Facility: **Wolf Creek** **Date of Exam**: **December 2019**

Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total	A2		G*		Total
1. Emergency and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A		3	18					6
	2	2	1	2				1	2			1	9					4
	Tier Totals	5	4	5				4	5			4	27					10
2. Plant Systems	1	3	2	3	3	2	2	3	3	2	2	3	28					5
	2	1	0	1	1	1	1	1	1	1	1	1	10					3
	Tier Totals	4	2	4	4	3	3	4	4	3	3	4	38					8
3. Generic Knowledge and Abilities Categories		1		2		3		4					10	1	2	3	4	7
		3		2		2		3										

Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it is replaced by a K/A from another Tier 3 category.)

2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points, and the SRO-only exam must total 25 points.
3. Systems/evolutions within each group are identified on the outline. Systems or evolutions that do not apply at the facility should be deleted with justification. Operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible. Sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
7. The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A catalog, but the topics must be relevant to the applicable evolution or system. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' IRs for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above. If fuel-handling equipment is sampled in a category other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2. (Note 1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

G* Generic K/As

* These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.

** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1				✓			EA1.07 Ability to operate and monitor the following as they apply to a reactor trip: MT/G trip; verification that the MT/G has been tripped	**4.3**	**39**
000008 (APE 8) Pressurizer Vapor Space Accident / 3	✓						AK1.02 Knowledge of the operational implications of the following concepts as they apply to a Pressurizer Vapor Space Accident: Change in leak rate with change in pressure	**3.1**	**40**
000009 (EPE 9) Small Break LOCA / 3			✓				EK3.18 Knowledge of the reasons for the following responses as the apply to the small break LOCA: Monitoring containment radiation levels	**3.9**	**41**
000011 (EPE 11) Large Break LOCA / 3		✓					EK2.02 Knowledge of the interrelations between the and the following Large Break LOCA: Pumps	**2.6**	**42**
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4			✓				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**	**43**
000022 (APE 22) Loss of Reactor Coolant Makeup / 2									
000025 (APE 25) Loss of Residual Heat Removal System / 4				✓			AA1.09 Ability to operate and / or monitor the following as they apply to the Loss of Residual Heat Removal System: LPI pump switches, ammeter, discharge pressure gauge, flow meter, and indicators	**3.2**	**44**
000026 (APE 26) Loss of Component Cooling Water / 8					✓		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Component Cooling Water: The cause of possible CCW loss	**2.9**	**45**
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3				✓			AA1.03 Ability to operate and / or monitor the following as they apply to the Pressurizer Pressure Control Malfunctions: Pressure control when on a steam bubble	**3.6**	**46**
000029 (EPE 29) Anticipated Transient Without Scram / 1						✓	2.2.36 Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	**3.1**	**47**
000038 (EPE 38) Steam Generator Tube Rupture / 3									
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4					✓		EA2.1 Ability to determine and interpret the following as they apply to the (Uncontrolled Depressurization of all Steam Generators): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	**3.2**	**48**
000054 (APE 54; CE E06) Loss of Main Feedwater /4						✓	2.1.31 Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	**4.6**	**49**
000055 (EPE 55) Station Blackout / 6						✓	2.1.20 Ability to interpret and execute procedure steps.	**4.6**	**50**
000056 (APE 56) Loss of Offsite Power / 6	✓						AK1.03 Knowledge of the operational implications of the following concepts as they apply to Loss of Offsite Power: Definition of subcooling: use of steam tables to determine it	**3.1***	**51**
000057 (APE 57) Loss of Vital AC Instrument Bus / 6									

000058 (APE 58) Loss of DC Power / 6	✓						AK1.01 Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: Battery charger equipment and instrumentation	**2.8**	**52**
000062 (APE 62) Loss of Nuclear Service Water / 4			✓				AK3.01 Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the nuclear service water coolers	**3.2**	**53**
000065 (APE 65) Loss of Instrument Air / 8									
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6		✓					AK2.07 Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Turbine / Generator Control	**3.6**	**54**
(W E04) LOCA Outside Containment / 3					✓		EA2.1 Ability to determine and interpret the following as they apply to the LOCA Outside Containment, Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	**3.4**	**55**
(W E11) Loss of Emergency Coolant Recirculation / 4		✓					EK2.2 Knowledge of the interrelations between the (Loss of Emergency Coolant Recirculation) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	**3.9**	**56**
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4									
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:		18

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1									
000003 (APE 3) Dropped Control Rod / 1									
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1			✓				AK3.01 Knowledge of the reasons for the following responses as they apply to Emergency Boration: When emergency boration is required	**4.1**	**57**
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2					✓		AA2.03 Ability to determine and interpret the following as they apply to the Pressurizer Level Control Malfunctions: Charging subsystem flow indicator and controller	**2.8**	**58**
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7					✓		AA2.02 Ability to determine and interpret the following as they apply to the Loss of Source Range Nuclear Instrumentation: Expected change in source range count rate when rods are moved	**3.6**	**59**
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7									
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8									
000037 (APE 37) Steam Generator Tube Leak / 3	✓						AK1.02 Knowledge of the operational implications of the following concepts as they apply to Steam Generator Tube Leak: Leak rate vs. pressure drop	**3.5**	**60**
000051 (APE 51) Loss of Condenser Vacuum / 4			✓				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	**2.8**	**61**
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7									
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW A06) Control Room Evacuation / 8									
000069 (APE 69; W E14) Loss of Containment Integrity / 5									
000074 (EPE 74; **W E06** & E07) Inadequate Core Cooling / 4	✓						EK1.3 Knowledge of the operational implications of the following concepts as they apply to the (Degraded Core Cooling): Annunciators and conditions indicating signals, and remedial actions associated with the (Degraded Core Cooling).	**3.7**	**62**
000076 (APE 76) High Reactor Coolant Activity / 9									
~~000078 (APE 78*) RCS Leak / 3~~									

(W E01 & **E02**) Rediagnosis & SI Termination / 3				✓			EA1.3 Ability to operate and / or monitor the following as they apply to the (SI Termination) Desired operating results during abnormal and emergency situations.	**3.8**	**63**
(W E13) Steam Generator Overpressure / 4						✓	2.4.6 Knowledge of EOP mitigation strategies.	**3.7**	**64**
(W E15) Containment Flooding / 5		✓					EK2.1 Knowledge of the interrelations between the (Containment Flooding) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	**2.8**	**65**
(W E16) High Containment Radiation /9									
~~(BW A01) Plant Runback / 1~~									
~~(BW A02 & A03) Loss of NNI-X/Y/7~~									
~~(BW A04) Turbine Trip / 4~~									
~~(BW A05) Emergency Diesel Actuation / 6~~									
~~(BW A07) Flooding / 8~~									
~~(BW E03) Inadequate Subcooling Margin / 4~~									
(BW E08; W E03) LOCA Cooldown—Depressurization / 4									
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
~~(BW E13 & E14) EOP Rules and Enclosures~~									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
~~(CE A16) Excess RCS Leakage / 2~~									
~~(CE E09) Functional Recovery~~									
~~(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4~~									
K/A Category Point Totals:	2	1	2	1	2	1	Group Point Total:		9

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump										✓		A4.03 Ability to manually operate and/or monitor in the control room: RCP lube oil and lift pump motor controls	**2.8**	**1**
004 (SF1; SF2 CVCS) Chemical and Volume Control					✓	✓						K5.20 Knowledge of the operational implications of the following concepts as they apply to the CVCS: Reactivity effects of xenon, boration and dilution — — K6.26 Knowledge of the effect of a loss or malfunction on the following CVCS components: Methods of pressure control of solid plant (PZR relief and water inventory)	**3.6** **—** **3.8**	**2** **—** **3**
005 (SF4P RHR) Residual Heat Removal						✓						K6.03 Knowledge of the effect of a loss or malfunction on the following will have on the RHRS: RHR heat exchanger	**2.5**	**4**
006 (SF2; SF3 ECCS) Emergency Core Cooling							✓					A1.18 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ECCS controls including: PZR level and pressure	**4.0**	**5**
007 (SF5 PRTS) Pressurizer Relief/Quench Tank								✓				A2.01 Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Stuck-open PORV or code safety	**3.9**	**6**
008 (SF8 CCW) Component Cooling Water				✓						✓		K4.09 Knowledge of CCWS design feature(s) and/or interlock(s) which provide for the following: The "standby" feature for the CCW pumps A4.07 Ability to manually operate and/or monitor in the control room: Control of minimum level in the CCWS surge tank	**2.7** **—** **2.9**	**7** **—** **8**
010 (SF3 PZR PCS) Pressurizer Pressure Control									✓		✓	A3.02 Ability to monitor automatic operation of the PZR PCS, including: PZR Pressure — — 2.4.20 Knowledge of the operational implications of EOP warnings, cautions, and notes.	**3.6** **3.6**	**9** **10**
012 (SF7 RPS) Reactor Protection	✓							✓				K1.05 Knowledge of the physical connections and/or cause effect relationships between the RPS and the following systems: ESFAS — — 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.	**3.8** **4.4**	**11** **12**

013 (SF2 ESFAS) Engineered Safety Features Actuation		✓						✓			K2.01 Knowledge of bus power supplies to the following: ESFAS/safeguards equipment control — — A3.02 Ability to monitor automatic operation of the ESFAS including: Operation of actuated equipment	**3.6** **—** **4.1**	**13** **—** **14**
022 (SF5 CCS) Containment Cooling		✓									K2.01 Knowledge of power supplies to the following: Containment cooling fans	**3.0**	**15**
~~025 (SF5 ICE) Ice Condenser~~											NOT APPLICABLE		
026 (SF5 CSS) Containment Spray							✓			✓	A1.01 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including: Containment Pressure — — 2.4.34 Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	**3.9** **—** **4.2**	**16** **—** **17**
039 (SF4S MSS) Main and Reheat Steam				✓							K4.08 Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Interlocks on MSIV and bypass valves	**3.3**	**18**
059 (SF4S MFW) Main Feedwater	✓		✓								K1.02 Knowledge of the physical connections and/or cause/effect relationships between the MFW and the following systems: AFW system — — K3.03 Knowledge of the effect that a loss or malfunction of the MFW will have on the following: S/GS	**3.4** **—** **3.5**	**19** **—** **20**
061 (SF4S AFW) Auxiliary/Emergency Feedwater								✓			A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the AFW; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of dc power	**3.1**	**21**
062 (SF6 ED AC) AC Electrical Distribution										✓	2.4.31 Knowledge of annunciator alarms, indications, or response procedures.	**4.2**	**22**
063 (SF6 ED DC) DC Electrical Distribution				✓							K4.02 Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: Breaker Interlocks, permissives, bypasses and cross-ties.	**2.9***	**23**
064 (SF6 EDG) Emergency Diesel Generator			✓								K3.02 Knowledge of the effect that a loss or malfunction of the ED/G system will have on the following: ESFAS controlled or actuated systems	**4.2**	**24**
073 (SF7 PRM) Process Radiation Monitoring					✓						K5.03 Knowledge of the operational implications as they apply to concepts as they apply to the PRM system: Relationship between radiation intensity and exposure limits	**2.9***	**25**

076 (SF4S SW) Service Water							✓					A1.02 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWS controls including: Reactor and turbine building closed cooling water temperatures	**2.6***	**26**
078 (SF8 IAS) Instrument Air	✓											K1.04 Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: Cooling water to compressor	**2.6**	**27**
103 (SF5 CNT) Containment			✓									K3.02 Knowledge of the effect that a loss or malfunction of the containment system will have on the following: Loss of containment integrity under normal operations	**3.8**	**28**
~~053 (SF1; SF4P ICS*) Integrated Control~~														
K/A Category Point Totals:	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	Group Point Total:		28

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive					✓							K5.97 Knowledge of the following operational implications as they apply to the CRDS: Relationship of T-avg to T-ref.	**3.3**	**29**
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication							✓					A1.04 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RPIS controls, including: Axial and radial power distribution	**3.5**	**30**
015 (SF7 NI) Nuclear Instrumentation			✓									K3.01 Knowledge of the effect that a loss or malfunction of the NIS will have on the following: RPS	**3.9**	**31**
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor						✓						K6.01, Knowledge of the effect of a loss or malfunction of the following ITM system components: Sensors and detectors.	**2.7**	**32**
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge	✓											K1.02 Knowledge of the physical connections and/or cause effect relationships between the Containment Purge System and the following systems: Containment radiation monitor	**3.3**	**33**
033 (SF8 SFPCS) Spent Fuel Pool Cooling									✓			A3.02 Ability to monitor automatic operation of the Spent Fuel Pool Cooling System including: Spent fuel leak or rupture.	**2.9**	**34**
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator										✓		A4.05 Ability to manually operate and/or monitor in the control room: Level Control to enhance natural circulation	**3.8**	**35**
041 (SF4S SDS) Steam Dump/Turbine Bypass Control														
045 (SF 4S MTG) Main Turbine Generator											✓	2.1.25 Ability to interpret reference materials, such as graphs, curves, tables, etc.	**3.9**	**36**
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate								✓				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**	**37**
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														

075 (SF8 CW) Circulating Water													
079 (SF8 SAS**) Station Air													
086 Fire Protection				✓							K4.03 Knowledge of design feature(s) and/or interlock(s) which provide for the following: Detection and location of fires	**3.1**	**38**
~~050 (SF 9 CRV*) Control Room Ventilation~~													
K/A Category Point Totals:	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	Group Point Total:	10

ES-401 **Generic Knowledge and Abilities Outline (Tier 3) - RO** **Form ES-401-3**

Facility: **Wolf Creek** **Date of Exam**: **December 2019**

Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.1	Knowledge of conduct of operations requirements.	3.8	66		
	2.1.19	Ability to use plant computers to evaluate system or component status.	3.9	67		
	2.1.41	Knowledge of the refueling process.	2.8	68		
	Subtotal			3		
2. Equipment Control	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations, such as risk assessments, work prioritization, etc.	2.6	69		
	2.2.39	Knowledge of less than or equal to one-hour Technical Specification action statements for systems.	3.9	70		
	Subtotal			2		
3. Radiation Control	2.3.11	Ability to control radiation releases.	3.8	71		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.4	72		
	Subtotal			2		
4. Emergency Procedures/Plan	2.4.11	Knowledge of abnormal condition procedures.	4.0	73		
	2.4.16	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines	3.5	74		
	2.4.19	Knowledge of EOP layout, symbols, and icons	3.4	75		
	Subtotal			3		
Tier 3 Point Total				10		

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	2												10	2	1	
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3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1 2 / 2 1	3 4 / 2 2	7

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000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1									
000008 (APE 8) Pressurizer Vapor Space Accident / 3									
000009 (EPE 9) Small Break LOCA / 3									
000011 (EPE 11) Large Break LOCA / 3									
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4									
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					✓		AA2.01 Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Makeup: Whether charging line leak exists	3.8	84
000025 (APE 25) Loss of Residual Heat Removal System / 4									
000026 (APE 26) Loss of Component Cooling Water / 8									
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3									
000029 (EPE 29) Anticipated Transient Without Scram / 1									
000038 (EPE 38) Steam Generator Tube Rupture / 3						✓	2.4.21 Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc.	4.6	85
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4									
000054 (APE 54; CE E06) Loss of Main Feedwater /4						✓	2.2.37 Ability to determine operability and/or availability of safety related equipment.	4.6	86
000055 (EPE 55) Station Blackout / 6									
000056 (APE 56) Loss of Offsite Power / 6									
000057 (APE 57) Loss of Vital AC Instrument Bus / 6					✓		AA2.05 Ability to determine and interpret the following as they apply to the Loss of Vital AC Instrument Bus: S/G pressure and level meters	3.8	87
000058 (APE 58) Loss of DC Power / 6									
000062 (APE 62) Loss of Nuclear Service Water / 4									
000065 (APE 65) Loss of Instrument Air / 8						✓	2.2.44 Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.4	88
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6									
(W E04) LOCA Outside Containment / 3									

(W E11) Loss of Emergency Coolant Recirculation / 4									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4					✓		EA2.2 Ability to determine and interpret the following as they apply to the (Loss of Secondary Heat Sink): Adherence to appropriate procedures and operation within the limitations in the facility*s license and amendments.	4.3	89
K/A Category Totals:					3	3	Group Point Total:		6

ES-401	PWR Examination Outline							Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal / 1					✓		AA2.03 Ability to determine and interpret the following as they apply to the Continuous Rod Withdrawal: Proper actions to be taken if automatic safety functions have not taken place	4.8	90
000003 (APE 3) Dropped Control Rod / 1						✓	2.4.8 Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	4.5	91
000005 (APE 5) Inoperable/Stuck Control Rod / 1									
000024 (APE 24) Emergency Boration / 1									
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2									
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7									
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7									
000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8									
000037 (APE 37) Steam Generator Tube Leak / 3									
000051 (APE 51) Loss of Condenser Vacuum / 4									
000059 (APE 59) Accidental Liquid Radwaste Release / 9									
000060 (APE 60) Accidental Gaseous Radwaste Release / 9									
000061 (APE 61) Area Radiation Monitoring System Alarms / 7									
000067 (APE 67) Plant Fire On Site / 8									
000068 (APE 68; BW A06) Control Room Evacuation / 8									
000069 (APE 69; W E14) Loss of Containment Integrity / 5									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4									
000076 (APE 76) High Reactor Coolant Activity / 9					✓		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	3.4	92
000078 (APE 78*) RCS Leak / 3									
(W E01 & E02) Rediagnosis & SI Termination / 3									
(W E13) Steam Generator Overpressure / 4									
(W E15) Containment Flooding / 5									
(W E16) High Containment Radiation /9									
~~(BW A01) Plant Runback / 1~~									
~~(BW A02 & A03) Loss of NNI-X/Y/7~~									
~~(BW A04) Turbine Trip / 4~~									
~~(BW A05) Emergency Diesel Actuation / 6~~									
~~(BW A07) Flooding / 8~~									
~~(BW E03) Inadequate Subcooling Margin / 4~~									

(BW E08; W E03) LOCA Cooldown—Depressurization / 4						✓	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.4	93
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4									
~~(BW E13 & E14) EOP Rules and Enclosures~~									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
~~(CE A16) Excess RCS Leakage / 2~~									
~~(CE E09) Functional Recovery~~									
~~(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4~~									
K/A Category Point Totals:					2	2	Group Point Total:		4

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump														
004 (SF1; SF2 CVCS) Chemical and Volume Control														
005 (SF4P RHR) Residual Heat Removal														
006 (SF2; SF3 ECCS) Emergency Core Cooling								✓				A2.12 Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Conditions requiring actuation of ECCS	4.8	76
007 (SF5 PRTS) Pressurizer Relief/Quench Tank														
008 (SF8 CCW) Component Cooling Water														
010 (SF3 PZR PCS) Pressurizer Pressure Control														
012 (SF7 RPS) Reactor Protection											✓	2.1.20 Ability to interpret and execute procedure steps.	4.6	77
013 (SF2 ESFAS) Engineered Safety Features Actuation														
022 (SF5 CCS) Containment Cooling														
~~025 (SF5 ICE) Ice Condenser~~														
026 (SF5 CSS) Containment Spray														
039 (SF4S MSS) Main and Reheat Steam														
059 (SF4S MFW) Main Feedwater														
061 (SF4S AFW) Auxiliary/Emergency Feedwater											✓	2.4.1 Knowledge of EOP entry conditions and immediate action steps.	4.8	78
062 (SF6 ED AC) AC Electrical Distribution								✓				A2.04 Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Effect on plant of de-energizing a bus	3.4	79
063 (SF6 ED DC) DC Electrical Distribution														

064 (SF6 EDG) Emergency Diesel Generator							✓				A2.03 Ability to (a) predict the impacts of the following malfunctions or operations on the P S; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Parallel operation of ED/Gs	3.1	80
073 (SF7 PRM) Process Radiation Monitoring													
076 (SF4S SW) Service Water													
078 (SF8 IAS) Instrument Air													
103 (SF5 CNT) Containment													
053 ~~(SF1; SF4P ICS*) Integrated Control~~													
K/A Category Point Totals:							3			2	Group Point Total:		5

ES-401	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)											Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive														
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control								✓				A2.10 Ability to (a) predict the impacts of the following malfunctions or operations on the Containment Purge System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Failure of PZR level instrument - high	3.6	81
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel-Handling Equipment											✓	2.4.41 Knowledge of the emergency action level thresholds and classifications.	4.6	82
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control								✓				A2.02 Ability to (a) predict the impacts of the following malfunctions or operations on the SAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Steam valve stuck open	3.9	83
045 (SF 4S MTG) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection														
~~050 (SF 9 CRV*) Control Room Ventilation~~														

K/A Category Point Totals:							2			1	Group Point Total:		3

Facility: Wolf Creek		**Date of Exam: December 2019**				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.3	Knowledge of shift or short-term relief turnover practices.			3.9	94
	2.1.15	Knowledge of administrative requirements for temporary management directives, such as standing orders, night orders, Operations memos, etc.			3.4	95
	Subtotal					2
2. Equipment Control	2.2.12	Knowledge of surveillance procedures.			4.1	96
	Subtotal					1
3. Radiation Control	2.3.7	Ability to comply with radiation work permit requirements during normal or abnormal conditions.			3.6	97
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			3.1	98
	Subtotal					2
4. Emergency Procedures/Plan	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.			4.4	99
	2.4.28	Knowledge of procedures relating to a security event (non-safeguards information).			4.1	100
	Subtotal					2
Tier 3 Point Total						7

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO T2/G1 063 A3.01	010 A3.02	**063 - DC Electrical Distribution** Ability to monitor automatic operation of the DC electrical system, including: Meters, annunciators, dials, recorders, and indicating lights Replaced with 010 A3.02 due to Audit Exam Overlap and fairly narrow K/A. The previous Chief agreed to change in the interest of balance of coverage.
RO T2/G1 064 A2.03	012 A2.06	**064 – Emergency Diesel Generators** Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Parallel operation of ED/Gs. Replaced with 012 A2.06 due to overlap with SRO Only section and oversampling of the 064 K/A. 064 A2.03 is on SRO Only Section so the 064 topic was sampled 3 times before all Tier 2 Group 1 topics were sampled twice. The previous Chief agreed to change in the interest of balance of coverage.
RO T2/G1 026 A1.02	026 A1.01	**026 – Containment Spray** Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CSS controls including: Containment temperature Replaced with 026 A1.01 as there is no Containment Temperature implication for Containment Spray System Operation at Wolf Creek. Containment Spray system is operated based on Containment Pressure, which is covered by K/A 026 A1.01. Will add K/A 026 A1.02 to Wolf Creek K/A Suppression list. The previous Chief agreed to this change.
RO T2/G1 064 K3.01	064 K3.02	**064 – Emergency Diesel Generators** Knowledge of the effect that a loss or malfunction of the ED/G system will have on the following: Systems controlled by automatic loader Replaced with 064 K3.02 due to audit exam overlap. The previous Chief agreed to change in the interest of balance of coverage.
RO T2/G2 001 K5.96	001 K5.97	**001 – Control Rod Drive System** Knowledge of the following operational implications as they apply to the CRDS: Sign changes (plus or minus) in reactivity, obtained when positive reactivities are added to negative reactivities. Replaced with 001 K5.97. The previous Chief agreed to change to aid in creation of a better Operationally valid question at the appropriate discriminatory level of difficulty as Tavg/Tref mismatch is the criteria which controls operation of automatic rod control.

Tier / Group	Randomly Selected K/A	Reason for Rejection
RO T2/G2 034 K6.02	017 K6.01	**034 – Fuel-Handling Equipment** Knowledge of the effect of a loss or malfunction on the following will have on the Fuel Handling System: Radiation monitoring system Replaced with 017 K6.01 based on overlap with audit exam and the SRO Only section. 034 2.4.31 is on the SRO Only section so the 034 topic is sampled twice before all Tier 2/Group 2 K/As are sampled at least once. The previous Chief agreed to change in the interest of balance of coverage.
RO T2/G2 041 A3.02	033 A3.02	**041 – Steam Dump / Turbine Bypass Control** Ability to monitor automatic operation of the SDS, including: RCS pressure, RCS temperature, and reactor power Replaced with 033 A3.02 due to oversampling with SRO Only section. 041 A2.02 is on SRO Only section so the 041 topic is sampled twice before all Tier 2 / Group 2 K/As are sampled at least once. The previous Chief agreed to change in the interest of balance of coverage.
RO T2/G2 028 2.1.25	045 2.1.25	**028 – Hydrogen Recombiner and Purge Control** Ability to interpret reference materials, such as graphs, curves, tables, etc. Replaced with 014 2.1.25 due to inapplicability of the K/A. Hydrogen Recombiners are Retired-in-place at Wolf Creek and there are no graphs, curves, tables to interpret for Hydrogen Purge Control. The previous Chief agreed to change to the Turbine Topic since there are applicable associated operational curves.
RO T1/G1 077 AK2.04	077 AK2.07	**APE 077 – Generator Voltage and Electric Grid Disturbances** Knowledge of the interrelations between Generator Voltage and Electric Grid Disturbances and the following: Controllers, positioners Replaced with APE 077 AK2.07 due to inapplicability of the K/A. There are no controllers, or positioners at Wolf Creek with upgraded Ovation Turbine Control System. Will add K/A 077 AK2.04 to Wolf Creek K/A Suppression list. The previous Chief agreed to this change.
RO T1/G1 WE05 EA2.2	WE04 EA2.1	**WE05 - Inadequate Heat Transfer – Loss of Secondary Heat Sink** Ability to determine and interpret the following as they apply to the Loss of Secondary Heat Sink: Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. Replaced with WE04 EA2.1 due to oversampling with SRO Only section. WE05 EA2.2 is on SRO Only section so WE05 topic is sampled twice before all Tier 1 / Group 1 topics are sampled once. The previous Chief agreed to change in the interest of balance of coverage.

Tier / Group	Randomly Selected K/A	Reason for Rejection
SRO T2/G2 034 2.4.6	034 2.4.41	**034 – Fuel Handling Equipment** Knowledge of EOP mitigation strategies. Replaced with 034 2.4.41 as EOP mitigation strategy for a fuel handling accident is to evacuate containment and place the fuel in a safe condition. This overall mitigative strategy is RO level knowledge. The previous Chief agreed to change to 2.4.41 to support writing an Operationally valid and discriminatory question at the SRO Only level.
SRO T1/G2 APE 076 AA2.05	APE 076 AA2.02	**APE 076 – High Reactor Coolant Activity** Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: CVCS letdown flow rate indication Replaced with APE 076 AA2.02 as the letdown flowrate at Wolf Creek is based on orifice flow lineup, either 75 gpm or 120 gpm, and is independent of Reactor Coolant Activity. Raising flow to 120 gpm, as directed by Chemistry, to maximize flow through Ion Exchanger displays system level knowledge at the RO Level. The previous Chief agreed to change in the interest of asking an Operationally valid discriminatory question based on High Reactor Coolant Activity.
SRO T3 G 2.4.21	G 2.4.22	**Generic 2.4.21** Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. Replaced with 2.4.22 due to overlap with #85. Both questions covered K/A 2.4.21. The previous Chief agreed to change in the interest of balance of coverage.
SRO T3 G 2.4.37	2.4.28	**Generic 2.4.37** Knowledge of the lines of authority during implementation of the emergency plan. Replaced with 2.4.28 due to overlap with audit exam and narrow focus of K/A. The previous Chief agreed to change in the interest of balance of coverage.

ES-301	Administrative Topics Outline	Form ES-301-1

Facility: Wolf Creek Date of Examination: Dec 2019

Examination Level: RO ☒ SRO ☐ Operating Test Number: _____

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,N	Calculate Water addition for Power Ascension
Conduct of Operations	R,D	Determine Final Accumulator Pressure per OFN EJ-015.
Equipment Control	R,N	Develop a Clearance Order for PZR Backup Heaters.
Radiation Control	R,D	Determine RO Responsibilities for a Radioactive Release.

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

* Type Codes and Criteria:

4 (C)ontrol room, (S)imulator, or Class(R)oom
2 (D)irect from bank (**≤ 3 for ROs**; ≤ 4 for SROs and RO retakes)
2 (N)ew or (M)odified from bank (**≥ 1**)
0 (P)revious 2 exams (**≤ 1**, randomly selected)

Facility: Wolf Creek Date of Examination: Dec 2019

Examination Level: RO ☐ SRO ☒ Operating Test Number: _____

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R, N	Given Data and completed 1/M plot, review and determine appropriate actions.
Conduct of Operations	R, M	Given a completed STS SF-002, CORE AXIAL FLUX DIFFERENCE, review and determine any related Technical Specifications
Equipment Control	R, N	Given a prepared Clearance Order for PZR Backup Heaters, review and approve.
Radiation Control	R,M,P	Given a prepared LRW Radioactive Release permit, review and approve.
Emergency Plan	R, N	Given plant conditions, classify the event and determine Protective Action Recommendation.

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

* Type Codes and Criteria:

5 (C)ontrol room, (S)imulator, or Class(R)oom
0 (D)irect from bank (≤ 3 for ROs; **≤ 4 for SROs** and RO retakes)
3/2 (N)ew or (M)odified from bank (**≥ 1**)
1 (P)revious 2 exams (**≤ 1**, randomly selected)

Facility: **Wolf Creek** Date of Examination: **Dec 2019**

Exam Level: RO ☒ SRO-I ☐ SRO-U ☐ Operating Test Number: _____

Control Room Systems:* **8 for RO**, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
S1 Perform a Manual Dilution to maintain power in MODE 1	L, M, S	1
S2 Manually align Containment Spray per EMG E-0, ATT F	A, D, E, EN, P, S	5
S3 Establish Hot Leg Recirculation per EMG ES-13	A, E, EN, N, S	2
S4 Start up 'A' Train CCW and transfer Service Loop.	N, S	8
S5 Cycle PORV Block Valve per STS BB-201A	D, L, S	3
S6 Restore AFW after LSP Actuation per ALR 00-127A	A, D, E, EN, S	4S
S7 Restore RCP Cooling per OFN BB-005	A, D, E, S	4P
S8 Change RM11 Process Rad Monitor Setpoint	M, P, S	9
In-Plant Systems:* **3 for RO**, 3 for SRO-I, and 3 or 2 for SRO-U		
P1 Line up EDG for Autostart per SYS KJ-121	A, D,	6
P2 Open Reactor Trip Breakers as directed by EMG FR-S1	E, N, R	7
P3 Isolate RCP Seals per EMG C-0	D, E, R	4P

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for **RO** /SRO-I/SRO-U
(A)lternate path **5**	**4–6**/4–6 /2–3
(C)ontrol room	
(D)irect from bank **6**	**≤ 9**/≤ 8/≤ 4
(E)mergency or abnormal in-plant **7**	**≥ 1**/≥ 1/≥ 1
(EN)gineered safety feature **3**	**≥ 1**/≥ 1/≥ 1 (control room system)
(L)ow-Power/Shutdown **2**	**≥ 1**/≥ 1/≥ 1
(N)ew or (M)odified from bank including 1(A) **5**	**≥ 2**/≥ 2/≥ 1
(P)revious 2 exams **2**	**≤ 3**/≤ 3/≤ 2 (randomly selected)
(R)CA **2**	**≥ 1**/≥ 1/≥ 1
(S)imulator **8**	

Facility: **Wolf Creek** Date of Examination: **Dec 2019**

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test Number: _____

Control Room Systems:* 8 for RO, **7 for SRO-I**, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
S1 Perform a Manual Dilution to maintain power in MODE 1	L, M, S	1
S2 Manually align Containment Spray per EMG E-0, ATT F	A, D, E, EN, P, S	5
S3 Establish Hot Leg Recirculation per EMG ES-13	A, E, EN, N, S	2
S4 Start up 'A' Train CCW and transfer Service Loop.	N, S	8
S5 Cycle PORV Block Valve per STS BB-201A	D, L, S	3
S6 Restore AFW after LSP Actuation per ALR 00-127A	A, D, E, EN, S	4S
S7 Restore RCP Cooling per OFN BB-005	A, D, E, S	4P

In-Plant Systems:* 3 for RO, **3 for SRO-I,** and 3 or 2 for SRO-U

P1 Line up EDG for Autostart per SYS KJ-121	A, D,	6
P2 Open Reactor Trip Breakers as directed by EMG FR-S1	E, N, R	7
P3 Isolate RCP Seals per EMG C-0	D, E, R	4P

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO / **SRO-I** / SRO-U
(A)lternate path **5**	4–6/**4–6** /2–3
(C)ontrol room	
(D)irect from bank **6**	≤ 9/**≤ 8**/≤ 4
(E)mergency or abnormal in-plant **7**	≥ 1/**≥ 1**/≥ 1
(EN)gineered safety feature **3**	≥ 1/**≥ 1**/≥ 1 (control room system)
(L)ow-Power/Shutdown **2**	≥ 1/**≥ 1**/≥ 1
(N)ew or (M)odified from bank including 1(A) **4**	≥ 2/**≥ 2**/≥ 1
(P)revious 2 exams **1**	≤ 3/**≤ 3**/≤ 2 (randomly selected)
(R)CA **2**	≥ 1/**≥ 1**/≥ 1
(S)imulator **8**	

Facility: **Wolf Creek**	Date of Examination: **Dec 2019**
Exam Level: RO ☐ SRO-I ☐ SRO-U ☒	Operating Test Number:

Control Room Systems:* 8 for RO, 7 for SRO-I, and **2** or 3 **for SRO-U**

System/JPM Title	Type Code*	Safety Function
S1 Perform a Manual Dilution to maintain power in MODE 1	L, M, S	1
S2 Manually align Containment Spray per EMG E-0, ATT F	A, D, E, EN, P, S	5

In-Plant Systems:* 3 for RO, 3 for SRO-I, and **3** or 2 **for SRO-U**

P1 Line up EDG for Autostart per SYS KJ-121	A, D,	6
P2 Open Reactor Trip Breakers as directed by EMG FR-S1	E, N, R	7
P3 Isolate RCP Seals per EMG C-0	D, E, R	4P

* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.

* Type Codes	Criteria for RO /SRO-I/**SRO-U**
(A)lternate path **2**	4–6/4–6 /**2–3**
(C)ontrol room	
(D)irect from bank **3**	≤ 9/≤ 8/**≤ 4**
(E)mergency or abnormal in-plant **3**	≥ 1/≥ 1/**≥ 1**
(EN)gineered safety feature **1**	≥ 1/≥ 1/**≥ 1 (control room system)**
(L)ow-Power/Shutdown **1**	≥ 1/≥ 1/**≥ 1**
(N)ew or (M)odified from bank including 1(A) **2**	≥ 2/≥ 2/**≥ 1**
(P)revious 2 exams **1**	≤ 3/≤ 3/**≤ 2 (randomly selected)**
(R)CA **2**	≥ 1/≥ 1/**≥ 1**
(S)imulator **2**	

Facility: Wolf Creek Scenario No.: 1 Op-Test No.: December 2019

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 4% Power, BOL, Yellow Train In Service, 'A' MFP Running, 'A' RHR Pump out of service.

Turnover: The unit is operating at 4% power, BOL with 'A' MFP in service. Power ascension is on hold due to emergency work on 'A' RHR Pump. 'A' RHR Pump is tagged out and is expected to be restored to service in 1 hour. LCO 3.5.2, COND A was entered. Maintain current power level while the crew briefs entry to MODE 1. MCB Annunciators 103D and E are listed on the White Board.

Critical Tasks: **CT-1** Manually start either 'A' or 'C' CCW Pump after SIS. **CT-2** Close either BG HIS-8160 or BG HIS-8152 to isolate CTMT. **CT-3** Initiate Cooldown of the RCS prior to RWST Level dropping below 68% per EMG C-11.

Event No.	Malf. No.	Event Type*	Event Description
1		C (BOP/CRS)	AE FK-560, 'B' S/G Feed Reg Bypass Valve fails OPEN in Auto, Manual Available ALR 00-109B
2		C (ATC/CRS) Tech Specs	Loss of bus NN03 OFN NN-021 LCO 3.8.9 COND C
3		I (ATC/CRS) Tech Specs	BB LI-459, Upper Selected PZR Level Channel fails HIGH. OFN SB-008, ATT J LCO 3.3.1, Functions 9, CONDs A, M
4		R (All)	AB UK-33, Steam Dump Cooldown CTRL fails HIGH in Auto AP15C-003
5		M (All)	Earthquake, Large Break LOCA (6") on Loop 4 Cold Leg EMG E-0, EMG E-1
6		C (ATC)	Three Valves fail to Auto Close on CISA EMG E-0, ATT F, Step F3
7		C (BOP)	Both Red Train CCW Pumps fail to autostart on SIS EMG E-0, ATT F, Step F6
8		C (None)	'B' RHR Pumps trips on SIS EMG C-11

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

Target Quantitative Attributes per Scenario (See Section D.5.d)		Actual Attributes
1.	Malfunctions after EOP entry (1–2)	3
2.	Abnormal events (2–4)	4
3.	Major transients (1–2)	1
4.	EOPs entered/requiring substantive actions (1–2)	2
5.	Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	1
6.	Preidentified critical tasks (≥ 2)	3

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT1: Close containment isolation valves such that at least one valve is closed on each critical Phase-A penetration before completion of EMG E-0, Attachment F.	The non-essential containment penetrations are isolated to prevent potential release of radioactive materials from containment.	Red lights lit on *BG HIS-8160 *BG HIS-8152 ESFAS Status PANEL CISA Section White Lights NOT LIT. *BGHV8152 (Red) *BGHV8160(Yellow)	On Panel RL001, Depress CLOSE on: *BG HIS-8160 *BG HIS-8152	Green lights lit on *BG HIS-8160 *BG HIS-8152 ESFAS Status Panel CISA Section White Lights all lit.
CT2: Manually start A or C CCW pump to cool Red Train ECCS equipment within 30 minutes to prevent the loss of ECCS pumps.	Failure to maintain CCW flow to ECCS components would result in a reduction of margin of safety due to loss of Red Train caused only by improper crew response.	Green lights are lit on both Yellow train hand switches * EG HIS-21 and * EG HIS-23.	On Panel RL-019, Manually start one Yellow Train CCW Pump. Either: * EG HIS-21 or * EG HIS-23.	Red Light on the manipulated hand switch, * EG HIS-21 or * EG HIS-23.
CT3 Initiate RCS Cooldown To Cold Shutdown before RWST level reaches the unacceptable region of EMG C-11, Figure 1 (68%).	Reduce the need for supporting plant systems and equipment required for heat removal	EMG C-11, Step 14 procedure direction.	Manipulation of S/G ARVs * AB PIC-1A * AB PIC-2A * AB PIC-3A * AB PIC-4A Or TDAFWP Pump at Max Load	Monitor NPIS Cooldown Rate <100F established or verified to exist by the crew.

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.

SCENARIO # 1 NARRATIVE

Turnover: The Unit is operating at 4% power, BOL with 'A' MFP in service. Power ascension is on hold due to emergent work on 'A' RHR Pump. 'A' RHR Pump is tagged out and is expected to be restored to service in 1 hour. LCO 3.5.2 COND A was entered. Maintain current power level while the crew briefs for entering MODE 1. Annunciators 103D and 103E are written on the White Board.

Event 1: AE FK-560, 'B' MFRV Bypass valve fails OPEN in Auto. Level in 'B' S/G rises. Annunciator 109B will actuate if level rises to 55%. The BOP and CRS will respond using ALR 00-109B to take Manual Control and restore level. After plant conditions are stable, the next event will start as directed by the Lead Examiner.

Event 2: Loss of bus NN03. Annunciators 027A and 027C will actuate, indicating a loss of instrument bus power, as well as multiple annunciators that are symptoms of that power loss. Partial Trip Status PERMIS/BLOC Panel, SB-069, will also show columns of white lights for the loss of NN03 powered equipment. The CRS will direct "Select out Blue" which will prompt which will prompt ATC and BOP Operators to select alternate channels as memory actions. The ATC will select manual on the PZR Master Pressure Controller before selecting an alternate channel to prevent lifting a PORV. The BOP will manually isolate 'C' ARV. The crew will perform OFN NN-021 and dispatch the Turbine Building Watch to investigate the loss of power, which was due to a maintenance worker inadvertently bumping open breaker NN0301. Closing this breaker restores power to NN03. Once the crew has reenergized the bus and determined applicable technical specifications, the next event will start as directed by the Lead Examiner.

Event 3: BB LI-459, Upper Selected PZR Level Channel fails HIGH. Annunciator 032A will actuate for high PZR Level and charging flow will lower, causing actual PZR level to lower. The crew will address using OFN SB-008, ATTACHMENT J. Once the CRS has determined applicable Technical Specifications, the next event will start as directed by the Lead Examiner.

Event 4: AB UK-33, Steam Dump Cooldown Controller fails HIGH in Auto. Controller Failure will be diagnosed by AB UK-33 output rising to 100% and the three Steam Dump Valves, AB UV34, AB UV-45 and AB UV41 fully opening. As a result of the steam dump valves opening, Tavg will drop, adding positive reactivity which will cause inadvertent MODE change to MODE 1 without prompt Operator Action. S/G Levels rise due to swell causing MCB Annunciators 109B-111B to actuate. The BOP should take manual control of the failed AB UK-33 controller per AP15C-003, Manual Back-up to stabilize plant conditions. Once plant conditions are stable, the Major event will start as directed by the Lead Examiner.

Event 5: Earthquake, Large Break LOCA (6") on Loop 4 Cold Leg. The earthquake will be felt and associated annunciators will all actuate (98B, 98D, 98E). The crew will diagnose RCS pressure and PZR Level lowering, as well as degrading conditions in CTMT, and manually trip the Reactor, actuate SI and perform EMG E-0 Immediate Actions. The next three post-trip events will also be addressed by the crew.

Event 6: Three CTMT Isolation Valves fail to close on CISA. (BG HV-8160, BG HV-8152, and KA HIS-29). This failure will be indicated on the ESF SYS Status Indication boards. The ATC, while performing EMG E-0, ATTACHMENT F should manually close one of the two valves Letdown valves to isolate the open path from CTMT while performing Step F3. The failure of KA HIS-29 supports the critical task as BG HIS-8160 fails closed on a loss of air to containment.
CT1: Close containment isolation valves such that at least one valve is closed on each critical phase-A penetration before completion of EMG E-0, Attachment F.

Event 7: Both Red Train CCW Pumps fail to Auto Start on SIS. The BOP, after completing Immediate Actions, should note no operating CCW Pump running to cool Red Train Safety Loads and manually start either 'A' or 'C' CCW Pumps. The ATC also has guidance per EMG E-0, ATTACHMENT F, Step F6, to manually start one of the two pumps if one is NOT running at that time.

CT2: Manually start 'A' or 'C' CCW pump to cool Red Train ECCS equipment within 30 minutes to prevent the loss of ECCS pumps.

Event 8: 'B' RHR pump trips on SIS. This failure combined with the unavailability of the 'A RHR pump will cause the crew to transition from EMG E-1 to EMG C-11 to conserve the remaining RWST inventory and mitigate the loss of Cold Leg Recirc Capability.
CT3: Initiate RCS Cooldown to Cold Shutdown before RWST level reaches the Unacceptable Region of EMG C-11, Figure 1 (68%).

The scenario is complete when the crew has initiated RCS Cooldown to Cold Shutdown per EMG C-11 and/or at the discretion of the Lead Examiner.

SIMULATOR SCENARIO FILES

;2019 ILO NRC Exam, Scenario 1

;Initial Conditions – IC301, 4% Power, BOL, RHR Pump 'A' OOS for emergent work (For Scenario)
ICR bkrNB00101 t:2

;Event 1 – Key 1 'B' Feed Reg Bypass Valve AE FK-560 fails OPEN in Auto, Manual Available (BOP, CRS)
IMF mAE20B f:100 r:10 k:1

;Event 2 – Key 2 Loss of Bus NN03 (ATC/CRS, Tech Specs)
IMF mNN03 i:-1 f:-1 k:2

;Event 3 – Key 3 – BB LI-459, Upper Selected PZR Level Channel fails HIGH (ATC/CRS, Tech Specs)
IMF mBB22A f:100 r:30 k:3

;Event 4 – Key 4 – AB UK-33, Steam Dump Cooldown CTRL fails HIGH in Auto (Reactivity)
IMF mAB08 f:100 r:60 k:4

;Event 5 - Key 5 - Earthquake, Large Break LOCA (6") on Loop 4 Cold Leg (Major)
IMF mSG01 f:60 k:5
IMF mBB06D f:6 r:60 k:5

;**Event 6** – Three CISA Valves fail to Auto Close (ATC - CT)
IMF mSA27KA01
IMF mSA27BG07
IMF mSA27BG08

;Event 7 –Both Red Train CCW Pumps fail to autostart on SI (BOP - CT)
{jpplsi} IMF mEG14A
{jpplsi} IMF mEG14C

;Event 8 – 'B' RHR Pump Trips on SI (For EMG C-11 Scenario)
{jpplsi} ICM bkrNB00204 t:1 d:0

;Local Action – **Key 9** - Reenergize Bus NN03
{Key[9]} DMF mNN03

;Local Action – Key 10 – Acknowledge alarms on NK03
{Key[10]} var jdalmack(3)=1
{Key[10]} var jdalmack(3)=0

;Local Action – **Key 11 -** Turbine Building Watch Locally closes breakers for BAT pumps.
{Key[11]} IRF rBG40A f:1
{Key[11]} IRF rBG40B f:1 d:30

;Local Action - **Key 12 -** Aux Building Watch locally closes breaker for BG HV-8104
{Key[12]} IRF rBG41 f:1

;End

Booth Instructions

Ensure NRC Exam Security Established per AIF 30B-015-09, and AIF 30B-015-18

Ensure the following procedures are available, free of markings and are the most recent revision in Curator (7/9/19):

- **ALR 00-109B, SG B LEV DEV (Rev 10A)**
- **ALR 00-109C, SG B FLOW MISMATCH (Rev 11A)**
- **OFN SB-008, INSTRUMENT MALFUNCTIONS (Rev 48)**
- **OFN SB-008, ATTACHMENT J, PZR LEVEL MALFUNCTION**
- **OFN NN-021, LOSS OF VITAL 120 VAC INSTRUMENT BUS (Rev 29)**
- **EMG E-0, REACTOR TRIP OR SAFETY INJECTION (Rev 40)**
- **EMG E-1, LOSS OF REACTOR OR SECONDARY COOLANT (Rev 29)**
- **EMG C-11, LOSS OF EMERGENCY COOLANT RECIRCULATION (Rev 30)**

NOTE: All events are loaded into snap **IC301**

Ensure malfunctions, including severity levels match scenario.

Ensure all meters, lamps, bistables and annunciators are correct for the initial setup. **Blue Placard is on the 'A' CCP and 'A' RHR Pump handswitch EJ HIS-1 is in PTL with Caution tag affixed.**

Ensure soft panel display in back is set to RP312 RCP Vibration on left screen and AMSAC on right screen.

Ensure no discernable history from RM11, Ovation screens, paper trend recorders, etc.

Ensure all laminated brief sheets, foldout pages, E plan boards are wiped clean.

Ensure all follow-up buttons are removed from the boards and trash cans and recycle bins are free of any potential exam material.

Ensure communications are established with the lead examiner, fresh batteries, radio check sat.

Critical Parameter Data to be collected:

- **Time from SIS Actuation until either A or C CCW Pump is Manually Started.** The crew must manually start either Red Train CCW Pump within 30 minutes to restore Red Train ECCS cooling.
- **RWST Level, BN LR-930.** The crew must commence a cooldown to cold shutdown per EMG C-11 prior to reaching Unacceptable level of 68% in RWST Level.

Ensure Horns are ON and machine is in RUN

Insert Key 1 for Event 1 (AE FK-560, 'B' S/G FRV Bypass fails OPEN

.

Insert Key 2 for Event 2 (Loss of Bus NN03).
When directed to shut breaker NN0301, **Insert Key 9**
When directed to Locally Acknowledge alarms on NK03, **Insert Key 10**

Insert Key 3 for Event 3 (BB LI-459 Upper Selected PZR Level channel fails HIGH)

Insert Key 4 for Event 4 (AB UK-33 fails HIGH in Auto)
Insert Key 5 for Major Event (Earthquake, Large Break LOCA on D Cold Leg, CISA valves fail to close, Red Train CCW Pumps fail to auto start on SI, 'B'RHR Pump trips on SI)
When directed to reset and close breakers for BAT pumps, **Insert Key 11**
When directed to reset and close breaker for BG HV-8104, **Insert Key 12**

Facility: Wolf Creek Scenario No.: 2 Op-Test No.: December 2019

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 100% Power, MOL, Yellow Train In Service, 'A' EDG Out service, LCO 3.8.1, COND B is entered.

Turnover: The unit is operating at 100% power, MOL Yellow Train is in Service, 'A' EDG is out of service due to repairs on the Auxiliary Lube Oil Pump. LCO 3.8.1 Condition B is entered (Actions B.1 and B.2 are current. STS NB-005 was performed 3 hours ago).

Critical Tasks: **CT-1** Manually Trip the Reactor per EMG FR-S1 **CT-2** Isolate Feed flow to Faulted 'A' S/G. **CT-3** Terminate SI prior to Rupturing PRT.

Event No.	Malf. No.	Event Type*	Event Description
1		C (ATC/CRS) Tech Specs	Breaker 4-16 to Bus SL-41 Trips, Loss of power to 'A' SW Pump. ALR 00-011D, ALR 00-08B, TR 3.7.8, COND A
2		I (BOP/CRS)	AE FI-520, B S/G Feed Flow Channel fails LOW. OFN SB-008, ATT E.
3		R (All)	'B' HDP Trips, Downpower to 95% OFN AF-025, OFN MA-038
4		I (BOP/CRS) Tech Specs	AC PT-505, Turbine Impulse Pressure Channel fails LOW OFN SB-008, ATT D LCO 3.3.1, Function 18.f, Conditions A, T
5		M (All)	'D' RCP Trips, Reactor Fails to Trip in both Auto and Manual (ATWS) EMG FR-S1
6		C (BOP)	'A' MDAFW Pump fails to Auto start EMG FR-S1, Step 3
7		C (ATC)	Two S/G Safeties on 'A' S/G fail to close (Faulted S/G), SI Actuates on 'A' Train ONLY. EMG E-0, Step 4, EMG E-2, EMG ES-03
8		C (ATC)	CRVIS Fails to Auto Actuate on SI EMG E-0, ATT F, Step F10

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

Target Quantitative Attributes per Scenario (See Section D.5.d)		Actual Attributes
1.	Malfunctions after EOP entry (1–2)	3
2.	Abnormal events (2–4)	4
3.	Major transients (1–2)	1
4.	EOPs entered/requiring substantive actions (1–2)	3
5.	Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	1
6.	Preidentified critical tasks (≥ 2)	3

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT 1: Given an ATWS, insert negative reactivity into the core by at least one of the following methods prior to dispatching operators to locally trip the reactor: • De-energize the control rod drive MG sets • Manually Insert control rods	Failure to insert negative reactivity by one of the methods listed can result in the needless continuation of an extreme or a severe challenge to the subcriticality CSF. The safeguards systems that protect the plant during accidents are designed assuming that only decay heat and pump heat are being added to the RCS.	1) Red first out annunciator 86A lit with indications of loss of RCS flow on one loop. 2) On Panel RL-004, Red lights lit for Reactor Trip Breakers *SB ZL-1 *SB ZL-2 3) On DRPI panel, ALL Rods out. 4) Reactor Not Manually Tripped after actuating Handswitches *SB HS-1 *SB HS-42 5) Reactor Power ≥5%	On Panel RL-004 RO inserts rods in MANUAL using * SF HS-2 On Panel RL-016, BOP/3rd RO opens breakers: *PG HIS-16 *PG HIS-18 When all rod bottom lights lit, RO recloses breakers: * PG HIS-16 * PG HIS-18	1) On DRPI panel, All Rod Bottom lights lit. 2) Reactor Power <5% on PR NIs. 2) Reactor power lowering on IR NI detectors * SE NI-34B * SE NI36B 3) Negative IR SUR *SE NI-35D *SE NI-36D
CT 2: Isolate feed flow into and steam flow from the Faulted 'A' S/G before ANY RCS Cold Leg temperature reaches 240°F.	Failure to isolate steam from and feed to a faulted S/G causes an unnecessary and avoidable challenge to the Integrity CSF due only to improper response by the crew.	S/G pressures, flows and level indications will make it possible to identify 'A' S/G as the faulted S/G. Reports from the field help identify safety valves have lifted.	Manipulates closed the following hand switches On Panel RL-005, ○ AL HK-7A AL HK-8A	On panel RL-005, AL HK-7A and 8A in the left latch detent position. Indicated flow on AL FI-2A is 0 lbm/hr

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT 3: Isolate high head ECCS flow through the BIT before overfill of the RCS results in a rupturing of the pressurizer relief tank (PRT)	Continued maximum injection causes RCS to go solid and PORV to open, passing excess inventory through PORVs to the PRT. Failure to terminate ECCS flow when it is possible to do so results in a rupture of the PRT, spread of radioactive coolant into Containment, and constitutes an avoidable degradation of a fission product barrier, as well as additional risk of stuck open PORV (SBLOCA).	RCS pressure and pressurizer level rise. PORVs open, flow indicated. PRT level, pressure, and temperature rise. When PRT ruptures at ~91 psig, PRT pressure drops and equalizes with Containment Pressure.	The Operator will isolate the BIT per EMG ES-03, Step 13, by Manipulation of the following handswitches on Panel RL018. *EM HIS-8803A *EM HIS-8803B *EM HIS-8801A *EM HIS-8801B	Green lights LIT and red lights extinguished for the following valves: *EM HIS-8803A *EM HIS-8803B *EM HIS-8801A *EM HIS-8801B CCP To BIT Flow indicators drop to 0 GPM. *EM FI-917A *EM FI-917B

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.

SCENARIO # 1 NARRATIVE

Turnover: The Unit is operating at 100% power. Yellow Train is in service. 'A' EDG is out of service due to repairs on the Auxiliary Lube Oil pump. LCO 3.8.1 Condition B is entered (Actions B.1 and B.2 are current. STS NB-005 was performed 3 hours ago)

Event 1: Breaker 4-16 Trips, Loss of Bus SL-41 and 'A' SW Pump. The crew will dispatch an Operator to investigate loss of bus SL-41 per ALR 00-011D and start 'B' SW pump per ALR 00-08B to restore Service Water System pressure to >85 psig. Once the CRS has determined TRM 3.7.8 is applicable for loss of 'A' SW Pump, the next event will start as directed by the Lead Examiner.

Event 2: B S/G Feed Flow Channel indicator AE FI-520 fails LOW. The crew will respond by taking manual control of AE FK-520, B FRV to match feed and steam flows per ALR 00-109C and then address the instrument failure per OFN SB-008, ATT C. Once the Crew has restored automatic control, the next event will start as directed by the Lead Examiner.

Event 3: 'B' HDP Trips. Per OFN AF-025, ATTACHMENT A, Maximum unit load is at 95% for one HDP out of service. The crew will reduce load per OFN MA-038 and beginning of shift reactivity brief. Once reactor power has stabilized at the new lower power level, the next event will start as directed by the Lead Examiner.

Event 4: Turbine First Stage Pressure indictor AC PT-505 fails LOW. After confirming no load reject is in progress, the ATC operator will take rods to manual to stop inward rod motion. The crew will address the failure per OFN SB-008, ATT D. Once the CRS has determined applicable technical specifications, the next event will start at the direction of the Lead Examiner.

Event 5: 'D' RCP spuriously trips and the Reactor fails to Trip in BOTH Auto and Manual. The loss of flow causes multiple MCB alarms, including a Red First Out 86A, which indicates the reactor should have tripped due to RCS flow <89.9% on 3/3 loop flow instruments on1/4 RCS Loops while Reactor Power >48% (P8). After the crew attempts to manually trip the reactor unsuccessfully, they will perform Immediate Actions of EMG FR-S1, to open RDMG breaker power supplies for PG19 and PG20 to trip the Reactor.

CT 1: Given an ATWS, insert negative reactivity into the core by at least one of the following methods prior to dispatching operators to locally trip the reactor:

- De-energize the control rod drive MG sets
- Manually Insert control rods.

Event 6: 'A' MD AFW Pump fails to Auto Start. The BOP will manually start 'A' MDAFW Pump per EMG FR-S1, Step 3 RNO.

Event 7: Two S/G Safety Valves will fail open on 'A' S/G and SI will actuate on 'A' Train ONLY: As soon as the Reactor trips. Safety valves will lift on 'A', 'B' and 'C' S/Gs. The Safety valves will reseat on 'B' and 'C' S/Gs, while 'A' S/G safety valve stick open. SI will actuate on 'A' Train ONLY and steam flow noises will be heard in the control room. Once the crew closes MSIVs, the 'A' faulted S/G will be more evident. The ATC will Manually Actuate SI on 'B' Train during performance of EMG E-0 Immediate actions before the crew continues in EMG E-0 to verify proper SI Auto actuation and then transition to EMG E-2 to address the faulted 'A' S/G.

CT 2: Isolate feed flow into and steam flow from the Faulted 'A' S/G before ANY RCS Cold Leg temperature reaches 240°F.

Event 8: CRVIS Fails to Actuate in Auto on both trains. The ATC will manually actuate CRVIS using handswitches SA HS-09 and SA HS-13, per EMG E-0, ATTACHMENT F, Step 10.

Once the crew isolates the Faulted S/G per EMG E-2, they will transition to EMG ES-03 to terminate SI.
CT 3: Isolate high head ECCS flow through the BIT before overfill of the RCS results in a rupturing of the pressurizer relief tank (PRT)

The scenario is complete when the crew has Terminated SI flow and verified ECCS Flow is NOT required per EMG ES-03, Step 18 and/or at the discretion of the Lead Examiner.

SIMULATOR SCENARIO FILES

;2019 ILO NRC Exam, Scenario 2

;Initial Conditions – 'A' EDG Out of Service for TSEO, LCO 3.8.1, Cond B is entered. (For Predictability)
scn SimGroup\TAGDGA

;Event 1 – Key 1 – Loss of Bus SL-41 ('A' SW Pump) (ATC/CRS-TS)
ICM bkrSL4_16 t:1 d:0 k:1

;Event 2 – Key 2 – AE FI-520,'B' S/G Feed Flow fails LOW (BOP/CRS)
IMF mAB01B1 f:0 r:30 k:2

;Event 3 – Key 3 – 'B' HDP Trips (Reactivity)
ICM bkrDPAF01B t:1 d:0 k:3

;Event 4 – Key 4 – AC PT-505 fails LOW (BOP/CRS - TS)
ICM trACPT0505 t:1 d:0 k:4

;Event 5 – Key 5 – 'D' RCP Spuriously Trips, Reactor Fails to Trip in Auto and Manual (Major)
ICM bkrPA00204 t:1 d:0 k:5
IMF mSF17A
IMF mSF17B

;Event 6 – 'A' MD AFW Pump fails to start on Reactor Trip (BOP – Not CT)
{jpplp4} IMF mAL04A i:-1 f:-1

;Event 7 – Two S/G Safeties on 'A' S/G fail to reseat after opening on ATWS, SI Train B Fails to Auto Actuate (ATC – Not CT)
{abp0514>1100} IMF mAB05A f:200 d:60 r:15
IMF mSA14B f:1

;Event 8 – CRVIS fails to auto actuate (ATC - Not CT)
IMF mSF20A
IMF mSF20B

;Local Action – Key 9 – Open Reactor Trip Breakers
{Key[9]} IRF rSF03A f:1
{Key[9]} IRF rSF03B f:1 d:10

Booth Instructions

Ensure NRC Exam Security Established per AIF 30B-015-09, and AIF 30B-015-18

Ensure the following procedures are available, free of markings and are the most recent revision in Curator (7/9/19):

- **ALR 00-008B, SERV WTR PRESS HILO (Rev 18)**
- **ALR 00-011D, SL41 BUS TROUBLE (Rev 6)**
- **ALR 00-109B, SG B LEV DEV (Rev 10A)**
- **ALR 00-109C, SG B FLOW MISMATCH (Rev 11A)**
- **OFN SB-008, INSTRUMENT MALFUNCTIONS (Rev 48)**
- **OFN SB-008, ATTACHMENT D, TURBINE IMPULSE PRESSURE CHANNEL MALFUNCTION**
- **OFN SB-008, ATTACHMENT E, FEEDWATER FLOW CHANNEL MALFUNCTION**
- **OFN AF-025, UNIT LIMITATIONS (Rev 56)**
- **OFN MA-038, RAPID PLANT SHUTDOWN (Rev 30)**
- **EMG FR-S1, RESPONSE TO NUCLEAR POWER GENERATION/ATWS (Rev 23B)**
- **EMG E-0, REACTOR TRIP OR SAFETY INJECTION (Rev 40)**
- **EMG E-2, FAULTED STEAM GENERATOR ISOLATION (Rev 22)**
- **EMG ES-03, SI TERMINATION (Rev 26)**

NOTE: All events are loaded into snap **IC302**

Ensure malfunctions, including severity levels match scenario.

Ensure all meters, lamps, bistables and annunciators are correct for the initial setup. **Blue Placard is on the 'A' CCP and Caution Tags hanging for 'A' EDG on KJ HS-8A, and NE HIS-25 (in PTL). Green placard for STS NB-005 posted, showing time due in 5 hours.**

Ensure soft panel display in back is set to RP312 RCP Vibration on left screen and **AMSAC** on right screen.
Ensure no discernable history from RM11, Ovation screens, paper trend recorders, etc.
Ensure all laminated brief sheets, foldout pages, E plan boards are wiped clean.
Ensure all follow-up buttons are removed from the boards and trash cans and recycle bins are free of any potential exam material.

Ensure communications are established with the lead examiner, fresh batteries, radio check sat.

Critical Parameter Data to be collected:

- **Cold Leg Temperature.** The crew must isolate feed flow to faulted 'A' S/G prior to RCS Cold Leg Temperatures reach 240°F.
- **PRT Pressure** The crew must terminate SI by closing the BITS before rupturing the PRT at 91psig.

Ensure Horns are ON and machine is in RUN

Insert Key 1 for Event 1 (Breaker 4-16, feeder to bus SL-4 Trips, 'A' SW Pump without power).

Insert Key 2 for Event 2 ('B' S/G Feed Flow fails LOW).

Insert Key 3 for Event 3 ('B' Heater Drain Pump Trips)

Insert Key 4 for Event 4 (AC PT-505 fails LOW)

Insert Key 5 for Major Event ('D' RCP Spuriously trips, Reactor fails to trip, 'A' MDAFW Pump fails to auto start, Two Safeties 'A' S/G fail open, B SI fails to Auto Actuate, CRVIS fails to Auto Actuate)
When directed to open RTBs, **Insert Key 9**

Facility: _Wolf Creek_____ Scenario No.: ____3_____ Op-Test No.: December 2019

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 59% Power, MOL, Yellow Train In Service, Benton Line is out of service.

Turnover: The unit is operating at 59% power, MOL Yellow Train is in Service, Benton Line is removed from service to replace multiple damaged poles.

Critical Tasks: **CT-1** ALL CLOSE MSIVs to isolate steam to the Turbine **CT-2** Given an open ARV on the Ruptured 'C' S/G, Isolate Feed flow and steam from Ruptured 'C' S/G. **CT-3** Depressurize the RCS per EMG E-3 to minimize break flow prior to overfilling the Ruptured 'C' S/G.

Event No.	Malf. No.	Event Type*	Event Description
1		I (ATC/CRS) Tech Specs	BB TI-421, Loop 2 TC Instrument channel fails LOW OFN SB-008, ATT L LCO 3.3.1, Functions 6 and 7, Conditions A, E
2		R (All)	'B' Stator Water Pump Trips, 'A' Stator Water Pump fails to Auto Start, Turbine Runback ALR 00-112C, OFN MA-001
3		C (ATC/CRS)	NCP Shaft Shears ALR 00-042E
4		I (BOP/CRS)	AE PT-508, Feed Header Pressure channel fails LOW OFN SB-008, ATT B
5		M (ALL) Tech Specs	S/G Tube leak that grows to 500 gpm SGTR OFN BB-07A, EMG E-0, EMG E-3 LCO 3.4.13, Condition B
6		C (BOP)	Turbine fails to trip in both Auto and Manual, MSIV ALL CLOSE Push Button Works. EMG E-0, Step 2
7		C (BOP)	'C' ARV opens to 20% on Reactor Trip, Closes Manually AP 15C-003, EMG E-3, Step 3.b
8		C (ATC)	'B' SI Pump fails to autostart on SI EMG E-0, ATT F, Step F5.b

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

Target Quantitative Attributes per Scenario (See Section D.5.d)		Actual Attributes
1.	Malfunctions after EOP entry (1–2)	3
2.	Abnormal events (2–4)	4
3.	Major transients (1–2)	1
4.	EOPs entered/requiring substantive actions (1–2)	1
5.	Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	0
6.	Preidentified critical tasks (≥ 2)	3

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT1, Manually ALL CLOSE main steamline isolation valves before a severe (orange-path) challenge develops to either the subcriticality (Positive IR SUR) or the integrity CSF (RCS Cold Leg Temperature <240°F)	Failure to isolate steam to the turbine given failure of auto and manual turbine trips will cause an unnecessary uncontrolled cooldown and avoidable challenges to the subcriticality and Integrity CSFs due only to lack of proper response by the crew.	Main Stop valves remain open despite reactor trip, and manual turbine trip.	On Panel RL-006 Manipulates either of the following handswitches: * AB HS-78 * AB HS-80	Green lights LIT on ○ AB HIS-14 ○ AB HIS-17 ○ AB HIS-20 ○ AB HIS-11 Indicated steam flow will drop to 0 MPPH on all four S/Gs.
CT2 Given an open ARV on ruptured S/G, Isolate feed flow into and steam flow from the ruptured 'C' S/G in time to prevent a transition to EMG E-2 or EMG C-31.	Feedwater is isolated to prevent overfill of ruptured SG. Steam flow out of SG is isolated to minimized radiological release. It also maintains ruptured S/G pressure higher than non-ruptured, which prevents transition from E-3, the preferred procedure, to C-31, which will release radiation to the public.	Radiation Monitor alarms, S/G levels and S/G pressures make it possible to identify S/G 'C' as ruptured.	Manipulate controls as required to: * Close AB PIC-3A * Close AB HIS-17 * Close AL HK-9A and 10A Dispatch Operator to close * AB V087 * AB-V082	Green light on *AB HIS-17 0% output: *AL HK-10A *AL HK-9A *AB PIC-3A Report from Local Operator that valves are closed: *AB V-087 *AB V-082
CT3 Depressurize the RCS to meet the following SI termination criteria: • RCS subcooling > 30F • RCS pressure stable or rising • PZR level >6% prior to overfilling the ruptured S/G (90% WR).	Depressurizing the RCS to equalize with Ruptured S/G pressure prior to overfilling the ruptured S/G minimizes radioactive release to the environment from the ruptured S/G, minimizes stress to the Main Steam Lines, and allows for a subcooled recovery vice a potential saturated recovery.	S/G Level rising in an uncontrolled manner with feed flow isolated. Radiation monitor alarms	Manipulation of controls as required to depressurize the RCS.	RCS Pressure reducing in a controlled manner, subcooling maintained, leak rate to ruptured S/G drops, PZR Level >6%, Ruptured S/G Level <90% WR.

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.

SCENARIO # 1 NARRATIVE

Turnover: The Unit is operating at 59% power. Yellow Train is in service. Benton Line is out of service to replace several damaged poles.

Event 1: Loop 2 TC instrument, BB TI-421) Fails LOW. There is no automatic plant response due to the channel failure in the low direction. Multiple MCB Annunciators will actuate, including 067D, LOOP 2 T AVG LO DEV which will help the crew diagnose which instrument failed. The crew will address the instrument failure using OFN SB-008, ATT L. Once the crew has evaluated technical specifications, the next event will start at the direction of the Lead Examiner.

Event 2: 'B' Stator Water Pump Trips and 'A' Stator Water Pump fails to Auto start. An automatic runback of the turbine will occur. The crew will address the runback per ALR 0112C and/or OFN MA-001. Once the crew has started 'A' Stator Water Pump, and stabilized plant conditions, the next event will start at the direction of the Lead Examiner.

Event 3: NCP Shaft shears. Annunciator 42A will actuate for low charging flow. The crew should identify no NPC discharge pressure or flow and manually secure the NCP, isolate letdown, and charge to seals only. ALR 00-042E could be used to swap to CCP 'B' and restore letdown, or the crew may choose to use SYS BG-201 to restore charging and letdown. Once the crew has placed 'B' CCP in service and restored letdown, the next event will start at the direction of the Lead Examiner.

Event 4: AE PT-508, Feed water header pressure channel fails LOW. In response to rising MFP speed, rising feed water flow and rising S/G levels, the BOP should take manual control of MFP TURBS MASTER SPEED CTRL and refer to the posted figure for programmed feedwater ΔP to manually control feedwater flow as a Memory Action. The crew will address the instrument failure per OFN SB-008, ATT B. The next event will start at the direction of the Lead Examiner.

Event 5: 'C' S/G Tube Leak that grows to 500 gpm STGR. Annunciator 062A will actuate for Process Radiation levels at the ALERT level. When the crew investigates which PRM is alarming they will diagnose the S/G tube leak and enter OFN BB-07A. When S/G Tube leakage exceeds 150 gpd, the CRS will enter LCO 3.4.13, COND B. As the leak size grows, the crew will maximize charging, isolate letdown and Trip the Reactor and Actuate SI per foldout page direction. The next three post-trip events will also be addressed by the crew.

Event 6: Main Turbine fails to auto trip and will not trip using manual push buttons. While performing immediate actions, the BOP will note the turbine failed to trip and attempt to trip the turbine manually using the two pushbuttons. When that is unsuccessful, the BOP will use the ALL CLOSE push buttons to close MSIVs to isolate steam to the main turbine.

CT1: Manually ALL CLOSE main steamline isolation valves before a severe (orange-path) challenge develops to either the subcriticality (Positive IR SUR) or the integrity CSF (RCS Cold Leg Temperature <240°F

Event 7: Ruptured S/G 'C' ARV opens to 20% on Reactor Trip: The crew will identify high steam flow rate for 'C' S/G and/or open indication on 'C' ARV and the BOP will manually close the valve.

CT2: Given an open ARV on ruptured S/G, Isolate feed flow into and steam flow from the ruptured 'C' S/G in time to prevent a transition to EMG E-2 or EMG C-31.

Event 8: 'B' SI Pump fails to autostart on SIS. The ATC will manually start 'B' SI Pump per EMG E-0, Attachment F, Step F5.b. RNO.

The crew will transition to EMG E-3 to isolate 'C' S/G and cool down and depressurize the RCS to meet SI Termination criteria to minimize break flow though 'C' S/G tube rupture.

CT3: Commence controlled RCS depressurization to allow for SI termination per EMG E-3 prior to overfilling the ruptured S/G (90% WR).

The scenario is complete when the crew has depressurized the RCS per EMG E-3 Step 25 and/or at the discretion of the Lead Examiner.

SIMULATOR SCENARIO FILES

;2019 ILO NRC Exam, Scenario 3

;Initial Conditions - IC32,59%, Benton Line out, PZR heaters in auto, rods in auto
IMF mSY03F

;Event 1 – Key 1 – Failure of Loop 2 TC, BB TI-421 Fails LOW (ATC/CRS-TS)
IMF mBB01F f:530 k:1

;Event 2 – Key 2 - 'B' Stator Water Pump Trips, 'A' Stator Water Pump Fails to Auto Start (Reactivity)
ICM bkrDPCE01B t:1 k:2
ICM swCEPS0001 t:4 k:2
ICM swCEPS0002 t:4 k:2

;Event 3 – Key 3 - NCP Shaft Shear (ATC/CRS)
ICM mtrDPBG04 t:1 k:3

;Event 4 – Key 4 - AE PT-508 fails LOW (BOP/CRS)
ICM trAEPT0508 t:1 d:0 k:4

;Event 5 – Key 5 – Steam Generator Tube Leak on 'C' S/G that grows to SGTR (Major/CRS-TS)
IMF mBB02C f:500 r:900 k:5

;Event 6 – Turbine fails to Trip in both Auto and Manual, MSIVs fail to Auto Close. (BOP-CT)
IMF mAC02A
IMF mAC02B
IMF mSA27AB01
IMF mSA27AB02
IMF mSA27AB03
IMF mSA27AB04

;Event 7 – 'C' ARV fails to 20% open on plant trip in auto, manually closes. (BOP-CT)
{jpplp4} IMF mAB07C f:20

;Event 8 – 'B' SI Pump fails to autostart on SI (ATC)
{jpplsi} IMF mEM01B

;Local Action – **Key 9** – Close AB-V087
{Key[9]} IRF rAB04B f:0 r:60

;Local Action – **Key 10** – Close AB-V082
{Key[10]} IRF rAB03C f:0 r:60

; End

Booth Instructions

Ensure NRC Exam Security Established per AIF 30B-015-09, and AIF 30B-015-18

Ensure the following procedures are available, free of markings and are the most recent revision in Curator (7/9/19):

- **SYS BG-201, SHIFTING CHARGING PUMPS (Rev 72)**
- **ALR 00-042A, CHG LINE FLOW HILO (Rev 17)**
- **ALR 00-042E, CHARGING PMP TROUBLE (Rev 14A)**
- **ALR 00-112C, AUTO TURB R/B ACT (Rev 9A)**
- **OFN MA-001, LOAD REJECTION OR TURBINE TRIP (Rev 25)**
- **OFN BB-07A, STEAM GENERATOR TUBE LEAKAGE (Rev 22)**
- **OFN SB-008, INSTRUMENT MALFUNCTIONS (Rev 48)**
- **OFN SB-008, ATTACHMENT B, STEAM OR FEEDWATER HEADER PRESSURE CHANNEL MALFUNCTION**
- **OFN SB-008, ATTACHMENT L, NARROW RANGE RTD MALFUNCTION**
- **EMG E-0, REACTOR TRIP OR SAFETY INJECTION (Rev 40)**
- **EMG E-3, STEAM GENERATOR TUBE RUPTURE (Rev 38)**

NOTE: All events are loaded into snap **IC303**

Ensure malfunctions, including severity levels match scenario.

Ensure all meters, lamps, bistables and annunciators are correct for the initial setup. **Blue Placard is on the 'A' CCP.**

Ensure soft panel display in back is set to RP312 RCP Vibration on left screen and AMSAC on right screen.

Ensure no discernable history from RM11, Ovation screens, paper trend recorders, etc.
Ensure all laminated brief sheets, foldout pages, E plan boards are wiped clean.

Ensure all follow-up buttons are removed from the boards and trash cans and recycle bins are free of any potential exam material.

Ensure communications are established with the lead examiner, fresh batteries, radio check sat.

Critical Parameter Data to be collected:

- **Cold Leg Temperature.** The crew must close MSIVs to isolate steam to the Turbine before RCS Cold Leg Temperatures reach 240°F.
- **'C' S/G WR Level.** The crew must depressurize the RCS to meet SI termination criteria prior to overfilling the ruptured S/G (90% WR)

Ensure Horns are ON and machine is in RUN

Insert Key 1 for Event 1 (BB TI-421, Loop 2 TC Instrument channel fails LOW).

Insert Key 2 for Event 2 ('B' Stator cooling water pump trips, 'A' pump fails to auto start).

Insert Key 3 for Event 3 (NCP Shaft Shears)

Insert Key 4 for Event 4 (AE PT-508 fails LOW)

Insert Key 5 for Major Event (S/G Tube Leak that grows to 500 gpm SGTR on 'C' S/G, Turbine fails to trip in both Auto and Manual, Ruptured C S/G ARV opens to 20%, B SI Pump fails to Autostart on SI)
When directed to locally close AB V-087, 'C' S/G Steam Isolation to TDAFW Pump, **Insert Key 9**
When directed to locally close AB V-082, 'C' S/G Main Steamline low point drain, **Insert Key 10**

Facility: _Wolf Creek_____ Scenario No.: ____4_____ Op-Test No.: December 2019

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 100% Power, MOL, Red Train In Service, 'B' MD AFW Pump is out of service.

Turnover: The unit is operating at 100% power, MOL, Red Train is in Service, 'B' MD AFW Pump was taken out of service 12 hours ago; LCO 3.7.5, Condition B is entered.

Critical Tasks: **CT-1** Manually Start 'B' ESW Pump within ~3 minutes prior to loaded 'B' EDG Tripping on high temperature **CT-2** Remove heat input from the RCS per EMG FR-H1 by stopping RCPs and securing PZR heaters. **CT-3** Restore Secondary Heat Sink using NS AFW Pump prior to being required to commence primary bleed and feed.

Event No.	Malf. No.	Event Type*	Event Description
1		I (ATC/CRS) Tech Specs	BB PI-457, Upper Selected PZR Pressure Channel fails LOW OFN SB-008, ATT K LCO 3.3.1 Functions 6 , 8, COND A, E LCO 3.3.2, Functions 1d, 3a3, 5d, 6e, 8b, COND A, D, L
2		I (BOP/CRS)	AB FT-543, 'D' S/G Steam Flow Instrument fails LOW OFN SB-008, ATT A
3		R (ALL) Tech Specs	NB02 Bus UV due to XNB02 failure ALR 00-022E, ALR 00-021C, OFN NB-030 LCO 3.8.1, COND A
4		C (ATC)	'B' ESW Pump fails to Auto Start on S/D Sequencer ALR 00-021C, Step 6
5		M (All)	Loss of Off Site Power EMG E-0, EMG ES-02
6		C (ATC)	Control Rods F14 and P8 fail to fully insert. EMG E-0, Step 1, EMG ES-02, Step 12.
7		C (None)	TDAFW Pump fails to restart in both Auto and Manual
8		C/M (All)	'A' MD AFW Pump Trips on Overcurrent EMG FR-H1, SYS AP-122
9		C (BOP)	SGBSIS fails to Auto Actuate EMG FR-H1, Step 3a

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

Target Quantitative Attributes per Scenario (See Section D.5.d)		Actual Attributes
1.	Malfunctions after EOP entry (1–2)	3
2.	Abnormal events (2–4)	4
3.	Major transients (1–2)	2
4.	EOPs entered/requiring substantive actions (1–2)	2
5.	Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	1
6.	Preidentified critical tasks (≥ 2)	3

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT1: Manually start 'B' ESW pump before loaded 'B' EDG trips on over temperature.	The onsite standby power system includes the Class 1E ac and dc power for equipment used to maintain a cold shutdown of the plant and to mitigate the consequences of a DBA. Not starting the ESW pumps in a timely manner could result in the loss of the EDG.	With the EDG running loaded: Green light lit on handswitch * EF HIS-56A No indicated ESW flow on * EF FI-54 No indicated ESW pressure on *EF PI-2	On Panel RL019, Manipulation of EF HIS-56A to Run Position.	Red light lit on handswitch * EF HIS-56A Indicated ESW flow on * EF FI-54 Indicated ESW pressure on *EF PI-2
CT 2: Remove RCS heat input (RCPs and PZR Heaters) per EMG FR-H1, Step 6 before S/G levels degrade to 12% [28%] WR level.	Removing heat input from the RCS extends the time at which Operator action to initiate bleed and feed must occur. The scenario is unnecessarily complicated if RCS bleed and feed is required only due to inaction by the crew to remove heat input to the RCS.	No Operating AFW Pumps Indicated flow at 0 lbm/hr on: *AL FI-2A *AL FI-3A *AL FI-4A *AL FI-1A	On Panel RL021, Manipulation of *BB HIS-37 *BB HIS-38 *BB HIS-39 *BB HIS-40 On Panel RL002, Manipulation of *BB HIS-50 *BB HIS-51A *BB HIS-52A	* On Panel RL021, Red lights extinguished and green lights lit for all four RCPs. * On Panel RL002, Red lights extinguished and green lights lit for PZR Heaters. * BB HIS-50 in PTL
CT3: Restore AFW Flow >270,000 lbm/hr using NSAFW Pump per EMG FR-H1 before S/G levels degrade to 12% [28%] WR level.	Establishing at least 270,000 lbm/hr feedwater flow rate to the S/Gs before RCS bleed and feed is initiated restores secondary heat sink and ensures the core will remain covered and adequately cooled. Completion of this step removes the challenge to Heat Sink Critical Safety Function.	No Operating AFW Pumps Indicated flow at 0 lbm/hr on: *AL FI-2A *AL FI-3A *AL FI-4A *AL FI-1A	On panel RL005, Manipulation of AFW REG VLV CTRL *AL HK-8A *AL HK-10A *AL HK-12A *AL HK-6A	On panel RL005, Combined Indicated AFW TO SG FLOW >270,000 lbm/hr *AL FI 2A *AL FI-3A *AL FI-4A *AL FI-1A

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.

SCENARIO # 1 NARRATIVE

Turnover: The Unit is operating at 100% power. Red Train is in service. 'B' MD AFW Pump was removed from service 12 hours ago for emergent work. LCO 3.7.5, Condition B is entered.

Event 1: BB PI-457, Upper Selected PZR Pressure Channel fails LOW. The PZR heaters will energize causing RCS Pressure to rise. The ATC will take Manual Control of the Master Pressurizer controller and restore pressure to normal operating band as a Memory Action. The crew will address the instrument failure using OFN SB-008, ATT K. Once the CRS has evaluated technical specifications, the next event will start at the direction of the Lead Examiner.

Event 2: AB FT-543, 'D' S/G Steam Flow instrument fails LOW. MCB Annunciator 111C will actuate due to feed/steam flow mismatch. The BOP will take manual control of AE FK-540, 'D' FRV to match steam and feed flows as a Memory Action Step. The crew will address the instrument failure using OFN SB-008, ATT A. Once AE FK-540 is restored to automatic, the next event will start at the direction of the Lead Examiner.

Event 3: NB02 Bus Degraded Voltage leading to power interruption and S/D Sequencer Actuation. NB02 bus voltage drops to 3755v due to a fault on XNB02 transformer. Annunciator 022E will alarm once voltage is <3760v for 25 seconds. The crew will reference ALR 00-022E and in 94 seconds, the normal feeder breaker will trip open as designed. 'B' EDG will start and load. The crew will address the interruption of power to NB02 per ALR 00-21C and OFN NB-030, ATT B, including reducing turbine loading to maintain reactor power ≤99% due to AFAS-T Actuation. Once the crew has stabilized plant conditions, determined applicable Technical Specifications, and secured the TDAFW Pump, the major event will start at the direction of the Lead Examiner.

Event 4: 'B' ESW Pump fails to Auto Start on the S/D Sequencer. While responding to momentary loss of NB02 , the ATC will note the failure of the 'B' ESW pump to auto start and manually start the pump within ~3 minutes of the EDG starting and loading to prevent the EDG from tripping on high temperature.
CT1: Manually start 'B' ESW pump before loaded 'B' EDG trips on over temperature.

Event 5: Offsite Power is Lost. The reactor will trip and the crew will perform EMG E-0 immediate actions and transition to EMG ES-02. The next four post-trip events will also be addressed by the Crew.

Event 6: Control Rods F14 and P8 fail to fully insert. The ATC, while performing EMG E-0 Immediate Actions will note the two control rods not fully inserted and manually trip the Reactor per Step 1 RNO using SB HS-1. EMG ES-02, Step 12 directs the crew to Emergency Borate per OFN BG-009 for this condition.

Event 6: TD AFW Pump fails to start in both Auto and Manual. The BOP will identify the TD AFW Pump failed to auto start, and attempts to start manually will be unsuccessful.

Event 7: 'A' MD AFW Pump trips on overcurrent: After the crew has determined Emergency Boration is required per EMG ES-02, Step 12, and/or at the direction of the Lead Examiner, the 'A' MDAFW Pump will trip on overcurrent causing the crew to transition to EMG FR-H1.

CT 2: Remove RCS heat input (RCPs and PZR Heaters) per EMG FR-H1, step 6 before S/G levels degrade to 12% [28%] WR level.

Event 8: SGBSIS fails to actuate in Auto. SGBSIS fails to Auto Actuate on S/G LoLo level immediately following the reactor trip. The crew may or may not notice the failure since there is no SIS. The crew will exit EMG E-0 without performing Attachment F, which would have prompted the crew to verify SGBSIS actuation. Once the crew transitions to EMG FR-H1, Step 3a directs the crew to go to Attachment C and manually close the 12 valves that failed to Auto Close. All 12 valves are located together on MCB Panel RL024. While not specifically a critical task, failure to manually close these valves will contribute to S/G dryout conditions, requiring the crew to bleed and feed when WR S/G levels degrade to <12% [28%].

The crew will be successful restoring aux feed water flow using the NS AFW Pump per SYS AP-122.

CT3: Restore AFW Flow >270,000 lbm/hr using NSAFW Pump per EMG FR-H1 before S/G levels degrade to 12% [28%] WR level.

The scenario is complete when the crew has restored the Secondary Heat Sink per EMG E-3 Step 25 and/or at the discretion of the Lead Examiner.

SIMULATOR SCENARIO FILES

;2019 ILO NRC Exam, Scenario 4

;Initial Conditions – IC29, 100% Red Train in Service, 'B' MDAFW Pump OOS. (LCO 3.7.5 COND B)
scn SimGroup\Tag B MDAFW

;Event 1 – Key 1 – BB PI-457, Upper Selected PZR Press Instrument fails LOW (ATC/CRS – TS)
IMF mBB21C f:1658 r:10 k:1

;Event 2 – Key 2 – AB FT-543, D S/G Steam Flow fails LOW (BOP/CRS)
IMF mAB02H f:0 r:30 k:2

;**Event 3 – Key 3** – Degraded Bus Voltage on NB02 (XNB02 Failure) (Reactivity/CRS–TS)
IMF mNB05B f:3755 k:3
{bkNB00209.state=0} DMF mNB05B

;**Event 4** – 'B' ESW Pump fails to autostart (ATC - CT)
IMF mEF05B i:-1 f:-1

;Event 5 – Key 5 – Loss Of Offsite Power (Major)
IMF mSY01 K:5

;Event 6 – Control Rods F14 and P8 fail to fully insert on Reactor Trip. (ATC)
{jpplp4} IMF mSF12F14 f:1
{jpplp4} IMF mSF12P8 f:1
{jpplp4} IMF mSF13F14 f:60
{jpplp4} IMF mSF13P8 f:36

;Event 7 – TDAFW Pump fails to Restart on Reactor Trip both Auto and Manual (Scenario)
{jpplp4} IMF mAL01
{jpplp4} IMF mAL02

;Event 8 – Key 8 - 'A' MDAFW Pump Trips on overcurrent (Scenario)
ICM bkrDPAL01A t:1 k:7

;Event 9 – SGBSIS Fails to Actuate (BOP – Not CT)
IMF mSA17A f:1
IMF mSA17B f:1
IMF mSA27BM01
IMF mSA27BM02
IMF mSA27BM03
IMF mSA27BM04

;Local Action – **Key 10** – to start NS AFW Pump per SYS AF-122
{Key[10]} scn SimGroup\Start PAP01-SBO DGs Standby

;End

Booth Instructions

Ensure NRC Exam Security Established per AIF 30B-015-09, and AIF 30B-015-18

Ensure the following procedures are available, free of markings and are the most recent revision in Curator (7/9/19):

- **SYS AP-122, NON-SAFETY AUX FEED PUMP OPERATION (Rev 12)**
- **ALR 00-021C, NF039B S/D SEQ ACTUATED (Rev 17)**
- **ALR 00-022E, NB02 BUS DGRD VOLT (Rev 7)**
- **ALR 00-111D, SG D FLOW MISMATCH (Rev 9A)**
- **OFN SB-008, INSTRUMENT MALFUNCTIONS (Rev 48)**
- **OFN SB-008, ATTACHMENT A, STEAM FLOW CHANNEL MALFUNCTION**
- **OFN SB-008, ATTACHMENT K, PZR PRESSURE MALFUNCTION**
- **OFN NB-030, LOSS OF AC EMERGENCY BUS NB01 (NB02) (Rev 38)**
- **EMG E-0, REACTOR TRIP OR SAFETY INJECTION (Rev 40)**
- **EMG ES-02, REACTOR TRIP RESPONSE (Rev 37A)**
- **EMG FR-H1, RESPONSE TO LOSS OF SECONDARY HEAT SINK (Rev 35)**

NOTE: All events are loaded into snap **IC304**

Ensure malfunctions, including severity levels match scenario.

Ensure all meters, lamps, bistables and annunciators are correct for the initial setup. **Blue Placard is on the 'B' CCP. 'B' MDAFW Pump handswitch, AL HIS-22A, in PTL with Caution Tag affixed.**

Ensure soft panel display in back is set to RP312 RCP Vibration on left screen and AMSAC on right screen.

Ensure no discernable history from RM11, Ovation screens, paper trend recorders, etc.
Ensure all laminated brief sheets, foldout pages, E plan boards are wiped clean.

Ensure all follow-up buttons are removed from the boards and trash cans and recycle bins are free of any potential exam material.

Ensure communications are established with the lead examiner, fresh batteries, radio check sat.

Critical Parameter Data to be collected:

- **S/G WR Levels.** The crew must remove heat input to the RCS and restore secondary heat sink prior to WR S/G levels degrading to 12% [28%].
- The crew must also manually start 'B' ESW Pump prior to loaded 'B' EDG tripping on high temperature.

Ensure Horns are ON and machine is in RUN

Insert Key 1 for Event 1 (BB PI-457, Upper Selected PZR Pressure Channel fails LOW).

Insert Key 2 for Event 2 (AB FT-543, 'D' S/G Steam Flow Instrument fails LOW).

Insert Key 3 for Events 3 and 4 (NB02 bus UV due to XNB02 failure, and failure of 'B' ESW Pump to auto start)

Insert Key 5 for First Major Event (LOOP, Two Control Rods Fail to Fully Insert, TDAFW Pump fails to re-start, and SGBSIS Fails to Auto Actuate)

Insert Key 8 for Second Major Event ('A' MD AFW pump trips on overcurrent)
When directed to locally start NSAFW Pump, **Insert Key 10**

Facility: _Wolf Creek_____ Scenario No.: ____(Spare)____ Op-Test No.: December 2019

Examiners: _____ Operators: _____

_____ _____

_____ _____

Initial Conditions: 100% Power, MOL, Yellow Train In Service, Letdown is at 120 gpm, Nothing is out of service.

Turnover: The unit is operating at 100% power, MOL Yellow Train is in Service, Letdown is at 120 gpm. Nothing is out of service

Critical Tasks: **CT1** Dispatch an Operator to open doors per EMG C-0, ATT B within 14 minutes of Station Blackout **CT2** Energize NB02 per OFN NB-030, ATT B within 10 minutes after an off-site power source is restored. **CT3** Manually Establish 'B' Train ECCS Injection per EMG CS-02 prior to ORANGE PATH condition developing on CORE COOLING CSF.

Event No.	Malf. No.	Event Type*	Event Description
1		C (BOP/CRS)	TB Closed Cooling Water Pump 'B' Trips ALR 00-105A
2		C (ATC/CRS)	BG PK-131 Fails HIGH in AUTO, Manual Available ALR 00-039E
3		R (ALL) Tech Spec	NB01 Bus Lockout ALR 00-18A, OFN NB-030 LCO 3.8.9, COND C
4		R (ALL)	AD HIS-8, Condensate Pump 'A' Discharge valve fails closed. OFN AF-025, OFN MA-038
5		I (ATC/CRS) Tech Spec	PR NI 42 fails LOW OFN SB-008, ATT R LCO 3.3.1, Functions 2,3,5,6,18.b, 18.c, 18.d and 18.e COND A,
6		M (ALL)	Earthquake, LOOP, B EDG Failure, Station Blackout (Restoration of Waverly/LaCygne Line Success) EMG C-0
7		C (BOP)	Emergency Seal Oil Pump fails to Auto Start EMG C-0, Step 6
8		M (ALL)	Small Break LOCA in CTMT EMG CS-02

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

Target Quantitative Attributes per Scenario (See Section D.5.d)		Actual Attributes
1.	Malfunctions after EOP entry (1–2)	2
2.	Abnormal events (2–4)	5
3.	Major transients (1–2)	2
4.	EOPs entered/requiring substantive actions (1–2)	2
5.	Entry into a contingency EOP with substantive actions (≥ 1 per scenario set)	1
6.	Preidentified critical tasks (≥ 2)	3

Critical Task	Safety Significance	Cueing	Measurable Performance Indicators	Performance Feedback
CT1: Dispatch an Operator to open doors per EMG C-0, ATT B within 14 minutes Station Blackout.	The associated equipment will heat above 120°F and possible fail without completion of this TCA. Per AI 21-016, this action is directed by WCAP-12231, Station Blackout Coping Assessment and Wolf Creek Letter NO 89-00072.	Loss of power to both NB01 and NB02. Lights out in the control room	Operator communicates with Simulator Operator to direct opening of the equipment cabinet doors listed in ATTACHMENT B.	Simulator Operator acknowledges request and records the time to verify <14 minutes has elapsed.
CT2: Energize bus NB02 within 10 minutes per OFN NB-030, ATT B after an off-site power source is restored.	Given a SBLOCA in progress, AC power restoration is important to stop deteriorating plant conditions. Recovery actions are delayed until AC power is restored, so failure to restore NB02 power within 10 minutes constitutes crew misoperation.	* Indication and/or annunciation of station blackout AND * Indication that an an off-site power source is available.	Manipulation of controls in the control room as required to establish power to one NB02	Normal voltage indicated on NB02.
CT3: Manually Establish B Train ECCS Injection per EMG CS-02, Steps 5 and 6 prior to ORANGE PATH condition developing on Core Cooling CSF.	Given the Automatic SI Actuation did NOT occur due to the loss of power, the crew must manually load safeguards equipment on energized AC emergency bus to establish ECCS Injection to provide core cooling.	Normal voltage indicated on NB02. AND ECCS pumps in PTL from previous procedure steps.	Manipulation of controls in the control room as required to start ECCS pumps per EMG CS-02, Steps 5 and 6.	Red Lights lit and indications of proper system operation for each component operated. RVLIS NC Range >45% and CETCs <712ºF

Note: Causing an unnecessary plant trip or ESF actuation may constitute a Critical Task failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.

SCENARIO # 1 NARRATIVE

Turnover: The Unit is operating at 100% power. Yellow Train is in service with letdown flow at 120 gpm. Nothing is out of service.

Event 1: Trip of 'B' TB CLCW Pump. Main Control Board Annunciators ALR 105A and 133A will both actuate. The crew should perform ALR 00-105A to restore cooling by starting 'A' CLCW pump using EB HIS-1. Once cooling is restored, the Turbine Building Watch will be dispatched to locally clear the 133A Isophase Bus Trouble Alarm. Once cooling is restored and at the direction of the Lead Examiner the next event will start.

Event 2: Letdown Outlet Pressure Controller BG PK-131 Fails HIGH in Auto. The output on Controller BG PK-131 will fail to 100% in auto, causing letdown HX high flow and Annunciator 039E to actuate. Once the ATC has taken action to manually restore proper letdown flow, the next event will start at the direction of the Lead Examiner.

Event 3: NB01 Bus Lockout: The crew will respond to a bus lockout condition per ALR 00-018A, which requires prompt action to lower turbine loading to maintain power <100% due to AFAS-T Actuation and to Start 'B' ESW pump. After plant conditions stabilize, the crew will perform OFN NB-030, ATTACHMENT A to address other equipment affected by loss of power to bus NB01. Once actions are complete and the CRS has determined technical specification implications and or at the discretion of the Lead Examiner, the next event will start.

Event 4: Condensate Pump 'A' Discharge Valve (AD HIS-8) fails closed. The crew will respond using OFN AF-025 to determine maximum power with only two condensate pumps is 90% (1102 MWE) and commence rapid downpower per OFN MA-038 IAW pre-shift reactivity brief. Once plant conditions have stabilized, and at the direction of the Lead Examiner, the next event will start.

Event 5: PRNI 42 Fails LOW. MCB Annunciators 78A and 83C will actuate. The crew will address the instrument failure using OFN SB-008, ATT R. After evaluating Technical Specifications and at the direction of the Lead Examiner, the Major event will start.

Event 6: Earthquake, LOOP, Speed failure of B EDG, Station Blackout. The earthquake will be felt and associated annunciators will all actuate (98B, 98D, 98E). Lights will go out and the Reactor will trip due to the loss of offsite power. A mechanical failure of the 'B' EDG speed control mechanism will prevent 'B' EDG from loading Emergency Bus NB02. Combined with the previous bus lockout on NB01, a Station Blackout exists, and the crew will respond using EMG C-0. The next two post-trip events will be also addressed by the crew.
CT1: Dispatch an Operator to open doors per EMG C-0, ATT B within 14 minutes of Station Blackout.

Event 7: Emergency Seal Oil Pump fails to Auto Start. EMG C-0, Step 6 checks the Emergency seal Oil Pump is running and provides direction for the BOP to manually start the Pump using CD HS-19 since the Main Generator is filled with hydrogen.

Event 8: Small Break LOCA inside CTMT. 30 seconds after the earthquake, an RCS leak develops on Loop 1 Cold Leg that grows to a 2" break over 10 minutes.

After the crew has placed Pumps in PTL per EMG C-0, Step 15, the Transmission Operator will restore the Waverly/Lacygne Line to allow the crew to restore power to bus NB02.
CT2: Energize bus NB02 within 10 minutes per OFN NB-030, ATT B after an off-site power source is restored.

Per EMG C-0 fold out page direction, the crew will go to Step 44 once power is restored to NB02. The crew will complete EMG C-0 actions and transition to EMG CS-02 to address the SB LOCA in CTMT.
CT3: Manually Establish B Train ECCS Injection per EMG CS-02, Steps 5 and 6 prior to ORANGE PATH CSF for Core Cooling.

The scenario is complete when the crew has manually aligned ‘B’ Train ECCS components for injection per EMG CS-02 Step 6 and/or at the discretion of the Lead Examiner.

SIMULATOR SCENARIO FILES

;2019 ILO NRC Exam, Spare Scenario

;Initial Conditions – IC31, 100% Red Train in Service, Letdown flow at 120 gpm

;Event 1 - [Key 1] TB Closed Cooling Water Pump Trips
ICR bkrDPEB01B t:1 k:1

;Event 2 - [Key 2] BG PK-131 fails to 100% in Auto
IMF mBG17A f:100 k:2
{Key[2]} ICM vmodBGPCV0131 t:1 d:0
{bgp0131a<200} DCM vmodBGPCV0131

;Event 3 - [Key 3] NB01 Bus Lockout
IMF mNB03 k:3

;Event 4 - [Key 4] AD HIS-8, 'A' Cond Pump Discharge Valve Fails Closed
ICM movADHV0008 f:0 k:4

;Event 5 - [Key 5] PRNI 42 fails LOW
IMF mSE03B f:0 r:30 k:5

;Events 6, 7 and 8 – [Key 6] Earthquake, Loss of Offsite Power, Speed Failure of 'B' EDG, Seal Oil Pump fails to auto start, SBLOCA in CTMT.
IMF mSG01 f:60 k:6
IMF mSY01 d:5 k:6
IMF mNE01B f:0 k:6
{jpplp4} ICM bkrDCCD01 t:3
IMF mBB06A f:2 d:30 r:600 k:6

;Remote Action – **[Key 9]** Locally reset ISOPHASE trouble alarm
IRF rMA04 f:1 f:1 k:9

;Remote Action – **[Key 10]** Locally close CCW Red Train Supply/Return Valves
ICM movEGHV0015 t:3 f:0 d:0 k:10
ICM movEGHV0053 t:3 f:0 d:30 k:10

;Remote Action – **[Key 11]** Locally secure A EDG.
{Key[11]} scn SimGroup\SHTDNDGA

;Remote Action – **[Key 12]** Locally Isolate RCP Seals
ICR movBGHV8100 t:2 f:0 d:120 r:30 k:12
IRF rBG09A f:0 d:30 r:30 k:12
IRF rBG09B f:0 d:60 r:30 k:12
ICM movEGHV0061 t:2 d:0 k:12

;Remote Action - **[Key 13]** Restore Waverly/LaCygne Line, Swyd energizes
{Key[13]} DMF mSY01
IMF mSY03E i:-1 f:-1 k:13
IRF rSY05 f:1 k:13
IRF rSY06 f:1 k:13

;End

Booth Instructions

Ensure NRC Exam Security Established per AIF 30B-015-09, and AIF 30B-015-18

Ensure the following procedures are available, free of markings and are the most recent revision in Curator (7/25/19):

- **ALR 00-018A, NB01 BUS LOCKOUT (Rev 21)**
- **ALR 00-039E, LTDN HX DISCH FLOW HI (Rev 9)**
- **ALR 00-105A, CLCL PMP FLOW LO (Rev 6)**
- **OFN SB-008, INSTRUMENT MALFUNCTIONS (Rev 48)**
- **OFN SB-008, ATTACHMENT R, PR NEUTRON FLUX CHANNEL MALFUNCTION**
- **OFN AF-025, UNIT LIMITATIONS (Rev 56)**
- **OFN NB-030, LOSS OF AC EMERGENCY BUS NB01 (NB02) (Rev 38)**
- **OFN MA-038, RAPID PLANT SHUTDOWN (Rev 30)**
- **EMG C-0, LOSS OF ALL AC POWER (Rev 43A)**
- **EMG CS-02, LOSS OF ALL AC POWER RECOVERY WITH SI REQUIRED (Rev 25)**

NOTE: All events are loaded into snap **IC305**

Ensure malfunctions, including severity levels match scenario.

Ensure all meters, lamps, bistables and annunciators are correct for the initial setup. **Blue Placard is on the 'A' CCP.**

Ensure soft panel display in back is set to RP312 RCP Vibration on left screen and AMSAC on right screen.

Ensure no discernable history from RM11, Ovation screens, paper trend recorders, etc.
Ensure all laminated brief sheets, foldout pages, E plan boards are wiped clean.

Ensure all follow-up buttons are removed from the boards and trash cans and recycle bins are free of any potential exam material.

Ensure communications are established with the lead examiner, fresh batteries, radio check sat.

Critical Parameter Data to be collected:

- Time from loss of NB02 until the TB Watch is dispatched to open doors per EMG C-0, ATT B. This action must be directed within 14 minutes.
- Time from restoration of power to the switchyard until NB02 bus is reenergized. The crew must energize NB02 per OFN NB-030, ATT B within 10 minutes.
- RVLIS NC Range must remain >45%.
- CETCs must remain <712ºF.

Ensure Horns are ON and machine is in RUN

Insert Key 1 for Event 1 (TB CLCW Pump Trips).
When Directed - Insert **Key 9** to Locally reset ISOPHASE Trouble Alarm

Insert Key 2 for Event 2 (BG PK-131 fails HIGH in Auto).

Insert Key 3 for Event 3 (NB01 Bus Lockout)
When Directed – **Insert Key 10** to locally close CCW Red Train Supply/Return Valves (EG HV-015/053)
When Directed – **Insert Key 11** to Locally secure 'A' EDG

Insert Key 4 for Event 4 (AD HIS-8, Cond Pump A Discharge Valve fails Closed)

Insert Key 5 for Event 5 (PRNI 42 fails LOW)

Insert Key 6 for Major Events. (Earthquake, LOOP, B EDG Fails, Emergency Seal Oil Pump fails to start, RCS Leak in CTMT that grows to SBLOCA)
When Directed - **Insert Key 12** to Locally Isolate RCP seals
When Directed – **Insert Key 13** to Restore the Waverly/LaCygne Line to reenergize the switchyard.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Crew A

APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 CREW POSITION SRO	2 ATC	2 BOP	3 CREW POSITION SRO	3 ATC	3 BOP	4 CREW POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
RO ☐ SRO-I ☐ **SRO-U1** X	RX	1			1									**2**	1	1	**0**
	NOR	0			0									**0**	1	1	**1**
	I/C	3			3									**6**	4	4	**2**
	MAJ	1			1									**2**	2	2	**1**
	TS	2			2									**4**	0	2	**2**
RO1 **X** SRO ☐ SRO-U ☐	RX		1				1							**2**	**1**	1	0
	NOR		0				0							**0**	**1**	1	1
	I/C		3				3							**6**	**4**	4	2
	MAJ		1				1							**2**	**2**	2	1
	TS		0				0							**0**	**0**	2	2
RO2 X SRO-I ☐ SRO-U ☐	RX			1		1								**2**	**1**	1	0
	NOR			0		0								**0**	**1**	1	1
	I/C			2		3								**5**	**4**	4	2
	MAJ			1		1								**2**	**2**	2	1
	TS			0		0								**0**	**0**	2	2
RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
	NOR														1	1	1
	I/C														4	4	2
	MAJ														2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the at-the-controls (ATC) and balance-of-plant (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional I/C malfunctions on a one-for-one basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Crew B

APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 CREW POSITION SRO	2 ATC	2 BOP	3 CREW POSITION SRO	3 ATC	3 BOP	4 CREW POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
RO ☐ SRO-I ☐ **SRO-U2 X**	RX	1			1									**2**	1	1	**0**
	NOR	0			0									**0**	1	1	**1**
	I/C	3			3									**6**	4	4	**2**
	MAJ	1			1									**2**	2	2	**1**
	TS	2			2									**4**	0	2	**2**
RO3 X SRO-I ☐ SRO-U ☐	RX		1				1							**2**	**1**	1	0
	NOR		0				0							**0**	**1**	1	1
	I/C		3				3							**6**	**4**	4	2
	MAJ		1				1							**2**	**2**	2	1
	TS		0				0							**0**	**0**	2	2
RO4 X SRO-I ☐ SRO-U ☐	RX			1		1								**2**	**1**	1	0
	NOR			0		0								**0**	**1**	1	1
	I/C			2		3								**5**	**4**	4	2
	MAJ			1		1								**2**	**2**	2	1
	TS			0		0								**0**	**0**	2	2
RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
	NOR														1	1	1
	I/C														4	4	2
	MAJ														2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the at-the-controls (ATC) and balance-of-plant (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional I/C malfunctions on a one-for-one basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Crew C

APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 CREW POSITION SRO	2 ATC	2 BOP	3 CREW POSITION SRO	3 ATC	3 BOP	4 CREW POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
RO ☐ SRO-I ☐ **SRO-U3 X**	RX	1												**1**	1	1	**0**
	NOR	0												**0**	1	1	**1**
	I/C	3												**3**	4	4	**2**
	MAJ	1												**1**	2	2	**1**
	TS	2												**2**	0	2	**2**
RO ☐ **SRO-I3 X** SRO-U ☐	RX		1		1			1						**3**	1	**1**	0
	NOR		0		0			0						**0**	1	**1**	1
	I/C		3		3			3						**9**	4	**4**	2
	MAJ		1		1			1						**3**	2	**2**	1
	TS		0		2			2						**4**	0	**2**	2
RO5 X SRO-I ☐ SRO-U ☐	RX			1		1				1				**3**	**1**	1	0
	NOR			0		0				0				**0**	**1**	1	1
	I/C			2		3				3				**8**	**4**	4	2
	MAJ			1		1				1				**3**	**2**	2	1
	TS			0		0				0				**0**	**0**	2	2
RO6 X SRO-I ☐ SRO-U ☐	RX						1		1					**2**	1	1	0
	NOR						0		0					**0**	1	1	1
	I/C						3		3					**6**	4	4	2
	MAJ						1		1					**2**	2	2	1
	TS						0		0					**0**	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the at-the-controls (ATC) and balance-of-plant (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional I/C malfunctions on a one-for-one basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Crew D

APPLICANT	EVENT TYPE	Scenarios 1 CREW POSITION SRO	1 ATC	1 BOP	2 CREW POSITION SRO	2 ATC	2 BOP	3 CREW POSITION SRO	3 ATC	3 BOP	4 CREW POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM(*) R	I	U
RO ☐ SRO-I ☐ **SRO-U4 X**	RX	1												**1**	1	1	**0**
	NOR	0												**0**	1	1	**1**
	I/C	3												**3**	4	4	**2**
	MAJ	1												**1**	2	2	**1**
	TS	2												**2**	0	2	**2**
RO ☐ **SRO-I4 X** SRO-U ☐	RX		1					1			1			**3**	**1**	1	0
	NOR		0					0			0			**0**	**1**	1	1
	I/C		3					3			2			**8**	**4**	4	2
	MAJ		1					1			2			**4**	**2**	2	1
	TS		0					2			2			**4**	**0**	2	2
RO7 X SRO-I ☐ SRO-U ☐	RX			1					1				1	**3**	**1**	1	0
	NOR			0					0				0	**0**	**1**	1	1
	I/C			2					3				2	**7**	**4**	4	2
	MAJ			1					1				2	**4**	**2**	2	1
	TS			0					0				0	**0**	**0**	2	2
RO8 X SRO-I ☐ SRO-U ☐	RX									1		1		**2**	1	1	0
	NOR									0		0		**0**	1	1	1
	I/C									3		3		**6**	4	4	2
	MAJ									1		2		**3**	2	2	1
	TS									0		0		**0**	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the at-the-controls (ATC) and balance-of-plant (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional I/C malfunctions on a one-for-one basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Crew E

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO ☐ **SRO-I1 X** SRO-U ☐	RX				1				1		1			**3**	1	**1**	0
	NOR				0				0		0			**0**	1	**1**	1
	I/C				3				3		2			**8**	4	**4**	2
	MAJ				1				1		2			**4**	2	**2**	1
	TS				2				0		2			**4**	0	**2**	2
RO ☐ **SRO-I2 X** SRO-U ☐	RX					1		1					1	**3**	1	**1**	0
	NOR					0		0					0	**0**	1	**1**	1
	I/C					3		3					2	**8**	4	**4**	2
	MAJ					1		1					2	**4**	2	**2**	1
	TS					0		2					0	**2**	0	**2**	2
RO9 X SRO-I ☐ SRO-U ☐	RX						1			1		1		**3**	**1**	1	0
	NOR						0			0		0		**0**	**1**	1	1
	I/C						3			3		3		**9**	**4**	4	2
	MAJ						1			1		2		**4**	**2**	2	1
	TS						0			0		0		**0**	**0**	2	2
RO ☐ SRO-I ☐ SRO-U ☐	RX														1	1	0
	NOR														1	1	1
	I/C														4	4	2
	MAJ														2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the at-the-controls (ATC) and balance-of-plant (BOP) positions. Instant SROs (SRO-I) must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an SRO-I *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional I/C malfunctions on a one-for-one basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

4. For new reactor facility licensees that use the ATC operator primarily for monitoring plant parameters, the chief examiner may place SRO-I applicants in either the ATC or BOP position to best evaluate the SRO-I in manipulating plant controls.

Facility: Wolf Creek Date of Exam: December 2019 Operating Test No.: Spare

APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		Spare			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO ☐ SRO-I ☐ **SRO-U X**	RX	**2**												**2**	1	1	**0**
	NOR	**0**												**0**	1	1	**1**
	I/C	**3**												**3**	4	4	**2**
	MAJ	**2**												**2**	2	2	**1**
	TS	**2**												**2**	0	2	**2**
RO ☐ **SRO-I X** SRO-U ☐	RX	**2**												**2**	1	**1**	0
	NOR	**0**												**0**	1	**1**	1
	I/C	**3**												**3**	4	**4**	2
	MAJ	**2**												**2**	2	**2**	1
	TS	**2**												**2**	0	**2**	2
RO X SRO-I ☐ SRO-U ☐	RX		**2**											**2**	**1**	1	0
	NOR		**0**											**0**	**1**	1	1
	I/C		**2**											**2**	**4**	4	2
	MAJ		**2**											**2**	**2**	2	1
	TS		**0**											**0**	**0**	2	2
RO X SRO-I ☐ SRO-U ☐	RX			**2**										**2**	**1**	1	0
	NOR			**0**										**0**	**1**	1	1
	I/C			**2**										**2**	**4**	4	2
	MAJ			**2**										**2**	**2**	2	1
	TS			**0**										**0**	**0**	2	2

Instructions:

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