Name

______________________________/________
Signature Date

Comment:

____

____

____

____

Tools/Equipment/Procedures Needed:

1. EOP-08, with applicable sign-offs complete
2. EOP-14, Enclosure 19

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
A LOCA has occurred.
Cooldown is in progress using EOP-08
BWST level is 20 feet.

Initiating Cues:

You are requested to transfer the ECCS suction.

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of EOP-08 and EOP-14 enclosure 19. COMMENTS:	SAT ____ UNSAT ___
PROCEDURE CAUTION: DHV-34 AND DHV-35 must be closed prior to BWST level < 7ft. STEP 2: (step 19.1 of EOP-14 enclosure 19) If 1 LPI pump is aligned for DHR, then go to step 19.17 in this enclosure. STANDARD: Candidate continues to step 19.2. COMMENTS:	SAT ____ UNSAT ___

STEP 3: (step 19.2) Ensure at least 1 train of LPI is properly aligned. 1. BWST to DHP valves open: A Train: DHV-34 — B Train: DHV-35 2. LPI pumps and required cooling water pumps operating: A Train: DCP-1A, RWP-3A, DHP-1A — B Train: DCP-1B, RWP-3B, DHP-1B [Rule 5, EDG Control] 3. DHP isolation valves open: A Train: DHV-210 — B Train: DHV-211 4. LPI injection valves open: A Train: DHV-5 — B Train: DHV-6 STANDARD: Candidate verifies DHV-34 and DHV-35 are open by red light ON and green light OFF for each valve. Candidate verifies DCP-1A, RWP-3A, DHP-1A, DCP-1B, RWP-3B, and DHP-1B are running by red light ON and green light OFF for each pump. Candidate verifies DHV-210 and DHV-211 are open by red light ON and green light OFF for each valve. Candidate verifies DHV-5 and DHV-6 are open by red light ON and green light OFF for each valve. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 4: (step 19.3) Adjust LPI control valve setpoint for RB sump operation. While observing for proper control, adjust LPI control valve setpoint to 2000 gpm: A Train: DHV-110 — B Train: DHV-111 STANDARD: Candidate adjusts thumb wheels of DHV-110 and DHV-111 to 2000 gpm and verifies flow follows. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 5: (step 19.4) When BWST level is < 15 ft, then adjust BS for RB sump operation. Select 1200 gpm and LOCAL for BSP discharge valves:. A Train — BSV-3 B Train — BSV-4 STANDARD: Candidate selects BSV-3 and BSV-4 control stations to REMOTE/LOCAL switch to LOCAL. 1200 gpm COMMENTS	**Critical Step** SAT ____ UNSAT ___
STEP 6: (s A • • STANDARD -11 and DHV-12 to open d green light OFF. COMMENT	**Critical Step** SAT ____ UNSAT ___
STEP 7: (step 19.6) PROCEDURE CAUTION: Aligning ECCS to RB sump may cause high radiation in AB. Align ECCS pump suction to RB sump. Open RB sump to DHP valves: A Train — DHV-42 B Train — DHV-43 STANDARD: Candidate rotates control switches for DHV-42 and DHV-43 to open and verifies for each valve red light ON and green light OFF. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 8: (step 19.7)	Critical Step
Isolate BWST from LPI. Close BWST to DHP valves: A Train: DHV-34 B Train: DHV-35 STANDARD: Candidate rotates control switches for DHV-34 and DHV-35 to close and verifies for each valve green light ON and red light OFF. COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
A LOCA has occurred.
Cooldown is in progress using EOP-08
BWST level is 20 feet.

Initiating Cues:

You are requested to transfer the ECCS suction.

LOCA COOLDOWN

1.0 ENTRY CONDITIONS

IF directed by other procedures,

THEN use this procedure.

2.0 IMMEDIATE ACTIONS

NOTE
There are no immediate actions for this procedure.

3.0 FOLLOW-UP ACTIONS

ACTIONS | DETAILS

STATUS
Any of the following exist: • **RCS leakage > 100 gpm** • **HPI cooling** • **OTSG tube rupture** • **ICC recovery**

3.1 ✓ Notify personnel of entry into EOP-08

- ✓ PA announcement
- ✓ STA
- ✓ Plant Operators
- ✓ NSM (evaluate plant conditions for potential entry into Emergency Plan)

3.2 ✓ Notify PPO to **CONCURRENTLY PERFORM** EOP-14, Enclosure 2, PPO Post Event Actions.

ACTIONS	DETAILS
3.3 ✓ IF at any time, ES systems have, OR should have actuated, THEN ensure ES equipment is properly aligned.	1 Ensure applicable ES actuations: ✓ HPI (1625 psig RCS PRESS) ✓ LPI (500 psig RCS PRESS) ✓ RBIC (4 psig RB PRESS) ✓ RB Spray (30 psig RB PRESS) 2 Bypass or reset ES actuation: ✓ Auto ✓ Manual 3 ✓ Control ES systems as required. [Rule 2, HPI Control] [Rule 5, EDG Control] 4 ✓ IF RBIC has actuated, AND adequate SCM exists, THEN stop all RCPs: ✓ RCP-1A ✓ RCP-1C ✓ RCP-1B ✓ RCP-1D

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.4 ___ IF at any time, Tincore indicates superheat conditions, THEN **GO TO** EOP-07, Inadequate Core Cooling, beginning with Step 3.1	
3.5 ✓ Verify proper CC cooling.	• ___ CC ventilation running in emergency recirc mode • ___ CC chiller running
✓ IF proper CC cooling does NOT exist, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 17, Control Complex Emergency Ventilation and Cooling.	
3.6 ✓ IF at any time, LPI flow is > 1400 gpm in any injection line, THEN **GO TO** Step 3.105 in this procedure.	

ACTIONS	DETAILS

STATUS

LPI flow > 1400 gpm in any injection line.

3.105 ✓ IF at any time,
BWST level is < 20 ft,
THEN **PERFORM**
EOP-14, Enclosure 19,
ECCS Suction Transfer.

3.106 ✓ IF all the following exist:

___ A Train LPI flow > 1400 gpm

___ B Train LPI flow > 1400 gpm

THEN close CFT isolation valves (if accessible).

1 Notify PPO to unlock and close CFT isolation valve Bkrs on ES MCC 3AB (119 ft AB):

___ 6B "CFV-5 A CFT ISO"

___ 6C "CFV-6 B CFT ISO"

2 ___ WHEN CFT isolation valve Bkrs are closed,
THEN close CFT isolation valves:

___ CFV-5

___ CFV-6

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS

3.107 ✓ Ensure PORV is closed.

___ IF PORV fails to close,
THEN close RCV-11

3.108 ✓ Ensure all high point vents are closed.

PZR	___ RCV-159
	___ RCV-160
A hot leg	___ RCV-157
	___ RCV-158
B hot leg	___ RCV-163
	___ RCV-164

3.0 FOLLOW-UP ACTIONS (CONT'D)

ACTIONS	DETAILS
3.109 ✓ IF at any time, all of the following exist: ___ BSPs running ≥ 5 hrs ___ RB PRESS < 10 psig ___ RB PRESS stable or lowering ___ RB atmosphere I^{131} < 13 μCi/cc ___ TSC has approved BS termination THEN stop BSPs.	1 Ensure BSPs are stopped: ___ BSP-1A ___ BSP-1B 2 Select BSVs to "MAN" and closed: ___ BSV-3 ___ BSV-4 3 Select BSVs to "AUTO": ___ BSV-3 ___ BSV-4

3.110 ✓ Notify PPO to **CONCURRENTLY PERFORM** EOP-14, Enclosure 21, RB Hydrogen Monitor Log.

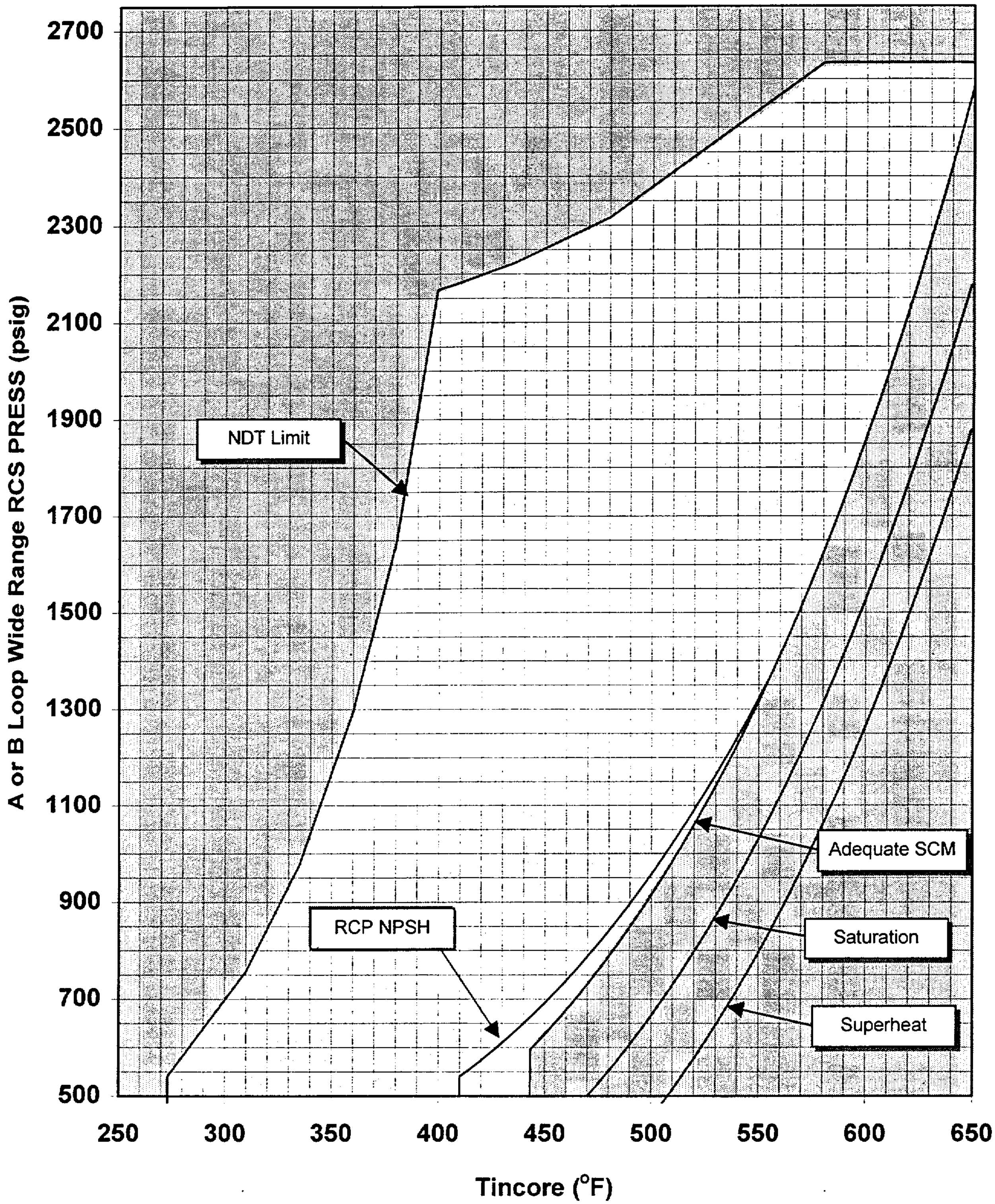
ACTIONS	DETAILS
3.111 ___ WHEN ECCS suction transfer is complete, THEN notify TSC to determine if boron precipitation control is required.	
3.112 ___ IF EFP-2 is running, THEN **CONCURRENTLY PERFORM** EOP-14, Enclosure 7, EFWP Management.	
3.113 ___ IF boron precipitation control is required, THEN **PERFORM** EOP-14, Enclosure 20, Boron Precipitation Control.	

3.0 FOLLOW-UP ACTIONS (CONT'D)

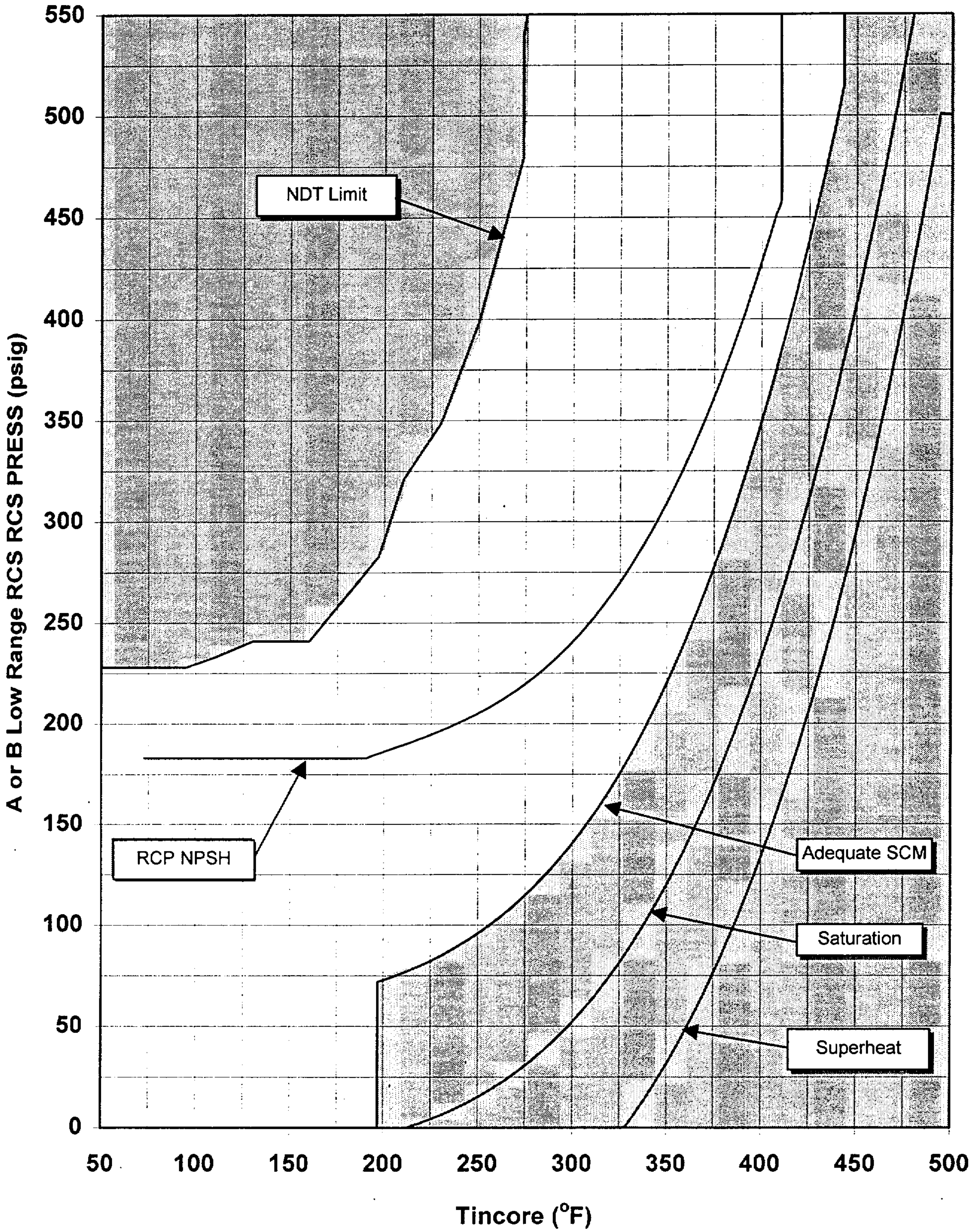
ACTIONS	DETAILS
3.114 ___ Notify TSC for further guidance.	• Notify TSC to consider the following as applicable: ___ RCP shutdown guidance ___ HPI termination ___ EFW termination ___ RB hydrogen control ___ RB sump level monitoring ___ RB sump boron concentration monitoring ___ Radioactive release paths from containment isolation valves ___ Long-term core cooling (EM-225E, Guidelines For Long Term Cooling)

3.115 ___ **EXIT** this procedure.

4.0 FIGURE 1 RCS PRESS AND TEMP (WIDE RANGE)



4.0 FIGURE 2 RCS PRESS AND TEMP (LOW RANGE)



ACTIONS	DETAILS

CAUTION

DHV-34 and DHV-35 must be closed prior to BWST level < 7 ft.

19.1 ___ IF 1 LPI pump is aligned for DHR,
THEN **GO TO** Step 19.17 in this enclosure.

ACTIONS	DETAILS
19.2 ___ Ensure at least 1 train of LPI is properly aligned.	1 BWST to DHP valves open:

A Train	B Train
___ DHV-34	___ DHV-35

2 LPI pumps and required cooling water pumps operating:

A Train	B Train
___ DCP-1A	___ DCP-1B
___ RWP-3A	___ RWP-3B
___ DHP-1A	___ DHP-1B

[Rule 5, EDG Control]

3 DHP isolation valves open:

A Train	B Train
___ DHV-210	___ DHV-211

4 LPI injection valves open:

A Train	B Train
___ DHV-5	___ DHV-6

ACTIONS		DETAILS
19.3 ___	Adjust LPI control valve setpoint for RB sump operation.	• While observing for proper control, adjust LPI control valve setpoint to 2000 gpm:

Thumbwheel

A Train	B Train
___ DHV-110	___ DHV-111

19.4 ___	<u>WHEN</u> BWST level is < 15 ft, <u>THEN</u> adjust BS for RB sump operation.	• Select 1200 gpm and "LOCAL" for BSP discharge valves:

R/L Local

A Train	B Train
___ BSV-3	___ BSV-4

19.5 ___	Align LPI pump discharge to MUP suction.	• ___ <u>IF</u> DHP-1A is running, <u>THEN</u> open DHV-11 • ___ <u>IF</u> DHP-1B is running, <u>THEN</u> open DHV-12

ACTIONS | DETAILS

CAUTION

Aligning ECCS to RB sump may cause high radiation in AB.

19.6 ___ Align ECCS pump suction to RB sump.

- Open RB sump to DHP valves:

A Train	B Train
___ DHV-42	___ DHV-43

19.7 ___ Isolate BWST from LPI.

- Close BWST to DHP valves:

A Train	B Train
___ DHV-34	___ DHV-35

ACTIONS	DETAILS
19.8 ___ Isolate flow to MUT.	• Ensure at least 1 letdown isolation valve is closed:

A Train	B Train
___ MUV-567	___ MUV-49

• Ensure at least 1 train of RCP CBO isolation valves are closed:

A Train	B Train
___ MUV-258	___ MUV-253
___ MUV-259	
___ MUV-260	
___ MUV-261	

19.9 ___ IF adequate SCM exists, THEN stop all RCPs.

___ RCP-1A
___ RCP-1C
___ RCP-1B
___ RCP-1D

ACTIONS	DETAILS
19.10 ___ Ensure at least 1 seal injection isolation valve is closed.	See table below

A Train	B Train
___ MUV-596	___ MUV-18

19.11 ___ IF MUP recirc valves are open, THEN align recirc flow to RB sump.

1 Ensure at least 1 train of HPI recirc to sump valves are open:

A Train	B Train
___ MUV-543	___ MUV-545
___ MUV-544	___ MUV-546

2 Ensure at least 1 MUP recirc to MUT valve is closed:

A Train	B Train
___ MUV-53	___ MUV-257

19.12 ___ Stop any MUP not aligned to a running LPI pump.

- ___ IF DHV-11 is NOT open, THEN stop the A ES selected MUP.
- ___ IF DHV-12 is NOT open, THEN stop the B ES selected MUP.

ACTIONS	DETAILS
19.13 ___ Isolate MUT (if accessible).	• Notify PPO to close MUV-64 "MUT OUTLET" (95 ft AB outside RC evaporator).
19.14 ___ Isolate BWST from HPI.	1 Notify PPO to bypass MUT low level interlocks: ___ Obtain key 47 for remote shutdown transfer cabinet. ___ Select "BWST ISOL. VALVE INTERLOCK BYPASS MUV-58" switch to "BYPASS" (B ES 4160V SWGR Room "RS AUX B" cabinet). ___ Select "BWST ISOL. VALVE INTERLOCK BYPASS MUV-73" switch to "BYPASS" (A ES 4160V SWGR Room "RS AUX A" cabinet). 2 ___ WHEN MUT low level interlocks have been bypassed, THEN close BWST to MUP valves while observing MUPs for signs of cavitation: ___ MUV-73 ___ MUV-58

ACTIONS	DETAILS
19.15 ___ Notify Chemistry to periodically perform CH-632D, Sampling and Analysis of the Reactor Building Sump, for boron concentration.	
19.16 ___ **EXIT** this enclosure.	

ACTIONS	DETAILS

STATUS

- **HPI or LPI flow exists.**
- **1 LPI pump aligned for DHR.**
- **Adequate SCM exists.**

19.17 ___ IF DHP-1B is aligned for DHR,
THEN **GO TO** Step 19.31 in this enclosure.

ACTIONS	DETAILS

STATUS

- **HPI or LPI flow exists.**
- **DHP-1A aligned for DHR.**

19.18 ___ Ensure B Train LPI is properly aligned.

1 ___ Ensure DHV-35 is open.

2 Ensure LPI pump and required cooling water pumps are running:

___ DCP-1B
___ RWP-3B
___ DHP-1B

[Rule 5, EDG Control]

3 ___ Ensure DHV-211 is open.

4 ___ Ensure DHV-6 is open.

19.19 ___ Adjust LPI control valve setpoint for RB sump operation.

- While observing for proper control, adjust DHV-111 setpoint to 2000 gpm.

ACTIONS	DETAILS
19.20 ___ WHEN BWST level is < 15 ft, THEN adjust BS for RB sump operation.	• Select 1200 gpm and "LOCAL" for BSV-4

19.21 ___ Open DHV-12

CAUTION

Aligning ECCS to RB sump may cause high radiation in AB.

19.22 ___ Open DHV-43

19.23 ___ Close DHV-35

ACTIONS	DETAILS

19.24 ___ Isolate flow to MUT.

- Ensure at least 1 letdown isolation valve is closed:

A Train	B Train
___ MUV-567	___ MUV-49

- Ensure at least 1 train of RCP CBO isolation valves are closed:

A Train	B Train
___ MUV-258	___ MUV-253
___ MUV-259	
___ MUV-260	
___ MUV-261	

19.25 ___ Stop all RCPs.

___ RCP-1A
___ RCP-1C
___ RCP-1B
___ RCP-1D

ACTIONS	DETAILS
19.26 ___ Ensure at least 1 seal injection isolation valve is closed.	see table below

A Train	B Train
___ MUV-596	___ MUV-18

19.27 ___ IF MUP recirc valves are open, THEN align recirc flow to RB sump.

1 Ensure at least 1 train of HPI recirc to sump valves are open:

A Train	B Train
___ MUV-543	___ MUV-545
___ MUV-544	___ MUV-546

2 Ensure at least 1 MUP recirc to MUT valve is closed:

A Train	B Train
___ MUV-53	___ MUV-257

ACTIONS	DETAILS
19.28 ___ Isolate MUT (if accessible).	• Notify PPO to close MUV-64 "MUT OUTLET" (95 ft AB outside RC evaporator).
19.29 ___ Isolate BWST from HPI.	1 Notify PPO to bypass MUT low level interlock: ___ Obtain key 47 for remote shutdown transfer cabinet. ___ Select "BWST ISOL. VALVE INTERLOCK BYPASS MUV-58" switch to "BYPASS" (B ES 4160V SWGR Room "RS AUX B" cabinet). 2 ___ WHEN MUT low level interlock has been bypassed, THEN close MUV-58 while observing MUP for signs of cavitation.
19.30 ___ **EXIT** this enclosure.	

ACTIONS	DETAILS

STATUS

- **HPI or LPI flow exists.**
- **DHP-1B aligned for DHR.**

19.31 ___ Ensure A Train LPI is properly aligned.

1 ___ Ensure DHV-34 is open.

2 Ensure LPI pump and required cooling water pumps are running:

___ DCP-1A
___ RWP-3A
___ DHP-1A

[Rule 5, EDG Control]

3 ___ Ensure DHV-210 is open.

4 ___ Ensure DHV-5 is open.

19.32 ___ Adjust LPI control valve setpoint for RB sump operation.

- While observing for proper control, adjust DHV-110 setpoint to 2000 gpm.

ACTIONS	DETAILS
19.33 ___ WHEN BWST level is < 15 ft, THEN adjust BS for RB sump operation.	• Select 1200 gpm and "LOCAL" for BSV-3

19.34 ___ Open DHV-11

CAUTION

Aligning ECCS to RB sump may cause high radiation in AB.

19.35 ___ Open DHV-42

19.36 ___ Close DHV-34

ACTIONS	DETAILS
19.37 ___ Isolate flow to MUT.	• Ensure at least 1 letdown isolation valve is closed:

A Train	B Train
___ MUV-567	___ MUV-49

• Ensure at least 1 train of RCP CBO isolation valves are closed:

A Train	B Train
___ MUV-258	___ MUV-253
___ MUV-259	
___ MUV-260	
___ MUV-261	

19.38 ___ Stop all RCPs.

___ RCP-1A
___ RCP-1C
___ RCP-1B
___ RCP-1D

ACTIONS | DETAILS

19.39 ___ Ensure at least 1 seal injection isolation valve is closed.

A Train	B Train
___ MUV-596	___ MUV-18

19.40 ___ IF MUP recirc valves are open,
THEN align recirc flow to RB sump.

1 Ensure at least 1 train of HPI recirc to sump valves are open:

A Train	B Train
___ MUV-543	___ MUV-545
___ MUV-544	___ MUV-546

2 Ensure at least 1 MUP recirc to MUT valve is closed:

A Train	B Train
___ MUV-53	___ MUV-257

ACTIONS	DETAILS
19.41 ___ Isolate MUT (if accessible).	• Notify PPO to close MUV-64 "MUT OUTLET" (95 ft AB outside RC evaporator).
19.42 ___ Isolate BWST from HPI.	1 Notify PPO to bypass MUT low level interlock: ___ Obtain key 47 for remote shutdown transfer cabinet. ___ Select "BWST ISOL. VALVE INTERLOCK BYPASS MUV-73" switch to "BYPASS" (A ES 4160V SWGR Room "RS AUX A" cabinet). 2 ___ WHEN MUT low level interlock has been bypassed, THEN close MUV-73 while observing MUP for signs of cavitation.
19.43 ___ **EXIT** this enclosure.	

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B1g1, Place the RPS in Shutdown Bypass

CANDIDATE ______________________________

EXAMINER ______________________________

PREPARED/
REVISED BY: ______________________________ Date/ ____________

REVIEWED BY: ______________________________ Date/ ____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ ____________
(Operations Representative)

APPROVED BY: ______________________________ Date/ ____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
IN-PLANT JOB PERFORMANCE MEASURE

Task: Place the RPS in shutdown bypass.

Alternate Path: N/A

JPM #: B1g1 (new)

K/A Rating/Importance 012A4.03/3.6/3.6 **Task Number/Position**: 0120102009/RO

Task Standard: Place the RPS in shutdown bypass using OP-507.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator __X___ In-Plant _____ Admin _____ Perform ______ Simulate ___X___

References:
1. OP-507, Rev 18

Validation Time: 15 min. **Time Critical**: No

Candidate: ____________________________________ **Time Start:** ________
Printed Name **Time Finish:**________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ ______________________________/________
Printed Name Signature Date

Comment:

SIMULATOR OPERATOR SETUP INSTRUCTIONS:

1. A plant shutdown is in progress.
2. Control Rod Groups 1 through 7 are fully inserted.
3. The Reactor is tripped.
4. Reactor Coolant pressure is 1750 psig.
5. The High Flux Trip has been reset to 5% (0.032).
6. IC #66.
7. If required ensure MUT level is not too high and clear MUT pressure alarm.

SIMULATOR OPERATOR INSTRUCTIONS:

1. Booth operator will take the roles for the various operators

Tools/Equipment/Procedures Needed:

1. OP-507, steps 4.14.1 through 4.14.4 should be already signed.

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be performed for this JPM. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the REACTOR OPERATOR.
A plant shutdown is in progress.
Control Rod Groups 1 through 7 are fully inserted.
The Reactor is tripped.
Reactor Coolant pressure is approximately 1750 psig.
The High Flux Trip has been reset to 5%.

Initiating Cues:

You are requested to place the RPS in shutdown bypass.

START TIME: __________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of OP-507, steps 4.14.1 through 4.14.4 are signed off. COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.14.5) PROCEDURE CAUTION: High Flux Trip must be reset to less than 5% RTP in all four (4) RPS Channels prior to performing this step. PROCEDURE NOTE: EFIC EFW actuation logic for loss of both MFW pumps is automatically bypassed when the RPS is placed in Shutdown Bypass. Initiate Shutdown Bypass in all (4) RPS Channels. _____ A RPS Channel (J-5-2 alarms) _____ B RPS Channel (J-6-2 alarms) _____ C RPS Channel (J-7-2 alarms) _____ D RPS Channel (J-8-2 alarms) _____/___ Initial/Date STANDARD: Candidate obtains the key and unlocks the RPS cabinet doors. Candidate obtains the shutdown bypass key for each RPS channel. Candidate places each key in shutdown bypass key switch and rotates to the bypass position. Candidate verifies lights (output state and output memory) on each Shutdown Bypass bistable are bright and the Manual Bypass light at the top of each cabinet is bright. Candidate initials and dates step. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 3: (step 4.14.6) **EXAMINER CUE: The Shutdown Bypass functional test has been performed.** Ensure Shutdown Bypass functional test has been performed. Refer to ITS 3.3.1 (SR 3.3.1.4) _____/___ Initial/Date STANDARD: Candidate initials and dates step. COMMENTS:	SAT ____ UNSAT ___
STEP 4: (step 4.14.7) Reset shutdown bypass bistables in all four (4) RPS channels. o_____ Depress both output state and output memory toggles on Shutdown Bypass bistable o_____ Verify both output state and output memory lights are dim _____ A RPS Channel _____ B RPS Channel _____ C RPS Channel _____ D RPS Channel o_____ Verify the Subsystem Status light on Reactor Trip Module is dim _____/___ Initial/Date STANDARD: For each RPS cabinet the candidate depresses the output state and output memory toggles on the shutdown bypass bistable and verifies that both the output state and output memory lights are dim. Candidate also verifies that the subsystem status light on the Reactor Trip Module is dim. Candidate initials and dates step. COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 9: (step 4.14.8) Reset all four (4) RPS channels. o_____ Depress subsystem reset toggle on Reactor Trip module o_____ Verify Protective Subsystem amber indicating lights, on top of each cabinet, are dim for the respective channel being reset _____ A RPS Channel (J-5-1 clears) _____ B RPS Channel (J-6-1 clears) _____ C RPS Channel (J-7-1 clears) _____ D RPS Channel (J-8-1 clears) _____/ ___ Initial/Date STANDARD: For each RPS cabinet the candidate depresses the subsystem reset toggle on the Reactor Trip module and verify that the protective subsystem amber indicating lights are dim. Candidate initials and dates step. COMMENTS:	**Critical Step** SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the REACTOR OPERATOR.
A plant shutdown is in progress.
Control Rod Groups 1 through 7 are fully inserted.
The Reactor is tripped.
Reactor Coolant pressure is 1750 psig.
The High Flux Trip has been reset to 5%.

Initiating Cues:

You are requested to place the RPS in shutdown bypass.

4.14 PLACING THE RPS IN SHUTDOWN BYPASS (CAT. 1)

	ACTIONS	DETAILS
4.14.1	ENSURE Control Rod Groups 1 through 7 are fully inserted	o REFER TO OP-502, Control Rod Drive System Initial/Date Initial/Date

NOTE: The following step will add a 125# bias to the Turbine Bypass Valves.

	ACTIONS	DETAILS
4.14.2	ENSURE the Reactor is tripped	o ✓ DEPRESS the Reactor trip pushbutton Initial/Date Initial/Date
4.14.3	DEPRESSURIZE the RCS to approximately 1750 psig and stabilize RCS pressure	o CONTROL pressure using RCV-14 Initial/Date Initial/Date
4.14.4	ENSURE High Flux Trip has been reset in all four (4) Channels to less than 5% RTP	o NOTIFY I&C to PERFORM SP-113H, High Flux Trip Set Point o ✓ "A" RPS Channel o ✓ "B" RPS Channel o ✓ "C" RPS Channel o ✓ "D" RPS Channel Initial/Date Initial/Date

4.14 PLACING THE RPS IN SHUTDOWN BYPASS (CAT. 1) (Cont'd)

ACTIONS		DETAILS

****

CAUTION: High Flux Trip must be reset to less than 5% RTP in all four (4) RPS Channels prior to performing this step.

****

NOTE: EFIC EFW actuation logic for loss of both MFW pumps is automatically bypassed when the RPS is placed in Shutdown Bypass.

4.14.5	INITIATE Shutdown Bypass in all (4) RPS Channels	o ___ "A" RPS Channel o ___ "B" RPS Channel o ___ "C" RPS Channel o ___ "D" RPS Channel ___/___ Initial/Date

NOTE: Performance of the previous steps in this section meets the intent of the OP-209 requirement for placing RPS in "SHUTDOWN BYPASS". The NSM must ensure that the CRDs are not capable of being withdrawn until the remaining steps are completed (refer to ITS 3.3.1).

4.14.6	ENSURE Shutdown Bypass functional test has been performed	Refer to ITS 3.3.1 (SR 3.3.1.4) ___/___ Initial/Date
4.14.7	RESET shutdown bypass bistables in all four (4) RPS channels	o ___ DEPRESS both output state and output memory toggles on Shutdown Bypass Bi-stable o ___ VERIFY both output state and output memory lights are dim ___ "A" RPS Channel ___ "B" RPS Channel ___ "C" RPS Channel ___ "D" RPS Channel o ___ VERIFY the Subsystem Status light on Reactor Trip Module is dim ___/___ Initial/Date

4.14 PLACING THE RPS IN SHUTDOWN BYPASS (CAT. 1) (Cont'd)

ACTIONS		DETAILS
4.14.8	RESET all four (4) RPS channels	o ___ DEPRESS subsystem reset toggle on Reactor Trip module o ___ VERIFY Protective Subsystem amber indicating lights, on top of each cabinet, are dim for the respective channel being reset ___ "A" RPS Channel ___ "B" RPS Channel ___ "C" RPS Channel ___ "D" RPS Channel ______/______ Initial/Date

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B2a1, Recirculation of FSP-1

CANDIDATE ____

EXAMINER ____

PREPARED/
REVISED BY: ______________________________ Date/ __________

REVIEWED BY: ______________________________ Date/ __________
(Operations Representative)

VALIDATED BY: ______________________________ Date/ __________
(Operations Representative)

APPROVED BY: ______________________________ Date/ __________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
IN-PLANT JOB PERFORMANCE MEASURE

Task: Recirculation of FSP-1.

Alternate Path: N/A

JPM #: B2a1 (new)

K/A Rating/Importance: 086A4.01/3.3/3.3 **Task Number/Position**: 0860104001;
1190404001/SPO

Task Standard: Recirculation of FSP-1 using AP-330 enclosure 3.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant __X___ Admin _____ Perform ______ Simulate ___X___

References:
1. AP-330, Rev 13

Validation Time: 7 min. **Time Critical**: No

Candidate: ______________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ ____________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

Tools/Equipment/Procedures Needed:

1. AP-330, Enclosure 3

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be simulated for this JPM. **Under no circumstances are you to operate any plant equipment**. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the SECONDARY PLANT OPERATOR.
AP-330, Loss of Nuclear Service Cooling has been entered.

Initiating Cues:

You are requested to perform Enclosure 3, FSP-1 Recirc., of AP-330.

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of AP-330 Enclosure 3. **EXAMINER NOTE: When the candidate indicates where they would obtain a copy of AP-330 Enclosure 3, provide them with the enclosure.** COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 3.1) Align FSP-1 to recirc FST-1A. o _____ Obtain key 20 from Control Room. o _____ Close FSV-28 FST-1B INLET ISO o _____ Open FSV-24 FSP RECIRC LINE TO FST ISO **EXAMINER NOTE: Key 20 is not required the Fire Pump House is no longer locked, see AI-505.** STANDARD: Candidate will enter the Fire Service Pump House. Candidate will rotate FSV-28 hand wheel in the clockwise direction (observes stem lowering) to hard stop. **EXAMINER CUE: Hand wheel rotates, stem moves, and handwheel comes to a hard stop.** STANDARD: Candidate will rotate FSV-24 hand wheel in the counter-clockwise direction (observes stem rising) to hard stop. **EXAMINER CUE: Handwheel rotates, stem moves, and hand wheel comes to a hard stop.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 3: (step 3.2) Slowly open FSV-18 FSP-1 RECIRC ISO until FSP-1 starts. STANDARD: Candidate rotates FSV-18 hand wheel in the counter-clockwise direction until examiner informs candidate that FSP-1 has started. **EXAMINER NOTE: FSP-1 should start when FSV-18 is about 1 turn open.** **EXAMINER CUE: FSP-1 is running.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 4: (step 3.3) Adjust FSV-18 FSP-1 RECIRC ISO to obtain 480 to 600 gpm recirc flow as read on FS-12-FIS. STANDARD: Candidate locates FS-12-FIS and examiner will indicate 400 gpm. Candidate rotates FWV-18 in the counter-clockwise direction further. Candidate locates FS-12-FIS and examiner will indicate 560 gpm. **EXAMINER NOTE: Indicate 400 gpm when candidate first checks FS-12-FIS; indicate 560 gpm the next time gage is checked.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___
STEP 5: (step 3.4) Exit this enclosure. STANDARD: Candidate informs control room (examiner) the Enclosure 3 of AP-330 is complete. **EXAMINER NOTE: Take the part of the Control Room in communication with the SPO.** COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the SECONDARY PLANT OPERATOR.
AP-330, Loss of Nuclear Service Cooling has been entered.

Initiating Cues:

You are requested to perform Enclosure 3, FSP-1 Recirc., of AP-330.

4.0 ENCLOSURE 3 FSP-1 RECIRC

ACTIONS			DETAILS
3.1	___	Align FSP-1 to recirc FST-1A	• ___ Obtain key 20 from Control Room. • ___ Close FSV-28 "FST-1B INLET ISO" (119 ft Berm between FSTs). • ___ Open FSV-24 "FSP RECIRC LINE TO FST ISO" (119 ft FSPH northwest wall).
3.2	___	Slowly open FSV-18 "FSP-1 RECIRC ISO" until FSP-1 starts (119 ft FSPH south wall).	
3.3	___	Adjust FSV-18 "FSP-1 RECIRC ISO" to obtain 480 to 600 gpm recirc flow as read on FS-12-FIS (119 ft FSPH).	
3.4	___	**EXIT** this enclosure.	

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B2b1, Placing EFP-2 in Standby

CANDIDATE____

EXAMINER____

PREPARED/
REVISED BY: ______________________________ Date/____________

REVIEWED BY: ______________________________ Date/____________
(Operations Representative)

VALIDATED BY: ______________________________ Date/____________
(Operations Representative)

APPROVED BY: ______________________________ Date/____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
IN-PLANT JOB PERFORMANCE MEASURE

Task: Placing EFP-2 in standby.

Alternate Path: N/A

JPM #: B2b1 (new)

K/A Rating/Importance: 068AA1.02/4.3/4.5 **Task Number/Position**: 1190403001/PPO

Task Standard: Place EFP-2 in standby using AP-990, Enclosure 3.

Preferred Evaluation Location: Simulator _____ In-Plant __X___ Admin _____

Preferred Evaluation Method: Perform ______ Simulate __X___

References:
1. AP-990 enclosure 3, Rev 15

Validation Time: 20 min.

Time Critical: No

Candidate: ______________________________ Printed Name

Time Start: ________
Time Finish: ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ______________________________ Printed Name ______________________________ Signature / ________ Date

Comment:

____

____

____

____

Tools/Equipment/Procedures Needed:

1. AP-990, Enclosure 3

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be simulated for this JPM. **Under no circumstances are you to operate any plant equipment**. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the PRIMARY PLANT OPERATOR.
A Shutdown Outside the Control Room is in progress.

Initiating Cues:

You are requested to perform the PPO portions of Enclosure 3 of AP-990 to place EFP-2 in standby.

START TIME: ________

STEP 1:	
Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of AP-990 Enclosure 3. **EXAMINER NOTE: When the candidate indicates where they would obtain a copy of AP-990 Enclosure 3, provide them with the enclosure.** COMMENTS:	SAT ____ UNSAT ___

STEP 2: (step 3.1) **EXAMINER CUE: The Control Room radios you to complete step 3.1 of AP-990 Enclosure 3.** **EXAMINER NOTE: PPO has the EFIC cabinet key on the PPO key ring.** Notify PPO to place EFW bistables for EFIC channels A and B in manual. 1. _____ Momentarily place the MAN/RES toggle switch to the MAN position on EFW module (B-4-12). 2. _____ Verify the following status lights are solid on EFW module B-4-12: _____ Tripped 1 _____ Tripped 2 3. _____ Momentarily place the MAN/RES toggle switch to the man position on EFW module (A-4-12). 4. _____ Verify the following status lights are solid on EFW module A-4-12: _____ Tripped 1 _____ Tripped 2 STANDARD: Candidate locates EFIC cabinet key (PPO key ring) and unlocks door to the B EFIC cabinet. Candidate locates module B-4-12 and momentarily places toggle in the MAN position and verifies that the red LED status lights are solid. Candidate locates EFIC cabinet key (PPO key ring) and unlocks door to the A EFIC cabinet. Candidate locates module A-4-12 and momentarily places toggle in the MAN position and verifies that the red LED status lights are solid. Candidate notifies the Control Room that step 3.1 of AP-990 Enclosure 3 is complete. **EXAMINER CUE: (For each module) The status lights are solid (or as you see them).** **EXAMINER NOTE: Take the part of the Control Room in communication with the SPO.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 3: (step 3.2) When EFW bistables for EFIC channels A and B are in manual, then close ASV-5. STANDARD: N/A, performed in control room. COMMENTS:	SAT ____ UNSAT ___
STEP 4: (step 3.3) **EXAMINER CUE: The Control Room radios you to complete step 3.3, detail 2, of AP-990 Enclosure 3, manually close ASV-204.** Ensure ASV-204 is closed. 1. _____ Notify RO to open DPDP 8A-17 ASV-204 MOTOR POWER. 2. _____ Notify PPO to manually close ASV-204 EFP-2 STEAM SUPPLY ISO If ASV-204 fails to close, then trip EFP-2. STANDARD: Candidate disengages motor (may hold lever entire time) for ASV-204 and rotates hand wheel clockwise until hard stop is reached (candidate may use ASV-204 local light to verify closure). Candidate notifies the Control Room that step 3.3 detail 2 of AP-990 Enclosure 3 is complete. **EXAMINER CUE: Hand wheel rotates and comes to a hard stop.** **EXAMINER NOTE: Take the part of the Control Room in communication with the SPO.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___

STEP 5: (step 3.4) Exit this procedure. STANDARD: N/A COMMENTS:	SAT ___ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the PRIMARY PLANT OPERATOR.
A Shutdown Outside the Control Room is in progress.

Initiating Cues:

You are requested to perform the PPO portions of Enclosure 3 of AP-990 to place EFP-2 in standby.

4.0 ENCLOSURE 3 PLACING EFP-2 IN STANDBY

ACTIONS	DETAILS

NOTE

Lighting may not be available in the A EFIC Room.

3.1 ___ Notify PPO to place EFW bistables for EFIC channels A and B in manual.	1 ___ Momentarily place the "MAN/RES" toggle switch to the "MAN" position on EFW module B-4-12 (124 ft CC B EFIC Room). 2 Verify the following status lights are solid on EFW module B-4-12: ___ TRIPPED 1 ___ TRIPPED 2 3 ___ Momentarily place the "MAN/RES" toggle switch to the "MAN" position on EFW module A-4-12 (124 ft CC A EFIC Room). 4 Verify the following status lights are solid on EFW module A-4-12: ___ TRIPPED 1 ___ TRIPPED 2

3.2 ___ WHEN EFW bistables for EFIC channels A and B are in manual,
THEN close ASV-5

ACTIONS	DETAILS
3.3 ___ Ensure ASV-204 is closed.	1 ___ Notify RO to open DPDP 8A-17 "ASV-204 MOTOR POWER" (A ES 4160V SWGR Room). 2 ___ Notify PPO to manually close ASV-204 "EFP-2 STEAM SUPPLY ISO" (95 ft IB by EFP-2).
___ IF ASV-204 fails to close, THEN trip EFP-2	• Notify PPO to manually trip ASV-50 "EFP-2 TRIP & THROTTLE VALVE" (95 ft IB by EFP-2).

3.4 ___ **EXIT** this enclosure.

REGION II
INITIAL LICENSE EXAMINATION
JOB PERFORMANCE MEASURE

JPM B2c1, Release a Waste Gas Decay Tank to Plant Ventilation

CANDIDATE____

EXAMINER____

PREPARED/
REVISED BY: _______________________________ Date/_____________

REVIEWED BY: _______________________________ Date/_____________
(Operations Representative)

VALIDATED BY: _______________________________ Date/_____________
(Operations Representative)

APPROVED BY: _______________________________ Date/_____________
(Supervisor Initial Training)

CRYSTAL RIVER UNIT 3
IN-PLANT JOB PERFORMANCE MEASURE

Task: Release waste gas decay tank to plant ventilation.

Alternate Path: When the release is started RM-A2 and RM-A11 goes into high alarm; WDV-439 does not close.

JPM #: B2c1 (new)

K/A Rating/Importance: G2.3.11/2.7/3.2 **Task Number/Position**: 07103004/PPO

Task Standard: Release waste gas decay tank to plant ventilation using OP-412B.

Preferred Evaluation Location: **Preferred Evaluation Method:**

Simulator _____ In-Plant __X___ Admin _____ Perform ______ Simulate ___X___

References:
1. OP-412B Rev 14

Validation Time: 15 min. **Time Critical**: No

Candidate: ________________________________ **Time Start:** ________
Printed Name **Time Finish:** ________

Performance Rating: SAT _______ UNSAT ________ **Performance Time:** __________

Examiner: ____________________________ ____________________________/________
Printed Name Signature Date

Comment:

____

____

____

____

Tools/Equipment/Procedures Needed:

1. OP-412B completed up to step 4.1.32
2. Waste Gas Release Permit
3. Key to WDV-478
4. Calculator

READ TO THE OPERATOR

Directions to the Student:

I will explain the initial conditions, and state the task to be performed. All steps, including any required communications, shall be simulated for this JPM. **Under no circumstances are you to operate any plant equipment**. I will provide initiating cues and reports on other actions when directed by you. Ensure you indicate to me when you understand your assigned task. To indicate that you have completed your assigned task, return the handout sheet to the examiner.

Initial Conditions:

You are the PRIMARY PLANT OPERATOR.
The previous shift has started the process of releasing the C Waste Gas Decay Tank to plant ventilation.

Initiating Cues:

You are requested to continue with the release of the C Waste Gas Decay Tank, starting with step 4.1.32 of OP-412B.

START TIME: ________

STEP 1: Obtain a copy of appropriate procedure. STANDARD: Candidate obtains a copy of OP-412B. **EXAMINER NOTE: When the candidate has completed reading the cue provide them with the partially completed OP-412B.** COMMENTS:	SAT ____ UNSAT ___
STEP 2: (step 4.1.32) Perform valve alignment for WGDT C discharge. 1. _____ Close the following: _____ WDV-392, WGDT WDT 1C Inlet Isol. _____ WDV-435, WGDT WDT 1C Drain Isol. _____ WDV-395, WGDT WDT 1C Outlet Isol to recycle. 2. _____ Open the following: _____ WDV-439, Waste Gas Discharge CV _____ WDV-438, WGDT WDT 1C Outlet Release _____ WDV-477, Outlet Isolation to RM-11A STANDARD: Candidate verifies green light ON and red light OFF for WDV-392.. Candidate verifies green light ON and red light OFF for WDV-395. Candidate rotates control switch for WDV-439 open and verifies red light ON and green light OFF. Candidate rotates control switch for WDV-438 open and verifies red light ON and green light OFF. Candidate rotates hand wheel for WDV-477 counter-clockwise until hard stop. EXAMINER CUE: **WDV-435 was closed earlier by an operator in the valve alley. WDV-392 and WDV-395 green lights are ON and red lights are OFF. WDV-439 and WDV-438 red lights are ON and green lights are OFF. WDV-477 hand wheel rotates and comes to a hard stop.** COMMENTS:	**Critical Step** SAT ____ UNSAT ___

<table>
<tr><td>

<u>STEP 3</u>: (step 4.1.33)

Complete valve alignment for WGDT Release.

1. _____ Close WDV-566, Nitrogen Gas Sampler Purge
2. _____ Close WDV-549, Nitrogen Gas Sampler Purge Isol
3. _____ Open WDV-565, Nitrogen Gas Sampler Purge

<u>STANDARD</u>: Candidate rotates manual valve operator of WDV-566 in clockwise direction until hard stop. Candidate rotates hand wheel of WDV-549 in clockwise direction until hard stop. Candidate rotates manual valve operator of WDV-565 in counter-clockwise direction until hard stop.

<u>EXAMINER CUE</u>: WDV-566 hand wheel rotates and comes to a hard stop. WDV-549 hand wheel rotates and comes to a hard stop. WDV-565 hand wheel rotates and comes to a hard stop.

<u>COMMENTS</u>:

</td><td>

Critical Step

SAT ____

UNSAT ___

</td></tr>
<tr><td>

<u>STEP 4</u>: (step 4.1.34)

If RM-A11 is inoperable, then complete enclosure 2, Independent Verification of Discharge Valves Lineup.

1. _____ Perform independent verification of discharge lineup.
2. _____ Annotate completion of two independent verifications of the discharge lineup on the GRWRP.

<u>EXAMINER CUE</u>: RM-A11 is operable.

<u>STANDARD</u>: N/A

<u>COMMENTS</u>:

</td><td>

SAT ____

UNSAT ___

</td></tr>
</table>

STEP 5: (step 4.1.35) Notify Security of Waste Gas Release. _____ Verify roof patrols have been secured. **EXAMINER CUE: This has been completed by the Control Room.** STANDARD: N/A COMMENTS:	SAT ____ UNSAT ___
STEP 6: (step 4.1.36) Ensure Channel Check on WD-19-FR is completed. o WD-19-FR Channel Check Complete 1. _____ Step 4.1.15 has been completed SAT OR _____ PT-168B, Section 4.1 has been completed SAT 2. _____ Annotate completion of WD-19-FR Channel Check on the GRWRP OR o _____ WD-19-FR is inoperable and to step 4.1.39 STANDARD: Candidate observes step 4.1.15 has been checked and checks the first part of detail 1. Candidate signs and dates GRWRP in appropriate section. COMMENTS:	SAT ____ UNSAT ___

STEP 7: (step 4.1.37)	Critical Step
PROCEDURE CAUTION: Do not pressurize GM tube in RM-A11 above 8 psig. Start WGDT release to ventilation filter units. o _____ Unlock and throttle WDV-478 adjusting flow to the most conservative of the following: o _____ Flow less than 10 scfm on WD-19-FR. OR o _____ Flow less than limits established on GRWRP. STANDARD: Candidate unlocks WDV-478 and rotates hand wheel counter-clockwise to a throttled position. After cues 1 and 2, candidate rotates hand wheel of WDV-478 clockwise to hard stop (Cue 3). Candidate will verify WDV-393, WDV-394, WDV-395, WDV-439, WDV-436, WDV-437, and WDV-438 are closed by green indicating light ON and red indicating light off (Cue 4). Candidate rotates control switch for WDV-439 to close and verifies green light ON and red light OFF (Cue 5). Candidate informs Control Room that the release is terminated and the proper valves are closed for a RM-A2 and RM-A11 actuation. EXAMINER CUE: 1. **After candidate has throttled WDV-478 open, RM-A2 and RM-A11 are in high alarm.** 2. **The Control Room requests you terminate the release and verify the appropriate valves have closed.** 3. **WDV-478 hand wheel rotates and comes to a hard stop.** 4. **WDV-439 red light is ON and green light is OFF. All other valves listed have green lights ON and red lights OFF.** 5. **WDV-439 green light is ON and red light is OFF.** **This completes the JPM.** COMMENTS:	SAT ____ UNSAT ___
END OF TASK	

TIME STOP __________

CANDIDATE CUE SHEET

(TO BE RETURNED TO EXAMINER UPON COMPLETION OF TASK)

Initial Conditions:

You are the PRIMARY PLANT OPERATOR.
The previous shift has started the process of releasing the C Waste Gas Decay Tank to plant ventilation.

Initiating Cues:

You are requested to continue with the release of the C Waste Gas Decay Tank, starting with step 4.1.32 of OP-412B.

ENCLOSURE 1

GASEOUS RADWASTE RELEASE PERMIT

ESTIMATED RELEASE CONDITIONS (CHEMISTRY)	
RELEASE POINT ID: WDT-1C (WGDT-3C)	PERMIT NUMBER: 00 0027.023. 015.G
MONITOR: RM-A11	
MAX WARNING SETPOINT: 6.4 E+5 CPM	MAX RELEASE RATE: 15 CFM
MAX HI TRIP SETPOINT: 8.0 E+5 CPM	RELEASE TO TERMINATE AT: 10 PSIG
SPECIAL REQUIREMENTS:	
RELEASE APPROVED BY: A. Chemist	REVIEWED BY: B. Chemist

ACTUAL RELEASE CONDITIONS (OPERATIONS)			
RELEASE APPROVED BY (NSS): A. Supervisor			DATE: 9-28-00
RM-A11 WARNING SETPOINT:	640,000 CPM		
RM-A11 HI TRIP SETPOINT:	800,000 CPM		
	DATE	TIME	WDT-1C PRESSURE
START			PSIG
STOP			PSIG
NET	N/A	MIN	PSIG
RM-A11 CHANNEL CHECK COMPLETE PER OP-412B	BY: A. Operator		DATE: 9-28-00
RM-A11 SOURCE CHECK COMPLETE PER OP-412B	BY: A. Operator		DATE: 9-28-00
WD-19-FR CHANNEL CHECK COMPLETE PER OP-412B	BY:		DATE:
IF RM-A11 INOPERABLE, THEN 2 INDEPENDENT VERIFI-CATIONS OF DISCHARGE VALVE LINEUP PER OP-412B:	BY/DATE:		BY/DATE:
IF WD-19-FR INOPERABLE, THEN ESTIMATE FLOW RATE AT LEAST ONCE PER 4 HOURS PER OP-412B AND ATTACH DATA SHEET	BY:		DATE:
COMPLETED BY:			DATE:
POST RELEASE APPROVED BY (NSS):			DATE:

(MC) Rev. 14

Effective Date 12/07/99

OPERATING PROCEDURE

OP-412B

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

WGDT RELEASE TO VENTILATION

APPROVED BY: Procedure Owner

John Addison for JHT
(SIGNATURE ON FILE)

DATE: 12/07/99

PROCEDURE OWNER: Manager, Nuclear Operations Support

TABLE OF CONTENTS

1.0 PURPOSE [NOCS 005802, 005803, 007382, 090050, 090130]

1.1 To provide guidelines for the release of WGDTs through the AB Ventilation System to the Atmosphere.

2.0 REFERENCES

2.1 DEVELOPMENTAL REFERENCES

2.1.1 FD-302-691, Gas Waste Disposal

2.1.2 FD-302-692, Waste Gas Sampling

2.1.3 MAR 87-10-27-01, Resolution of Backup Met Tower Instrument Failures

3.0 PERSONNEL INDOCTRINATION

	DESCRIPTION	VALUE
3.1	SETPOINTS	
3.1.1	Waste Gas Decay Tanks Relief Valve	125 PSIG
3.1.2	Waste Gas Decay Tanks Rupture Disc	150 PSIG
3.1.3	Waste Gas Decay Tank Valves; WDV-390, WDV-391, & WDV-392 Auto Close	80 PSIG
3.1.4	Waste Gas Discharge Pressure Reducing Valve WDV-857	8 PSIG
3.1.5	WDV-393, 394, 395, & 439 close	RMA-11 High Alarm
3.1.6	WDV-436, 437, & 438 Close	RMA-2 High Rad Alarm
3.1.7	WDV-439 Close	Greater than or equal to 15 SCFM

3.2 LIMITS AND PRECAUTIONS

	LIMIT	BASIS
3.2.1	A Gaseous Radwaste Release Permit shall be initiated and approved for gas decay tanks prior to release of waste gas to environment	Ensure ODCM Limits are not exceeded
3.2.2	For work located in Radiation Controlled Areas, consideration must be given to ALARA program	Personnel protection
3.2.3	IF either RMA-11, OR WD-19-FR becomes inoperative, THEN TERMINATE the release immediately [NOCS 009658, 009659]	Offsite Dose Calculation Manual (ODCM 2.2, Tables 2-3 and 2-4)
3.2.4	A gaseous release may be started or restarted if either RMA-11 or WD-19-FR is out of service, in accordance with the ODCM [NOCS 009658, 009659]	Offsite Dose Calculation Manual (ODCM 2.2, Tables 2-3 and 2-4)

4.0 INSTRUCTIONS

ACTIONS		DETAILS
4.1	GAS RELEASE TO PLANT VENT (CAT. 1)	
4.1.1	IF water is to be drained from WGDT to be released, THEN PERFORM this Step	o ___ Refer to OP-412A, Section 4.3
4.1.2	RECORD Pressure of Tank to be released	o 80 PSIG

NOTE: To Close WDV-390, WDV-391, or WDV-392 use of the "OVERRIDE" switch is required.

4.1.3	ENSURE WGDT to be released is isolated	o IF WGDT "A", THEN ENSURE CLOSED: ___ WDV-390, WGDT WDT 1A Inlet Isol ___ WDV-393, WGDT WDT 1A Outlet to Header ___ WDV-436, WGDT WDT 1A Outlet Release OR o IF WGDT "B", THEN ENSURE CLOSED: ___ WDV-391, WGDT WDT 1B Inlet Isol ___ WDV-394, WGDT WDT 1B Outlet to Header ___ WDV-437, WGDT WDT 1B Outlet Release OR o IF WGDT "C", THEN ENSURE CLOSED: ✓ WDV-392, WGDT WDT 1C Inlet Isol ✓ WDV-395, WGDT WDT 1C Outlet to Header ✓ WDV-438, WGDT WDT 1C Outlet Release

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

	ACTIONS		DETAILS
4.1.4	SELECT "OVERRIDE" switch to ON, for WGDT to be released	o ✓	
4.1.5	NOTIFY Chemistry to generate GRWRP for WGDT to be released	o ✓	ENSURE Chemistry submits GRWRP to Operation after sampling and analysis is complete

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

	ACTIONS		DETAILS
4.1.6	NOTIFY Security of pending Waste Gas Release	o ✓	NOTIFY 2 hours prior to start of release
4.1.7	PERFORM method of WD-19-FR channel check; determined by NSS/NSM [NOCS 021217]	o ✓	IF Flow Check is to be performed, THEN GO TO Step 4.1.8
		OR	
		o ___	IF PT-168B, Section 4.1, is to be performed, THEN GO TO Step 4.1.17
		OR	
		o ___	IF WD-19-FR inoperable, THEN GO TO Step 4.1.17
4.1.8	ESTABLISH and PREPARE a Flow Element Testing Source to WD-19-FE	1. ✓	OBTAIN Hand Loader with Tygon Tubing
		2. ✓	CONNECT Tygon tubing to WDV-1163, Waste Gas Analyzer

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS		
4.1.9	ISOLATE WD-137-PT	o	✓	VERIFY LOCKED CLOSED, WDV-478, Inlet Isol to RM-A11
		o	✓	CLOSE, WDV-480, WD-137-PT Isolation
		o	✓	CLOSE, WD-137-PT Isolation Valve V-1
4.1.10	ENSURE WD-137-PT is drained	1.	✓	OPEN WD-137-PT Drain Connection
		2.	✓	WHEN all condensate is drained, THEN CLOSE WD-137-PT drain connection
4.1.11	CONNECT Tygon Tubing to WD-137-PT drain connection	o	✓	
4.1.12	PERFORM Valve Alignment for Flow Test	1.	✓	OPEN, WDV-480
		2.	✓	OPEN, Drain Connection on WD-137-PT
		3.	✓	OPEN, WDV-477, Outlet Isolation to RM-A11
		4.	✓	OPEN, WDV-439, Waste Gas Discharge Control Valve

ACTIONS		DETAILS

****
CAUTION: When using Hand Loader and Nitrogen Source, DO NOT Exceed 8 PSIG pressure output.
****

4.1.13	THROTTLE WDV-1163 and establish approximately 5 PSIG using Hand Loader, AND RECORD final pressure	o Final Pressure 5 PSIG
4.1.14	ESTABLISH flow through Waste Gas Release Lines AND after flow has stabilized, RECORD flowrate	1. ✓ UNLOCK & THROTTLE, WDV-478, adjusting flow to approximately 5 SCFM, DO NOT Exceed 10 SCFM 2. ✓ IF flow cannot be established, THEN ENSURE Hand Loader is reset to 5 PSIG 3. ✓ Final flow 5 SCFM 4. ✓ IF flow still cannot be established, THEN the channel check of WD-19-FR is Unsat

	ACTIONS	DETAILS
4.1.15	IF Channel Check is SAT, THEN RECORD Initials, "Channel Check" and date on WD-19-FR OR IF Channel Check is UNSAT, THEN NOTIFY NSS/NSM	1. Channel Check complete ✓ SAT OR ___ UNSAT 2. ✓ NOTIFY Security if release will be delayed
4.1.16	RESTORE WD-137-PT from Flow Test Equipment	1. ✓ CLOSE WDV-1163, to stop Nitrogen to WD-137-PT 2. ✓ REMOVE Tygon Tubing from WDV-1163 3. ✓ CLOSE WD-137-PT Drain Connection 4. ✓ CLOSE WDV-480 5. ✓ REMOVE Tygon Tubing from Drain Connection 6. ✓ OPEN WD-137-PT Isol Valve V-1 7. ✓ OPEN WDV-480 8. ✓ CLOSE WDV-439 9. ✓ LOCK CLOSED WDV-478 10. ✓ CLOSE WDV-477 11. ✓ VERIFY WD-19-FR is indicating approximately 0.0 SCFM 12. ✓ OPEN WDV-1163

ACTIONS		DETAILS
4.1.17	VERIFY "POWER" lights are lit on Radiation Monitoring Panel	o ✓ RMA-2G o ✓ RMA-11
4.1.18	TEST and ADJUST RMA-2G "WARNING" setpoint per GRWRP [NOCS 001943, 009670]	1. ✓ DEPRESS and release "HORN SILENCE" pushbutton 2. ✓ VERIFY "HORN SILENCE" pushbutton is backlit 3. ✓ RECORD background count rate 60 CPM 4. ✓ SELECT & HOLD "ALARM SETTING" switch to "WARNING" position AND ADJUST "WARNING" potentiometer to read below background count rate on panel meter 5. ✓ RELEASE "ALARM SETTING" switch 6. ✓ VERIFY alarm at Control Center Rate Meter and Main Control Board Annunciator 7. ✓ SELECT & HOLD "ALARM SETTING" switch to "WARNING" position AND ADJUST "WARNING" potentiometer to "WARNING" setpoint per GRWRP for continuous Aux. Building release (posted in Control Room) 8. ✓ RELEASE "ALARM SETTING" switch 9. ✓ RECORD "Warning" Setpoint here 120 CPM.

ACTIONS		DETAILS
4.1.19	TEST and ADJUST RMA-2G "HIGH" setpoint per GRWRP [NOCS 001943, 009670]	1. ✓ DEPRESS and HOLD "BYPASS RMA-2" pushbutton 2. ✓ SELECT & HOLD "ALARM SETTING" switch to "HIGH" position AND ADJUST "HIGH" potentiometer to read below background count rate on panel meter 3. ✓ RELEASE "ALARM SETTING" switch 4. ✓ VERIFY alarm at Control Center Rate Meter and Main Control Board Annunciator 5. ✓ SELECT & HOLD "ALARM SETTING" switch to "HIGH" position AND ADJUST "HIGH" potentiometer meter to "HIGH" setpoint per GRWRP for continuous Aux. Building release (posted in Control Room) 6. ✓ RELEASE "ALARM SETTING" switch 7. ✓ RECORD "High" Setpoint here 200 K CPM. 8. ✓ RESET all alarms 9. ✓ DEPRESS & RELEASE "HORN SILENCE" pushbutton 10. ✓ RELEASE "RMA-2 Bypass" pushbutton

ACTIONS		DETAILS
4.1.20 TEST and ADJUST RMA-11 "WARNING" setpoint per GRWRP [NOCS 001943, 009670]	1. ✓	DEPRESS and RELEASE "HORN SILENCE" pushbutton
	2. ✓	VERIFY "HORN SILENCE" pushbutton is backlit
	3. ✓	RECORD background count rate 3K CPM
	4. ✓	SELECT & HOLD "ALARM SETTING" switch to "WARNING" position AND ADJUST "WARNING" potentiometer to read below background count rate on panel meter
	5. ✓	RELEASE "ALARM SETTING" switch
	6. ✓	VERIFY alarm at Control Center Rate Meter and Main Control Board Annunciator
	7. ✓	SELECT & HOLD "ALARM SETTING" switch to "WARNING" position AND ADJUST "WARNING" potentiometer to "WARNING" setpoint per GRWRP
	8. ✓	RELEASE "ALARM SETTING" switch
	9. ✓	RECORD "Warning" Setpoint 6.4E5 CPM, and on GRWRP for the batch release

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS
4.1.21	TEST and ADJUST RMA-11 "HIGH" setpoint per GRWRP [NOCS 001943, 009670]	1. ✓ DEPRESS and HOLD "BYPASS RMA-11" pushbutton 2. ✓ SELECT & HOLD "ALARM SETTING" switch to "HIGH" position AND ADJUST "HIGH" potentiometer meter to read below background count rate on panel meter 3. ✓ RELEASE "ALARM SETTING" switch 4. ✓ VERIFY alarm at Control Center Rate Meter and Main Control Board Annunciator 5. ✓ SELECT & HOLD "ALARM SETTING" switch to "HIGH" position AND ADJUST "HIGH" potentiometer to "HIGH" setpoint per GRWRP 6. ✓ RELEASE "ALARMSETTING" switch 7. ✓ RECORD "HIGH" Setpoint 8.0E5 CPM, and on GRWRP for batch release 8. ✓ RESET all alarms 9. ✓ RELEASE "RMA-11 Bypass" pushbutton 10. ✓ DEPRESS and release "HORN SILENCE" pushbutton

ACTIONS		DETAILS
4.1.22	ENSURE RMA-2/RMA-11 Channel Check is complete [NOCS 009670]	o RMA-2/RMA-11 Channel Check Complete 1. ✓ ENSURE Steps 4.1.18, 4.1.19, 4.1.20, and 4.1.21 are complete 2. ✓ ANNOTATE completion of RMA-11 Channel Check on the GRWRP OR o ___ IF RMA-2/RMA-11 Channel Check is unsatisfactory, THEN NOTIFY NSS/NSM to refer to ODCM Section 2.2 and Table 2-3.
4.1.23	PERFORM Check Source or Wand Check on RMA-11 [NOCS 009671]	o ✓ VERIFY meter responds to check source/Wand check by observing increasing value on meter o IF Wand Test is satisfactory, THEN ✓ ANNOTATE completion of RMA-11 Source Check on the GRWRP ✓ GO TO Step 4.1.24 OR o ___ IF Wand Test is unsatisfactory, THEN NOTIFY NSS/NSM to refer to ODCM Section 2.2 and Table 2-3.

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS
4.1.24	NOTIFY NSS/NSM to verify Radiation Monitor Setpoints per Release Permit [NOCS 001943]	o ✓ RMA-2 Gas setpoints verified o ✓ RMA-11 Gas setpoints verified o ✓ NSS/NSM has authorized and signed GRWRP
4.1.25	ENSURE proper alignment of HVAC	o ENSURE two of the following Auxiliary Building Exhaust Fans are in service ✓ AHF-14A ✓ AHF-14C OR ___ AHF-14B ___ AHF-14D

	ACTIONS	DETAILS
4.1.26	RECORD Meteorological conditions from Primary Met Tower OR Secondary Met Tower	o Data from Primary Met Tower o ✓ 33 ft Wind Speed 6.3 meters/sec o ✓ 33 ft Wind Direction 262 degrees o ✓ 175 ft Wind Speed 8.7 meter sec o ✓ 175 ft Wind Direction 267 degrees o ✓ Delta Temperature -2.14 °F OR o Data from Secondary Met Tower o ___ Sigma-Theta ________ degrees
4.1.27	IF Delta Temperature is greater than or equal to Zero OR Primary Met Tower Delta Temperature is unavailable and Secondary Met Tower Sigma-Theta is less than 3 degrees, THEN CONTACT Chemistry for release approval	o N/A NOTIFY Security if release will be delayed
4.1.28	ENSURE RMA-2 Sample Pump is operable	o ✓ NOTIFY Chemistry to verify Particulate Filter and Charcoal Filter installed at RMA-2 AND o ✓ ENSURE Chemistry checks Sample Pump operation

	ACTIONS	DETAILS
4.1.29	PERFORM Valve Alignment for Tank being discharged	o ___ IF aligning WGDT "A", THEN GO TO Step 4.1.30 OR o ___ IF aligning WGDT "B", THEN GO TO Step 4.1.31 OR o ✓ IF aligning WGDT "C", THEN GO TO Step 4.1.32
4.1.30	PERFORM Valve Alignment for WGDT "A" Discharge	1. CLOSE the following: ___ WDV-390, WGDT WDT 1A Inlet Isol ___ WDV-433, WGDT WDT 1A Drain Isol ___ WDV-393, WGDT WDT 1A Outlet Isolation to Recycle 2. OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-436, WGDT WDT 1A Outlet Release ___ WDV-477, Outlet Isolation to RM-11A 3. ___ GO TO Step 4.1.33

	ACTIONS	DETAILS
4.1.31	PERFORM Valve Alignment for WGDT "B" Discharge	1. CLOSE the following: ___ WDV-391, WGDT WDT 1B Inlet Isol ___ WDV-434, WGDT WDT 1B Drain Isol ___ WDV-394, WGDT WDT 1B Outlet Isol to Recycle 2. OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-437, WGDT WDT 1B Outlet Release ___ WDV-477, Outlet Isolation to RM-11A 3. ___ GO TO Step 4.1.33
4.1.32	PERFORM Valve Alignment for WGDT "C" Discharge	1. CLOSE the following: ___ WDV-392, WGDT WDT 1C Inlet Isol ___ WDV-435, WGDT WDT 1C Drain Isol ___ WDV-395, WGDT WDT 1C Outlet Isol to Recycle 2. OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-438, WGDT WDT 1C Outlet Release ___ WDV-477, Outlet Isolation to RM-11A
4.1.33	COMPLETE Valve Alignment for WGDT Release	1. ___ CLOSE WDV-566, Nitrogen Gas Sampler Purge 2. ___ CLOSE WDV-549, Nitrogen Gas Sampler Purge Isol 3. ___ OPEN WDV-565, Nitrogen Gas Sampler Purge

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS
4.1.34	IF RMA-11 is inoperable, THEN COMPLETE Enclosure 2, Independent Verification of Discharge Valves Lineup [NOCS 009658]	1. ___ PERFORM independent verification of discharge lineup 2. ___ ANNOTATE completion of two independent verifications of the discharge lineup on the GRWRP
4.1.35	NOTIFY Security of Waste Gas Release	o ___ VERIFY roof patrols have been secured
4.1.36	ENSURE Channel Check on WD-19-FR is completed [NOCS 009659, 009674, 021217]	o WD-19-FR Channel Check Complete 1. ___ Step 4.1.15 has been completed SAT OR ___ PT-168B, Section 4.1 has been completed SAT 2. ___ ANNOTATE completion of WD-19-FR Channel Check on the GRWRP OR o ___ WD-19-FR is Inoperable and GO TO Step 4.1.39

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS

****
CAUTION: DO NOT pressurize G-M Tube in RMA-11 above 8 PSIG.
****

4.1.37	START WGDT Release to Ventilation Filter Units	o ___ UNLOCK and THROTTLE WDV-478, adjusting flow to the most conservative of the following: o ___ Flow less than 10 SCFM on WD-19-FR OR o ___ Flow less than limits established on GRWRP

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

	ACTIONS		DETAILS
4.1.38	DETERMINE if WD-19-FR is operating properly [NOCS 009659]	o ___	IF flow rate appears accurate, THEN GO TO Step 4.1.40
		OR	
		o ___	IF no flow rate is indicated or appears inaccurate, THEN CLOSE, WDV-478 AND NOTIFY the NSS/NSM
4.1.39	OBTAIN NSS/NSM permission to use Manual Release Rate Calculations and start WGDT release [NOCS 009659, 021217]	1. ___	REFER to ODCM, Section 2.2 and Table 2-3
		2. ___	OBTAIN NSS/NSM permission
		3. ___	UNLOCK and THROTTLE WDV-478, adjusting pressure on WD-118-PI, Nitrogen Gas Sampler Purge to 1 PSIG
		4. ___	BEGIN Manual Release Rate Calculations using Enclosure 1

****
CAUTION: DO NOT pressurize G-M Tube in RMA-11 above 8 PSIG.
****

4.1.40	THROTTLE WDV-478 to maintain release rate below limits	o	MAINTAIN Release Rate below the most conservative of the following limits: o ___ Less than 10 SCFM o ___ Less than limits established on GRWRP

	ACTIONS	DETAILS
4.1.41	MAKE notifications of WGDT Release in progress	1. NOTIFY the Control Room of the Release start and VERIFY the following: ___ RMA-11 indication is functioning with no Failure Alarms 2. ___ NOTIFY Chemistry of Release start
4.1.42	RECORD pertinent Release data	1. RECORD the following on RMA-11: ___ RMA-11 recorder time ___ GRWRP number 2. RECORD the following on the GRWRP: ___ Date of Release start ___ Time of Release start ___ Initial WGDT pressure

NOTE: Waste Gas Analyzer will not operate unless 10 psig is present in WGDT.

4.1.43	WHEN WGDT is greater than or equal to 10 PSIG, THEN CLOSE Release Outlet Valve for Vented Tank	o DETERMINE Pressure from following: ___ WD-16-PI, WGDT WDT 1A for WGDT "A" ___ WD-17-PI, WGDT WDT 1B for WGDT "B" ___ WD-18-PI, WGDT WDT 1C for WGDT "C" o CLOSE Outlet Valve of Vented Tank: ___ IF WGDT "A", THEN CLOSE, WDV-436 OR ___ IF WGDT "B", THEN CLOSE, WDV-437 OR ___ IF WGDT "C", THEN CLOSE, WDV-438

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

	ACTIONS	DETAILS
4.1.44	NOTIFY Control Room	o ___ NOTIFY time release was secured
4.1.45	RESTORE Waste Gas System standby condition	o ___ IF the WGDT being released is dedicated for MUT Venting THEN SELECT "OVERRIDE" Switch to ON IF not dedicated for MUT Venting THEN SELECT "OVERRIDE" Switch to OFF o ___ RECORD GRWRP Number and Time on RMA-11 Recorder o ___ RECORD Date/Time and Pressure on GRWRP, Section II o ___ LOCK CLOSED, WDV-478 o CLOSE the following: ___ WDV-439 ___ WDV-477 ___ WDV-565
4.1.46	NOTIFY Chemistry that release is completed	o ___
4.1.47	COMPLETE Section II of GRWRP and Sign	IF Release was performed using Manual Release Rate Calculations, THEN ___ ATTACH Enclosure 1, Manual Release Rate Data Sheet, to the GRWRP ___ ANNOTATE completion of Manual Release Rate Calculations on the GRWRP

4.1 GAS RELEASE TO PLANT VENT (CAT. 1) (Cont'd)

ACTIONS		DETAILS
4.1.48	ENSURE Shift Supervisor signs GRWRP for release termination AND RETURN original copy of GRWRP to Chemistry	o ___
4.1.49	NOTIFY Security that Release is completed	o ___

5.0 FOLLOW-UP ACTIONS

ACTIONS	DETAILS
None	

6.0 RESTORATION INSTRUCTIONS

ACTIONS	DETAILS
None	

MANUAL RELEASE RATE DATA SHEET [NOCS 009659, 021217]

Time*	WGDT Pressure (PSIG)	Δ WGDT Pressure (PSIG)	Δ Pressure / Δ Time (min) X 119.28	Release Rate (SCFM)	Initials & Date
		N/A	N/A	N/A	
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		
			______ X 119.28 =		

*Every two hours or per NSS/NSM

Reviewed by ______________________ Time __________ Date __________
NSS/NSM

INDEPENDENT VERIFICATION OF DISCHARGE VALVES LINEUP [NOCS 009658]

ACTIONS	DETAILS
1. IF preparing WGDT "A" for discharge, THEN PERFORM the following:	1. ENSURE CLOSED the following: ___ WDV-390, WGDT WDT 1A Inlet Isol ___ WDV-433, WGDT WDT 1A Drain Isol ___ WDV-393, WGDT WDT 1A Outlet Isol to Recycle 2. ENSURE OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-436, WGDT WDT 1A Outlet Release ___ WDV-477, Outlet Isol to RM-11A 3. ___ GO TO Step 4
2. IF preparing WGDT "B" for discharge, THEN PERFORM the following:	1. ENSURE CLOSED the following: ___ WDV-391, WGDT WDT 1B Inlet Isol ___ WDV-434, WGDT WDT 1B Drain Isol ___ WDV-394, WGDT WDT 1B Outlet Isol to Recycle 2. ENSURE OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-437, WGDT WDT 1B Outlet Release ___ WDV-477, Outlet Isol to RM-11A 3. GO TO Step 4

INDEPENDENT VERIFICATION OF DISCHARGE VALVES LINEUP

ACTIONS	DETAILS
3. IF preparing WGDT "C" for discharge, THEN PERFORM the following:	1. ENSURE CLOSED the following: ___ WDV-392, WGDT WDT 1C Inlet Isol ___ WDV-435, WGDT WDT 1C Drain Isol ___ WDV-395, WGDT WDT 1C Outlet Isol to Recycle 2. ENSURE OPEN the following: ___ WDV-439, Waste Gas Discharge CV ___ WDV-438, WGDT WDT 1C Outlet Release ___ WDV-477, Outlet Isol to RM-11A 3. ___ GO TO Step 4
4. COMPLETE Valve Alignment for WGDT Release	1. ___ ENSURE CLOSED WDV-566, Nitrogen Gas Sampler Purge 2. ___ ENSURE CLOSED WDV-549, Nitrogen Gas Sampler Purge Isol 3. ___ ENSURE OPEN WDV-565, Nitrogen Gas Sampler Purge