Facility: Waterford **K/A Catalog Rev. 2** **Rev.** 2 **Date of Exam:** 02/21/2022

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	2	1	4				4	4			3	18	**3**		**3**	**6**
	2	1	1	2				2	1			2	9	**2**		**2**	**4**
	Tier Totals	3	2	6				6	5			5	27	**5**		**5**	**10**
2. Plant Systems	1	2	3	3	2	2	3	2	2	4	3	2	28	**3**		**2**	**5**
	2	1	0	1	1	2	0	1	1	0	2	1	10	**1**	**1**	**1**	**3**
	Tier Totals	3	3	4	3	4	3	3	3	4	5	3	38	**5**		**3**	**8**

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

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.

Item #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	Q#
1	000007 (EPE 7; BW E02 & E10; CE E02) Reactor Trip, Stabilization, Recovery / 1		X					(000007EK2.03) Knowledge of the interrelations between (EPE 7) REACTOR TRIP, STABILIZATION, RECOVERY / 1 and the following (CFR: 41.7 / 45.7): Reactor trip status panel	3.5	11
2	000008 (APE 8) Pressurizer Vapor Space Accident / 3			X				(000008AK3.02) Knowledge of the reasons for the following responses as they apply to the (APE 8) PRESSURIZER VAPOR SPACE ACCIDENT / 3 (CFR 41.5,41.10 / 45.6 / 45.13): Why PORV or code safety exit temperature is below RCS or PZR temperature	3.6	31
3	000009 (EPE 9) Small Break LOCA / 3				X			(000009EA1.09) Ability to operate and / or monitor the following as they apply to (EPE 9) SMALL BREAK LOCA / 3 (CFR: 41.7 / 45.5 / 45.6): RCP	3.6	12
4	**000009 (EPE 9) Small Break LOCA / 3**					**X**		**(000009EA2.01) Ability to determine and interpret the following as they apply to (EPE 9) SMALL BREAK LOCA / 3 (CFR: 43.5 / 45.13): Actions to be taken, based on RCS temp and press, saturated and superheated**	**4.8**	**81**
5	000011 (EPE 11) Large Break LOCA / 3					X		(000011EA2.06) Ability to determine and interpret the following as they apply to (EPE 11) LARGE BREAK LOCA / 3 (CFR: 43.5 / 45.13): That fan is in slow speed and dampers are in accident mode during LOCA	3.7	32
6	000015 (APE 15) Reactor Coolant Pump Malfunctions / 4						X	(000015 (APE 15) Reactor Coolant Pump Malfunctions / 4) (G2.4.11) Knowledge of abnormal condition procedures. (CFR: 41.10)	4.0	33
7	000022 (APE 22) Loss of Reactor Coolant Makeup / 2					X		(000022AA2.03) Ability to determine and interpret the following as they apply to the (APE 22) LOSS OF REACTOR COOLANT MAKEUP / 2 (CFR: 43.5 / 45.13): Failures of flow control valve or controller	3.1	13
8	000025 (APE 25) Loss of Residual Heat Removal System / 4			X				(000025AK3.01) Knowledge of the reasons for the following responses as they apply to the (APE 25) LOSS OF RESIDUAL HEAT REMOVAL SYSTEM / 4 (CFR 41.5,41.10 / 45.6 / 45.13): Shift to alternate flowpath	3.1	34
9	**000025 (APE 25) Loss of Residual Heat Removal System / 4**						**X**	**(000025 (APE 25) Loss of Residual Heat Removal System / 4) (G2.2.40) Ability to apply Tech Specs for a system. (CFR:43.2 / 43.5)**	**4.7**	**82**
10	000026 (APE 26) Loss of Component Cooling Water / 8			X				(000026AK3.01) Knowledge of the reasons for the following responses as they apply to the (APE 26) LOSS OF COMPONENT COOLING WATER / 8 (CFR 41.5,41.10 / 45.6 / 45.13): The conditions that will initiate the automatic opening and closing of the SWS isolation valves to the CCWS coolers	3.2	14
11	000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3					X		(000027AA2.11) Ability to determine and interpret the following as they apply to the (APE 27) PRESSURIZER PRESSURE CONTROL SYSTEM MALFUNCTION / 3 (CFR: 43.5 / 45.13): RCS pressure	4.0	35
12	**000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3**						**X**	**(000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3) (G2.2.36) Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations. (CFR: 41.10 / 43.2 / 45.13)**	**4.2**	**83**
13	000029 (EPE 29) Anticipated Transient Without Scram / 1	X						(000029EK1.01) Knowledge of the operational implications of the following concepts as they apply to (EPE 29) ANTICIPATED TRANSIENT WITHOUT SCRAM / 1 (CFR: 41.8 / 41.10 / 45.3): Reactor nucleonics and thermo-hydraulics behavior	2.8	15

14	000038 (EPE 38) Steam Generator Tube Rupture / 3				X			(000038EA1.19) Ability to operate and / or monitor the following as they apply to (EPE 38) STEAM GENERATOR TUBE RUPTURE / 3 (CFR: 41.7 / 45.5 / 45.6): MFW System status indicator	3.4	36
15	**000038 (EPE 38) Steam Generator Tube Rupture / 3**					**X**		**(000038EA2.08) Ability to determine and interpret the following as they apply to (EPE 38) STEAM GENERATOR TUBE RUPTURE / 3 (CFR: 43.5 / 45.13): Viable alternatives for placing plant in safe condition when condenser is not available**	**4.4**	**84**
16	000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture – Excessive Heat Transfer / 4	X						(000040AK1.04) Knowledge of the operational implications of the following concepts as they apply to (APE 40) STEAM LINE RUPTURE - EXCESSIVE HEAT TRANSFER / 4 (CFR 41.8 / 41.10 / 45.3): Nil ductility temperature	3.2	16
17	000054 (APE 54; CE E06) Loss of Main Feedwater /4				X			(000054AA1.02) Ability to operate and / or monitor the following as they apply to the (APE 54) LOSS OF MAIN FEEDWATER /4 (CFR 41.7 / 45.5 / 45.6): Manual startup of electric and steam-driven AFW pumps	4.4	37
18	**000055 (EPE 55) Station Blackout / 6**						**X**	**(000055 (EPE 55) Station Blackout / 6) (G2.1.7) Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 43.5)**	**4.7**	**85**
19	000056 (APE 56) Loss of Offsite Power / 6						X	(000056 (APE 56) Loss of Offsite Power / 6) (G2.4.18) Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.5 / 45.13)	3.3	17
20	000057 (APE 57) Loss of Vital AC Instrument Bus / 6						X	(000057 (APE 57) Loss of Vital AC Instrument Bus / 6) (G2.4.4) Ability to recognize abnormal indications for system operating parameters that are entry-level conditions for emergency and abnormal operating procedures. (CFR: 41.10 / 43.2 / 45.6)	4.5	38
21	000058 (APE 58) Loss of DC Power / 6				X			(000058AA1.01) Ability to operate and / or monitor the following as they apply to the (APE 58) LOSS OF DC POWER / 6 (CFR 41.7 / 45.5 / 45.6): Cross-tie of the affected dc bus with the alternate supply	3.4	18
22	**000062 (APE 62) Loss of Nuclear Service Water / 4**					**X**		**(000062AA2.03) Ability to determine and interpret the following as they apply to the (APE 62) LOSS OF NUCLEAR SERVICE WATER / 4 (CFR: 43.5 / 45.13): The valve lineups necessary to restart the SWS while bypassing the portion of the system causing the abnormal condition**	**2.9**	**86**
23	000065 (APE 65) Loss of Instrument Air / 8					X		(000065AA2.08) Ability to determine and interpret the following as they apply to the (APE 65) LOSS OF INSTRUMENT AIR / 8 (CFR: 43.5 / 45.13): Failure modes of air-operated equipment	2.9	39
24	000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6			X				(000077AK3.02) Knowledge of the reasons for the following responses as they apply to the (APE 77) GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES / 6 (CFR 41.5,41.10 / 45.6 / 45.13): Actions contained in abnormal operating procedure for voltage and grid disturbances.	3.6	40
	(W E04) LOCA Outside Containment / 3							Not Applicable to CE		
	(W E11) Loss of Emergency Coolant Recirculation / 4							Not Applicable to CE		
	(BW E04; W E05) Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4							Not Applicable to CE		
K/A Category Totals:		**2**	**1**	**4**	**4**	**4 / 3**	**3 / 3**	**Group Point Total:**		**18 / 6**

Item #	E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	Q#
25	000001 (APE 1) Continuous Rod Withdrawal / 1		X					(000001AK2.05) Knowledge of the interrelations between the (APE 1) CONTINUOUS ROD WITHDRAWAL / 1 and the following (CFR 41.7 / 45.7): Rod motion lights	2.9	41
26	000003 (APE 3) Dropped Control Rod / 1			X				(000003AK3.10) Knowledge of the reasons for the following responses as they apply to the (APE 3) DROPPED CONTROL ROD / 1 (CFR 41.5,41.10 / 45.6 / 45.13): RIL and PDIL	3.2	42
27	**000024 (APE 24) Emergency Boration / 1**						**X**	**(000024 (APE 24) Emergency Boration / 1) (G2.2.37) Ability to determine operability and/or availability of safety related equipment (CFR: 43.5 / 45.7)**	**4.6**	**87**
28	000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2	X						(000028AK1.01) Knowledge of the operational implications of the following concepts as they apply to (APE 28) PRESSURIZER (PZR) LEVEL CONTROL MALFUNCTION / 2 (CFR 41.8 / 41.10 / 45.3): PZR reference leak abnormalities	2.8	43
	000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7							Not Selected		
29	000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7				X			(000033AA1.02) Ability to operate and / or monitor the following as they apply to the (APE 33) LOSS OF INTERMEDIATE RANGE NUCLEAR INSTRUMENTATION / 7 (CFR 41.7 / 45.5 / 45.6): Level trip bypass	3.0	44
30	000036 (APE 36; BW/A08) Fuel-Handling Incidents / 8					**X**		**(000036AA2.03) Ability to determine and interpret the following as they apply to the Fuel handling accidents (CFR: 43.5 / 45.13): Magnitude of potential radioactive release**	**4.2**	**88**
31	000037 (APE 37) Steam Generator Tube Leak / 3			X				(000037AK3.08) Knowledge of the reasons for the following responses as they apply to the (APE 37) STEAM GENERATOR TUBE LEAK / 3 (CFR 41.5,41.10 / 45.6 / 45.13): Criteria for securing RCP	4.1	45
	000051 (APE 51) Loss of Condenser Vacuum / 4							Not Selected		
	000059 (APE 59) Accidental Liquid Radwaste Release / 9							Not Selected		
	000060 (APE 60) Accidental Gaseous Radwaste Release / 9							Not Selected		
	000061 (APE 61) Area Radiation Monitoring System Alarms / 7							Not Selected		
32	000067 (APE 67) Plant Fire On Site / 8				X			(000067AA1.07) Ability to operate and / or monitor the following as they apply to the (APE 67) PLANT FIRE ON SITE / 8 (CFR 41.7 / 45.5 / 45.6): Fire alarm reset panel	2.9	46
	000068 (APE 68; BW A06) Control Room Evacuation /8							Not Selected		

34	000069 (APE 69; W E14) Loss of Containment Integrity / 5						X	(000069 (APE 69; W E14) Loss of Containment Integrity / 5) (G2.4.21) 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. (CFR: 41.7 / 43.5 / 45.12)	4.0	47
35	000074 (EPE 74; W E06 & E07) Inadequate Core Cooling / 4					X		(000074EA2.04) Ability to determine and interpret the following as they apply to (EPE 74) INADEQUATE CORE COOLING / 4 (CFR: 43.5 / 45.13): Relationship between RCS temperature and main steam pressure	3.7	48
	000076 (APE 76) High Reactor Coolant Activity / 9							Not Selected		
	000078 (APE 78*) RCS Leak / 3							Not Selected		
	(W E01 & E02) Rediagnosis & SI Termination / 3							Not Applicable to CE		
	(W E13) Steam Generator Overpressure / 4							Not Applicable to CE		
	(W E15) Containment Flooding / 5							Not Applicable to CE		
	(W E16) High Containment Radiation /9							Not Applicable to CE		
	(BW A01) Plant Runback / 1							Not Applicable to CE		
	(BW A02 & A03) Loss of NNI-X/Y/7							Not Applicable to CE		
	(BW A04) Turbine Trip / 4							Not Applicable to CE		
	(BW A05) Emergency Diesel Actuation / 6							Not Applicable to CE		
	(BW A07) Flooding / 8							Not Applicable to CE		
	(BW E03) Inadequate Subcooling Margin / 4							Not Applicable to CE		
	(BW E08; W E03) LOCA Cooldown – Depressurization / 4							Not Applicable to CE		
36	(BW E09; CE A13**; W E09 & E10) Natural Circulation/4						X	((BW E09; CE A13**; W E09 & E10) Natural Circulation/4) (G2.1.20) Ability to interpret and execute procedure steps. (CFR: 41.10 / 43.5 / 45.12)	4.6	49
	(BW E13 & E14) EOP Rules and Enclosures							Not Applicable to CE		
33	**(CE A11**; W E08) RCS Overcooling –Pressurized Thermal Shock / 4**					**X**		**(CE/A11 AA2.2) Ability to determine and interpret the following as they apply to Overcooling (CFR: 43.5 / 45.13): Adherence to appropriate procedures and operations within the limitations in the facility's license and amendments**	**3.4**	**89**
37	**(CE A16) ExcessRCS Leakage / 2**						**X**	**(CE A16 Excess RCS leakage / 2) (G2.2.25) Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits (43.2)**	**4.2**	**90**

	(CE E09) Functional Recovery							Not Selected		
	(CE E13*) Loss of Forced Circulation / LOOP / Blackout / 4							Not Selected		
K/A Category Totals:		**1**	**1**	**2**	**2**	**1 / 2**	**2 / 2**	**Group Point Total:**		**9 / 4**

Item #	System / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	Q#
38	003 (SF4P RCP) Reactor Coolant Pump System						X						(003K6.04) Knowledge of the of the effect of a loss or malfunction on the following will have on the (SF4P RCP) REACTOR COOLANT PUMP SYSTEM (CFR: 41.7 / 45.7): Containment isolation valves affecting RCP operation	2.8	1
39	004 (SF1; SF2 CVCS) Chemical and Volume Control System											X	(004 (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM) (G2.4.18) Knowledge of the specific bases for EOPs. (CFR: 41.10 / 43.1 / 45.13)	3.3	2
40	004 (SF1; SF2 CVCS) Chemical and Volume Control System						X						(004K6.05) Knowledge of the of the effect of a loss or malfunction on the following will have on the (SF1; SF2 CVCS) CHEMICAL AND VOLUME CONTROL SYSTEM (CFR: 41.7 / 45.7): Sensors and detectors	2.5	9
41	005 (SF4P RHR) Residual Heat Removal System			X									(005K3.06) Knowledge of the effect that a loss or malfunction of the (SF4P RHR) RESIDUAL HEAT REMOVAL SYSTEM will have on the following (CFR: 41.7 / 45.6): CSS	3.1	3
42	006 (SF2; SF3 ECCS) Emergency Core Cooling System		X										(006K2.04) Knowledge of the bus power supplies to the following (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM (CFR: 41.7): ESFAS-operated valves	3.6	4
43	**006 (SF2; SF3 ECCS) Emergency Core Cooling System**								**X**				**(006A2.02) Ability to (a) predict the impacts of the following on the (SF2; SF3 ECCS) EMERGENCY CORE COOLING SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Loss of flow path**	**4.3**	**76**

44	007 (SF5 PRTS) Pressurizer Relief / Quench Tank System					X							(007K5.02) Knowledge of the operational implications of the following concepts as they apply to the (SF5 PRTS) PRESSURIZER RELIEF/QUENCH TANK SYSTEM (CFR: 41.5 / 45.7): Method of forming a steam bubble in the PZR	3.1	5
45	**007 (SF5 PRTS) Pressurizer Relief / Quench Tank System**								**X**				**(007A2.02) Ability to (a) predict the impacts of the following on the (SF5 PRTS) PRESSURIZER RELIEF/QUENCH TANK SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Abnormal pressure in the PRT**	**3.2**	**77**
46	008 (SF8 CCW) Component Cooling Water System									X			(008A3.08) Ability to monitor automatic operations of the (SF8 CCW) COMPONENT COOLING WATER SYSTEM including (CFR: 41.7 / 45.5): Automatic actions associated with the CCWS that occur as a result of a safety injection signal	3.6	6
47	010 (SF3 PZR PCS) Pressurizer Pressure Control System										X		(010A4.02) (SF3 PZR PCS) PRESSURIZER PRESSURE CONTROL SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): PZR heaters	3.6	7
48	**010 (SF3 PZR PCS) Pressurizer Pressure Control System**											**X**	**(010 (SF3 PZR PCS) PRESSURIZER PRESSURE CONTROL SYSTEM) (G2.4.44) Ability to interpret control room indications to verify status and operation of a system, understand how operator actions affect plant and system conditions. (CFR: 41.10 / 43.5 / 45.11)**	**4.4**	**78**
49	012 (SF7 RPS) Reactor Protection System							X					(012A1.01) Ability to predict and/or monitor changes in parameters associated with operating the (SF7 RPS) REACTOR PROTECTION SYSTEM controls including (CFR: 41.5 / 45.5): Trip setpoint adjustment	2.9	8
50	012 (SF7 RPS) Reactor Protection System										X		(012A4.01) (SF7 RPS) REACTOR PROTECTION SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): Manual trip button	4.5	19

51	013 (SF2 ESFAS) Engineered Safety Features Actuation System						X						(013K6.01) Knowledge of the of the effect of a loss or malfunction on the following will have on the (SF2 ESFAS) ENGINEERED SAFETY FEATURES ACTUATION SYSTEM (CFR: 41.7 / 45.7): Sensors and detectors	2.7	10
52	**013 (SF2 ESFAS) Engineered Safety Features Actuation System**											**X**	**(013 G2.2.38) Engineered Safety Features Actuation System Knowledge of conditions and limits in the facility license (CFR: 43.1)**	**4.5**	**79**
53	022 (SF5 CCS) Containment Cooling System											X	(022 (SF5 CCS) CONTAINMENT COOLING SYSTEM) (G2.4.34) Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects. (CFR: 41.10 / 43.5 / 45.13)	4.2	20
	025 (SF5 ICE) Ice Condenser System												Not Applicable to WAT-3		
54	026 (SF5 CSS) Containment Spray System								X				(026A2.08) Ability to (a) predict the impacts of the following on the (SF5 CSS) CONTAINMENT SPRAY SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Safe securing of containment spray when it can be done)	3.2	21
55	**026 (SF5 CSS) Containment Spray System**								**X**				**(026A2.07) Ability to (a) predict the impacts of the following on the (SF5 CSS) CONTAINMENT SPRAY SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Loss of containment spray pump suction when in recirculation mode, possibly caused by clogged sump screen, pump inlet high temperature exceeded cavitation, voiding), or sump level below cutoff (interlock) limit**	**3.9**	**80**
56	039 (SF4S MSS) Main and Reheat Steam System							X					(039A1.06) Ability to predict and/or monitor changes in parameters associated with operating the (SF4S MSS) MAIN AND REHEAT STEAM SYSTEM controls including (CFR: 41.5 / 45.5): Main steam pressure	3.0	22
	053 (SF1; SF4P ICS*) Int Control System												Not Applicable to CE		

57	059 (SF4S MFW) Main Feedwater System										X		(059A4.11) (SF4S MFW) MAIN FEEDWATER SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): Recovery from automatic feedwater isolation	3.1	23

58	061 (SF4S AFW) Auxiliary / Emergency Feedwater System				X								(061K4.06) Knowledge of (SF4S AFW) AUXILIARY / EMERGENCY FEEDWATER SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): AFW startup permissives	4.0	24
59	062 (SF6 ED AC) AC Electrical Distribution System		X										(062K2.01) (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM Knowledge of electrical power supplies to the following (CFR: 41.7): Major system loads	3.3	50
60	062 (SF6 ED AC) AC Electrical Distribution System			X									(062K3.03) Knowledge of the effect that a loss or malfunction of the (SF6 ED AC) AC ELECTRICAL DISTRIBUTION SYSTEM will have on the following (CFR: 41.7 / 45.6): DC system	3.7	25
61	063 (SF6 ED DC) DC Electrical Distribution System		X										(063K2.01) (SF6 ED DC) DC ELECTRICAL DISTRIBUTION SYSTEM Knowledge of electrical power supplies to the following (CFR: 41.7): Major DC loads	2.9	51
62	064 (SF6 EDG) Emergency Diesel Generator System									X			(064A3.13) Ability to monitor automatic operations of the (SF6 EDG) EMERGENCY DIESEL GENERATOR SYSTEM including (CFR: 41.7 / 45.5): Rpm controller/megawatt load control (breaker-open/ breaker-closed effects)	3.0	26
63	073 (SF7 PRM) Process radiation Monitoring System			X									(073K3.01) Knowledge of the effect that a loss or malfunction of the (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM will have on the following (CFR: 41.7 / 45.6): Radioactive effluent releases	3.6	52
64	073 (SF7 PRM) Process radiation Monitoring System					X							(073K5.01) Knowledge of the operational implications of the following concepts as they apply to the (SF7 PRM) PROCESS RADIATION MONITORING SYSTEM (CFR: 41.5 / 45.7): Radiation theory, including sources, types, units, and effects	2.5	27
65	076 (SF4S SW) Service Water System								X				(076A2.02) Ability to (a) predict the impacts of the following on the (SF4S SW) SERVICE WATER SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Service water header pressure	2.7	53

66	076 (SF4S SW) Service Water System	X											(076K1.19) Knowledge of the physical connections and/or cause-effect relationships between (SF4S SW) SERVICE WATER SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): SWS emergency heat loads	3.6	28
67	078 (SF8 IAS) Instrument Air System									X			(078A3.01) Ability to monitor automatic operations of the (SF8 IAS) INSTRUMENT AIR SYSTEM including (CFR: 41.7 / 45.5): Air pressure	3.1	54
68	078 (SF8 IAS) Instrument Air System	X											(078K1.02) Knowledge of the physical connections and/or cause-effect relationships between (SF8 IAS) INSTRUMENT AIR SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): Service air	2.7	29
69	103 (SF5 CNT) Containment System									X			(103A3.01) Ability to monitor automatic operations of the (SF5 CNT) CONTAINMENT SYSTEM including (CFR: 41.7 / 45.5): Containment isolation	3.9	55
70	103 (SF5 CNT) Containment System				X								(103K4.01) Knowledge of (SF5 CNT) CONTAINMENT SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Vacuum breaker protection	3.0	30
K/A Category Totals:		**2**	**3**	**3**	**2**	**2**	**3**	**2**	**2 / 3**	**4**	**3**	**2 / 2**	**Group Point Total:**		**28 / 5**

Item #	System / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	Q#
71	001 (SF1 CRDS) Control Rod Drive System								X				(001A2.13) Ability to (a) predict the impacts of the following on the (SF1 CRDS) CONTROL ROD DRIVE SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): ATWS	4.4	59
72	002 (SF2; SF4P RCS) Reactor Coolant System					X							(002K5.12) Knowledge of the operational implications of the following concepts as they apply to the (SF2; SF4P RCS) REACTOR COOLANT SYSTEM (CFR: 41.5 / 45.7): Relationship of temperature average and loop differential temperature to loop hot-let and cold-leg temperature indications	3.7	60
73	011 (SF2 PZR LCS) Pressurizer Level Control System										X		(011A4.03) (SF2 PZR LCS) PRESSURIZER LEVEL CONTROL SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): PZR heaters	3.3	61
74	014 (SF1 RPI) Rod Position Indication System					X							(014K5.01) Knowledge of the operational implications of the following concepts as they apply to the (SF1 RPI) ROD POSITION INDICATION SYSTEM (CFR: 41.5 / 45.7): Reasons for differences between RPIS and step counter	2.7	62
75	**015 (SF7 NI) Nuclear Instrumentation System**								**X**				**(015A2.04) Ability to (a) predict the impacts of the following on the (SF7 NI) NUCLEAR INSTRUMENTATION SYSTEM and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal operation (CFR: 41.5 /43.5/ 45.3/45.13): Effects on axial flux density of control rod alignment and sequencing, xenon production and decay, and boron vs. control rod reactivity changes**	**3.8**	**91**
	016 (SF7 NNI) Non-Nuclear Instrumentation System												Not Selected		
	017 (SF7 ITM) In-Core Temperature Monitoring System												Not Selected		

76	027 (SF5 CIRS) Containment Iodine Removal System										X		(027A4.03) (SF5 CIRS) CONTAINMENT IODINE REMOVAL SYSTEM Ability to manually operate and/or monitor in the control room (CFR: 41.7 / 45.5 to 45.8): CIRS fans	3.3	66
	028 (SF5 HRPS) Hydrogen Recombiner and Purge Control												Not Selected		
	029 (SF8 CPS) Containment Purge System												Not Selected		
77	033 (SF8 SFPCS) Spent Fuel Pool Cooling System							X					(033A1.02) Ability to predict and/or monitor changes in parameters associated with operating the (SF8 SFPCS) SPENT FUEL POOL COOLING SYSTEM controls including (CFR: 41.5 / 45.5): Radiation monitoring systems	2.8	67
78	**034 (SF8 FHS) Fuel Handling Equipment System**				**X**								**(034 K4.03) Knowledge of design features and/or interlocks which provide for the following: Overload protection**	**3.3**	**93**
79	035 (SF4P SG) Steam Generator System	X											(035K1.02) Knowledge of the physical connections and/or cause-effect relationships between (SF4P SG) STEAM GENERATOR SYSTEM and the following (CFR: 41.2 to 41.9 / 45.7 to 45.8): MRSS	3.2	68
80	041 (SF4S SDS) Steam Dump / Turbine Bypass Control System			X									(041K3.04) Knowledge of the effect that a loss or malfunction of the (SF4S SDS) STEAM DUMP/TURBINE BYPASS CONTROL SYSTEM will have on the following (CFR: 41.7 / 45.6): Reactor power	3.5	73
	045 (SF4S MTG) Main Turbine Generator System												Not Selected		
	050 (SF9 CRV*) Control Room Ventilation												Not selectable KA (r3)		
	055 (SF4S CARS) Condenser Air removal												Not Selected		
81	056 (SF4S CDS) Condensate System											X	(056 (SF4S CDS) CONDENSATE SYSTEM) (G2.1.23) Ability to perform specific and integrated plant procedures during all modes of operation. (CFR:41.10)	4.3	74
	068 (SF9 LRS) Liquid radwaste												Not Selected		

82	071 (SF9 WGS) Waste Gas Disposal System											X	(071 (SF9 WGS) WASTE GAS DISPOSAL SYSTEM) (G2.1.32) Ability to explain and apply system limits and precautions. (CFR: 41.10 / 43.2 / 45.12)	4.0	92
	072 (SF7 ARM) Area Radiation Monitoring System												Not Selected		
83	075 (SF8 CW) Circulating Water System				X								(075K4.01) Knowledge of (SF8 CW) CIRCULATING WATER SYSTEM design feature(s) and or interlock(s) which provide for the following (CFR: 41.7): Heat sink	2.5	75
	079 (SF8 SAS**) Station Air System												Not selected		
	086 (SF8 FPS) Fire Protection												Not Selected		
K/A Category Totals:		**1**	**0**	**1**	**1/1**	**2**	**0**	**1**	**1 / 1**	**0**	**2**	**1 / 1**	**Group Point Total:**		**10 / 3**

Facility: Waterford Date of Exam: 02/21/2022

Category	K/A #	Topic	Item #	RO IR	RO Q#	SRO-Only IR	SRO-Only Q#
1. Conduct of Operations	G2.1.19	(G2.1.19) Ability to use plant computers to evaluate system or component status. (CFR: 41.10 / 45.12)	84	3.9	56		
	G2.1.21	(G2.1.21) Ability to verify the controlled procedure copy. (CFR: 41.10 / 45.10 / 45.13)	85	3.5	57		
	G2.1.8	(G2.1.8) Ability to coordinate personnel activities outside the control room. (CFR: 41.10 / 45.5 / 45.12 / 45.13)	86	3.4	58		
	G2.1.34	**(G2.1.34) Knowledge of primary and secondary plant chemistry limits. (CFR: 41.10 / 43.5 / 45.12)**	**91**			**3.5**	**94**
	G2.1.35	**(G2.1.35) Knowledge of the fuel-handling responsibilities of SROs. (CFR: 41.10 / 43.7)**	**92**			**3.9**	**95**
	Subtotal				3		**2**
2. Equipment Control	G2.2.12	(G2.2.12) Knowledge of surveillance procedures. (CFR: 41.10 / 45.13)	89	3.7	63		
	G2.2.38	(G2.2.38) Knowledge of conditions and limitations in the facility license. (CFR: 41.7 / 41.10 / 43.1 / 45.13)	90	3.6	64		
	G2.2.43	(G2.2.43) Knowledge of the process used to track inoperable alarms. (CFR: 41.10 / 43.5 / 45.13)	91	3.0	65		
	G2.2.11	**(G2.2.11) Knowledge of the process for controlling temporary design changes. (CFR: 41.10 / 43.3 / 45.13)**	**96**			**3.3**	**96**
	G2.2.21	**(G2.2.21) Knowledge of pre- and post-maintenance operability requirements. (CFR: 41.10 / 43.2)**	**97**			**4.1**	**97**
	Subtotal				3		**2**
3. Radiation Control	G2.3.13	(G2.3.13) Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc. (CFR: 41.12 / 43.4 / 45.9 / 45.10)	94	3.4	69		
	G2.3.7	(G2.3.7) Ability to comply with radiation work permit requirements during normal or abnormal conditions. (CFR: 41.12 / 45.10)	95	3.5	70		
	G2.3.11	**(G2.3.11) Ability to control radiation releases. (CFR: 41.11 / 43.4 / 45.10)**	**98**			**4.3**	**98**
	Subtotal				2		**1**
4. Emergency Procedures/Plan	G2.4.17	(G2.4.17) Knowledge of EOP terms and definitions. (CFR: 41.10 / 45.13)	97	3.9	71		
	G2.4.30	(G2.4.30) Knowledge of events related to system operation/status that must be reported to internal organizations or external agencies, such as the State, the NRC, or the transmission system operator. (CFR: 41.10 / 43.5 / 45.11)	98	2.7	72		
	G2.4.23	**(G2.4.23) Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations. (CFR: 41.10 / 43.5 / 45.13)**	**99**			**4.4**	**99**
	G2.4.28	**(G2.4.28) Knowledge of procedures relating to a security event (non-safeguards information). (CFR: 41.10 / 43.5 / 45.13)**	**100**			**4.1**	**100**
	Subtotal				**2**		**2**
Tier 3 Point Total					**10**		**7**

Tier / Group	Randomly Selected K/A	Reason for Rejection
2/1 (RO)	062 K3.01, Question 25	Essentially the same K/A as Question 50. Randomly selected and replaced with K/A 062 K3.03
2/1 (RO)	010 A4.03 Q7	No PORVs or block valves at Waterford-changed to A4.02
2/1 (RO)	078 K1.05, Question 29	Instrument Air has no interaction with MSIVs. Randomly reselected and replaced with K/A 078 K1.02: Service Air.
2/1(SRO)	010 G.2.4.41 Question 78	Could not develop an SRO-only question for the K/A. Randomly reselected and replaced with K/A 010 G.2.2.44.
2/2 (SRO)	Q93 034 K4.03	Too much overlap with instrument air and Q29 and Q54, changed KA and Sys to 034 K4.03 from 079 A2.01
2/2 (SRO)	Q91 015 A2.04	Poor validation due to LOD of question with KA A2.05, changed KA to A2.04

Facility:	**Waterford 3**	Date of Examination:	**02/21/2022**
Examination Level: RO ☒ SRO ☐		Operating Test Number:	1

Rev 2

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A1 Conduct of Operations K/A Importance: 4.6	N,R	EFW Pump operability calculation 2.1.20 Ability to interpret and execute procedure steps.
A2 Equipment Control K/A Importance: 3.7	N,R	Calculate Pressurizer heater operability 2.2.12, Knowledge of Surveillance Procedures.
A3 Conduct of Operations K/A Importance: 3.9	M,R	Determine time to boil and time to core uncovery 2.1.25, Ability to interpret reference materials, such as graphs, curves, tables, etc.
A4 Radiation Control K/A Importance: 3.2	M,R	Calculate Stay Times Based on Dose Rates 2.3.4, Knowledge of radiation exposure limits under normal and emergency conditions.
Emergency Plan		Not Selected

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

Facility:	**Waterford 3**	Date of Examination:	**1/25/2022**
Examination Level: RO ☐ SRO ☒		Operating Test Number:	1

Rev 2

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
A5 Conduct of Operations K/A Importance: 4.6	N, R	Review EFW pump Operability Calc (TS) 2.1.20, Ability to interpret and execute procedure steps
A6 Equipment Control K/A Importance: 4.1	N, R	Review PZR HTR Operability (TS) 2.2.12, Knowledge of Surveillance Procedures
A7 Conduct of Operations K/A Importance: 4.2	M, R	Determine time to boil and core uncover, apply containment isolation requirements 2.1.25, Ability to interpret reference materials, such as graphs, curves, tables, etc.
A8 Radiation Control K/A Importance: 3.7	M, R	Authorize Emergency Exposure as the Emergency Director in accordance with EP-002-030, Emergency Radiation Exposure Guidelines and Controls. 2.3.4, Knowledge of radiation exposure limits under normal or emergency conditions.
A9 Emergency Plan K/A Importance: 4.6	N,R	Determine EAL 2.4.41, Knowledge of the emergency action level thresholds and classifications.

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

Facility:	Waterford 3	Date of Examination:	02/21/2022
Exam Level: RO ☒ SRO-I ☒ SRO-U ☒		Operating Test Number:	1
Rev 2			

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 Adjust Rods for axial flux **001 A2.19 Axial Flux distribution RO- 3.6**	**N, S**	**1**
S2 Establish natural circulation **CE A13 AA.1.1 Ability to operate comp for Nat Circ RO-3.3** **(RO ONLY)**	**N, L, S**	**2**
S3 Raise SIT pressure A **006 A4.02 Ability to operate ECCS valves (SIT) RO – 4.1**	**N, EN, S**	**3**
S4 Start the '2A' RCP-Alt path **003 A4.06 Ability to operate / monitor RCP parameters** **RO – 2.9**	**N, A, L, S**	**4P**
S5 Place H2 recombiner in service during LOCA-Alt path **A4.01 HRPS Controls RO - 4.0** **(SRO-U)**	**N, A, EN, L, S**	**5**
S6 Parallel EDG for surveillance run-Alt path **063 A4.02 Adjustment of exciter voltage during parallel operations RO-3.3** **(SRO-U) (Used on March 2017 NRC Exam)**	**N, A, S**	**6**
S7 Swap SFP cooling pumps-alt path **033 A2.02, Loss of SFPCS RO – 2.7**	**N, A, S**	**8**
S8 Discharge Waste Condensate Tank A to CW system **068 A4.02 Remote radwaste release RO – 3.2** **(Modified from NRC 2017 Exam)**	**M, S**	**9**

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

P1 Locally borate RCS after control room evacuation **068 AA1.11 Emerg borate valve/controls RO 3.9** **(SRO-U)**	**N, E, L**	**1**

Facility:	Waterford 3	Date of Examination:	02/21/2022
Exam Level: RO ☒ SRO-I ☒ SRO-U ☒		Operating Test Number:	1
Rev 2			

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

System/JPM Title	Type Code*	Safety Function
P2 Transfer EFW Suction to ACC -Time Critical **076 K1.20 AFW RO 3.4 (Used on 2012 NRC Exam)** **(SRO-U)**	**D, L, R, E**	**4S**
P3 Return Battery Charger B1 to service-alt path **063 K1.03 Battery charger and battery RO – 2.9** **(SRO-U)**	**N, A**	**6**

* 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 R /SRO-I/SRO-U	
(A)lternate path	4–6/4–6 /2–3	**5/5/3**
(C)ontrol room		**0**
(D)irect from bank	≤ 9/≤ 8/≤ 4	**1/1/1**
(E)mergency or abnormal in-plant	≥ 1/≥ 1/≥ 1	1/1/1
(EN)gineered safety feature	≥ 1/≥ 1/≥ 1 (control room system)	2/2/1
(L)ow-Power/Shutdown	≥ 1/≥ 1/≥ 1	**5/4/3**
(N)ew or (M)odified from bank including 1(A)	≥ 2/≥ 2/≥ 1	**10/9/4**
(P)revious 2 exams	≤ 3/≤ 3/≤ 2 (randomly selected)	0/0/0
(R)CA	≥ 1/≥ 1/≥ 1	**1**
(S)imulator		**8**

NRC JPM Examination Summary Description

S1: The plant completed a rapid down power to approximately 70% power due a dropped CEA. The CRS has directed you to restore ASI within specifications by inserting Group P in Manual Group Mode using OP-901-212, Rapid Plant Power Reduction, Attachment 3, Operation of CEAs for ASI Control.

S2: The plant has experienced a loss of offsite power and the CRS has directed you to establish natural circulation IAW procedure OP-902-003, Step 17. This will require establishing feedwater and opening dump valves until verification of steady and then declining RCS hot leg temperatures has occurred while meeting all other required parameters for natural circulation IAW step 17.

S3: The ‘A’ SIT tank pressure has dropped due the low alarm setpoint and must be raised IAW OP-009-008, section 6.1, using N2, to a final value above the lo alarm setpoint and within the specification the CRS directed.

S4: The plant is preparing to startup with only the ‘1A’ RCP running. The CRS has directed you to start the ‘2A’ RCP IAW procedure OP-001-002. After the start, the applicant is monitoring RCP parameters and vibrations, lube oil temperature, and bearing temperatures will increase until several alarms come in. The applicant will take actions to secure the pump IAW OP-001-002 before it trips automatically (Alt Path).

S5: the plant has experienced a LOCA with containment Hydrogen at 0.7%. The CRS has directed you to place the first hydrogen recombiner in service IAW OP-008-006, section 6.1, starting at 6.1.3. When the first increase is performed to raise kw above the 5kw hold point, the power will continue to increase without control (exceeding 75kw) and will require it to be secured (Alt Path).

S6: the CRS has directed you to parallel EDG ‘A’ for monthly surveillance run IAW OP-009-002, section 6.4. After the parallel, the KW load will continue to increase without control and will require the EDG to be tripped (Alt Path).

S7: The ‘B’ SFP cooling pump maintenance was recently completed, and it is ready for a post maintenance run. The CRS has directed you to shift SFP cooling pumps from the ‘A’ pump to the ‘B’ pump IAW OP-002-006, section 6.14. Shortly after securing the ‘A’ pump, the ‘B’ pump trips, requiring a restart of the ‘A’ pump due to loss of SFP cooling (Alt Path).

S8: The CRS has directed you to discharge Waste Condensate Tank A to the Circulating Water System in accordance with OP-007-004, Liquid Waste Management System. (Modified from 2017 NRC Exam-it was alt path on that exam and it is normal path for this exam)

P1: The control room was evacuated due to fire and you are at LCP-43 (Remote Shutdown panel) and have completed steps 1-32 of OP-901-502. You are directed to complete steps 33 and 34 to borate the RCS from LCP-43.

P2: The CRS has directed you to align the EFW Pump suction to the Auxiliary Component Cooling Water system within 30 minutes for Train A IAW OP-902-009, Appendix 10. This JPM is **Time Critical**.

P3: The CRS directs you to return the battery charger (Train A {A1} or B {B1} whichever is not protected train on exam week) to service in accordance with OP-006-003, 125V DC Electrical Distribution. After AC isolation breaker closed, applicant requests voltage status (value of < 144 VDC) and the High Voltage shutdown lamp will be illuminated. This is alt path and requires the applicant to press the reset pushbutton to clear the lamp or the charger will not be charging the battery.

Facility: Waterford 3 Scenario No.: **1** Op Test No.: 2022

Examiners: Operators:

Initial Conditions: Mode 2, Reactor Power is at POAH. Two Charging Pumps in operation. AB Buses are aligned to Train B. A LPSI pump OOS for repairs. Temp Diesels are not available.

Turnover: Protected Train is B. Pull Control rods to continue startup to 1%.

Critical Tasks: (1) Trip RCPs
(2) Manually open CS B train spray valve

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	R – ATC N – SRO	Pull control rods to continue startup
2	RC19C	I-BOP I-SRO TS-SRO	Safety Channel C RCS Cold Leg instrument RC-ITI- 0102CC (Loop T112C) fails high requiring TS 3.3.1 entry and bypassing affected bistables
3	CC01A	C – BOP TS –SRO	A CCW pump trips on OC. TS 3.7.3 and cascading
4	RX14A	I-ATC I-SRO	Selected Pressurizer Pressure Control Channel (RC- IPR-100X) fails high and Both Pressurizer Spray Valves open, will close in manual
5	RC23A	M-All	RCS leak, ramps into LB LOCA (**Critical Task 1, Trip RCPs)**
6	ED01A ED01B ED01C ED01D EG10A	M-All	Loss of Off-Site Power EDG A trips after 10 seconds
7	CS04B	C-BOP C-SRO	CS B spray valve CS-125B fails to auto open and must be manually opened **(CT-2)**
8	RP09E	C-ATC	BAM-113A / CVC-183 fail to reposition

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

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4) *[Events 2, 3, and 4 credited]*	3
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)	2

The crew assumes the shift with the reactor at POAH following a forced outage. The turnover will include instructions to continue the startup by pulling control rods in accordance with the reactivity plan.

Event 1: The reactivity plan will include instructions to pull control rods. Once enough of a reactivity change is seen by the examiners the next event can be triggered.

Event 2: After the first event is complete, the Safety Channel C RCS Cold Leg instrument RC-ITI-0102CC (Loop T112C) fails high requiring TS 3.3.1 entry and bypassing affected bistables. The SRO should review and enter Technical Specification 3.3.1 Action 2 and bypass 3-HI LOCAL POWER and 4-LOW DNBR bistables within 1 hour in accordance with OP-009-007, Plant Protection System.

Event 3: Once TS have been entered and bypasses are complete, the A CCW pump trips, requiring a manual start of another pump. The SRO should review and enter 3.7.3 and cascading Technical Specifications and take actions to align the AB CCW pump within 72 hrs per OP-901-510, Component Cooling Water System Malfunction. Tech Spec 3.8.1.1 will be entered for Electrical Breaker Alignment Check and to verify Train A components and EFW AB operability.

Event 4: After event 3 is complete, the selected Pressurizer Pressure Control Channel (RC- IPR-100X) fails high and both spray valves open but will close in manual. The crew should close the spray valves to stop the pressure reduction. The SRO should enter OP-901-120, Pressurizer Pressure Control Malfunction and implement Section E1 Pressurizer Pressure Control Channel Instrument Failure. The crew should take manual control of the Pressurizer Pressure Controller to restore Pressurizer Pressure to within band (if out), swap control to the Channel Y pressure channel, and return the Pressurizer Pressure Controller back to AUTO.

Event 5: A large Break LOCA is inserted on a ramp. This event contains **CT-1, Trip RCPs on LBLOCA.** The ATC will manually trip the reactor then trip RCP's within 3 min following loss of CCW Cooling due to containment pressure reaching 17.7 psia (CSAS) or due to low RCS pressure. The crew will perform Standard Post Trip Actions using OP-902-000, SPTAs and diagnose to OP-902-002, Loss of Coolant Accident Recovery.

Event 6: After the reactor is tripped, and RCPs are secured a loss of offsite power occurs. The A EDG energizes the A safety bus for 10 seconds and then trips on overspeed, the A safety bus remains deenergized (dead) for the remainder of the scenario.

Event 7: CS B spray valve fails to auto open and must be manually opened to meet the containment safety function **(CT-2, manually open CS-125B)** before leaving step 9.3 of the procedure.

Event 8: BAM-113 and CVC-183 fail to reposition following SIAS and should be repositioned. BAM-113 should be manually opened and CVC-183 should be manually closed.

The scenario can be terminated once all CT's are complete (RCPs tripped and CS-125B open), event diagnosed and procedure transition is done, AND event 8 is completed or at the lead examiner's discretion.

Critical Task	Safety Significance	Cueing	Measurable Performance Indicator	Performance Feedback
CT-1: Trip any RCP exceeding operating limits or after 3 min without CCW flow This task is satisfied by manually tripping all 4 Reactor Coolant Pumps within 3 minutes of a loss of CCW flow to the RCPs. This task becomes applicable following the actuation of CSAS.	This step is performed for protection of the RCPs, since CCW, which provides cooling to the RCPs, is isolated upon CSAS actuation.	CCW flow low/lost to RCPs alarms on CP-2 and CP-18 CCW valve status CP-2 CSAS initiated CP-8 Procedurally driven from OP-902-000 step 3.b.1 and 9.3	Stops RCPs using control switch	RCP off light illuminated RCP indicated flow lowering
CT-2: CS-125B, CS B spray, valve fails to auto open This task is satisfied by manually opening CS-125B. This task becomes applicable following the actuation of CSAS (containment pressure exceeds 17.7 psia) and must be complete prior to leaving step 14 of the LOCA procedure OP-902-002.	Preserves containment building boundary by preventing or minimizing pressure excursions.	Containment pressure > 17.7 psia CS-125 indicates closed CS Header flow not indicated Procedurally driven from OP-902-000 step 9.3 OR OP-902-002 step 14	Opens CS-125 valve using control switch	CSAS annunciators actuated CS-125 indicates open CS Header flow indicated

Critical Task (NUREG-1021, Rev. 11 Appendix D)

If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review.

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

REFERENCES

Event	Procedures
1	OP-010-003, Plant Startup
2	OP-009-007, Plant Protection System, Rev. 20 OP-903-013, Monthly Channel Checks, Rev. 19 Technical Specifications 3.3.1, 3.3.3.5, 3.3.3.6
3	OP-901-510, Component Cooling Water Malfunction, Rev 305 OP-903-066, Electrical Breaker Alignment Check OP-100-014, Technical Specifications and Technical Requirements Compliance, Rev 360 Technical Specification 3.7.3 Cascading, 3.8.1.1b, 3.8.1.1
4	OP-901-120, Pressurizer Pressure Control Malfunction, Rev. 303
5/6/7/8/9	OP-902-000, Standard Post Trip Actions OP-902-002, Loss of Coolant Accident Recovery OP-902-009, Standard Appendices, Rev. 319
GEN	EN-OP-115, Conduct of Operations, Rev. 26 EN-OP-115-08, Annunciator Response, Rev. 5 OI-038-000, EOP Operations Expectations / Guidance, Rev. 19 OP-100-017, EOP Implementation Guide, Rev 5

Facility: Waterford 3 Scenario No.: **2** Op Test No.: 1

Examiners: Operators:

Initial Conditions: MOC. Reactor power is 100%. AB Buses are aligned to Train B. Temp Diesels are not available.

Turnover: Protected Train is B; Maintain 100%.

Critical Tasks: (1) Trip reactor during ATWS conditions by opening the "32" breakers before exiting step 1 of SPTA's

(2) Commence emergency boration before exiting step 1 of SPTA's and within 1 minute of losing two RCPs

Event No.	Malf. No.	Event Type*	Event Description
1	DI-18A3S10-1 = STOP LO-18A3S10-1 = OFF B_M04 = Fail On	TS-SRO	AH-12A, Control Room Air Handler trips (new) TS 3.7.6.3a
2	SG11A	I – BOP I – SRO TS – SRO	Steam Generator #2 Narrow Range level Safety Channel A fails low (SG-ILT-1123A). (TS 3.3.1, 3,3,2, TRM 3.3.1)
3	RC21A	I-All	Hot Leg 1 Temperature, RC-ITI-0111X, fails low affecting PZR level setpoint.
4	FW35B	R-ATC N-BOP N-SRO	5B Feedwater Heater (Low Pressure) tube leak, Rapid Plant Power Reduction (OP Ex April 2021)
5	ED04A	M-All	Loss of 1A non-safety bus (causes trip of 1A and 2A RCPs), causes reactor trip. ATWS (**CT-1, Trip Reactor by de-energizing CEDMs)**
6	RD11A30 RD11A28 RD11A40	C-ATC C-SRO	Three CEDMs stick out due to bowing **(CT-2 emergency boration required)**
7	MS03B	M-All	ESD due to Safety Valve MS-106B Fail to 50%.
8	FW49A1	C – BOP C – SRO	Main Feedwater Isolation Valve Steam Generator 1, FW-184A failed open, will close manually (event trigger setup).

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

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	4
3. Major transients (1–2)	2
4. EOPs entered/requiring substantive actions (1–2)	1
5. Entry into a contingency EOP with substantive actions ($\geq$ 1 per scenario set)	0
6. Preidentified critical tasks ($\geq$ 2)	2

The crew assumes the shift at 100% power with instructions to maintain 100% power. AB Buses are aligned to Train B. Temp Diesels are not available.

Event 1: Following crew turnover, AH-12A trips and AH-12B starts. CRS declares AH-12A inoperable and enters TS 3.7.6.3a 7 day LCO.

Event 2: SG #2 NR Level channel (1123A) fails low. The SRO should direct the BOP to bypass bistables 8, 10, and 20 on PPS Channel A. The SRO will enter TS 3.3.1 action 2, 3.3.2 action 19, TRM 3.3.1 action 1 and comply with TRM 3.3.2. TS 3.3.3.5 and 3.3.3.6 are evaluated and determined to be not applicable. At LCP-43, SG-ILI-1123-A1 is indicating failed low. Use Thunder View if asked for other SG levels at LCP-43.

Event 3: Hot Leg 1 Temperature, RC-ITI-0111X, fails low affecting PZR level setpoint. Pressurizer level setpoint will lower which will cause letdown flow to rise with only one charging pump in operation. Pressurizer level will lower due to this condition. SRO will enter OP-901-110, Pressurizer Level.

Event 4: Once event 3 is complete, a tube leak occurs in Feedwater Heater 5B, causing Condensate flow to isolate through Low Pressure Feedwater Heaters 5B and 6B. The crew will enter OP-901-221, Secondary System Transient, Section E1, Loss of Feedwater Preheating. This also requires a power reduction in accordance with OP-901-212, Rapid Plant Power Reduction, which will prompt a reactivity manipulation.

Event 5: Once event 4 is complete, a Loss of 1A non-safety bus (causes trip of 1A and 2A RCPs), causes reactor trip. ATWS occurs which requires crew to open the 32A and 32B CEDM MG set breakers to insert all control rods per SPTA procedure OP-902-000, step1 **CRITICAL TASK (CT-1).**

Event 6: Three CEDMs stick out due to bowing and emergency boration is required within 1 minute of the trip of two RCPs and before leaving the step on reactivity control in SPTA procedure **CRITICAL TASK (CT-2).**

Event 7: AN ESD occurs with MS-106B, Main Steam Line #2 Safety #1, on SG #2 failing 50% open and requires entry into OP-902-004, Excess Steam Demand Recovery Procedure.

Event 8: Main Feedwater Isolation Valve Steam Generator 1, FW-184A fails to AUTO close on MSIS requiring manual closure.

Critical Task	Safety Significance	Cueing	Measurable Performance Indicator	Performance Feedback
<u>CT-1</u>: Trip Reactor during ATWS event with the two "32" breakers when other methods fail to trip it. This task is satisfied by manually tripping the Reactor by de-energizing busses 32A and 32B within 1 minute of the two RCPS tripping and before leaving step 1 of SPTA procedure OP-902-000. The task becomes applicable following the trip of the 1A and 2A RCPs because a PPS limit could be exceeded. This task is satisfied by manually Opening BOTH of the following breakers for 5 seconds and THEN re-closing: a) SST A32 FEEDER b) SST B32 FEEDER	Failure to trip the Reactor when an automatic PPS signal has failed to actuate can lead to a degradation of fission product barriers. 1 minute is determined to be a reasonable time limit to identify and take action for satisfactory performance. OPS management standard documented in TM-OP-100-03. (TM-OP-100-03, CT-1)	RCP off light illuminated Trips and pre-trips on SG lo flow on CP-7 All CEA rod bottom lights extinguished (after the breakers opened) Procedurally driven from OP-902-000 step 1.a.1.1)	Open indicators for both A32 and B32 feeder breakers	Reactor Trip breakers open All CEA rod bottom lights illuminated (except the three that are stuck out) Reactor power lowering

Critical Task	Safety Significance	Cueing	Measurable Performance Indicator	Performance Feedback
<u>CT-2:</u> Commence emergency boration prior to exiting step 1 of OP-902-000 SPTAs and within 1 minute of tripping two RCPs. This task is satisfied by commencing Emergency Boration flow by either Boric Acid makeup pumps or gravity feed valves in accordance with OP-902-000, Standard Post Trip Actions step 1, prior to exiting the step to verify Reactivity Control. This task becomes applicable following the initiation of a Reactor Trip.	Based on Emergency Operating Procedure Required actions for Reactivity Control. Failure to initiate emergency boration would result in a condition that is not allowed by the facility license as analysis assumes that all CEAs are fully inserted during a reactor trip with the exception of the most reactive rod. OPS management Standard documented in TM-OP-100-03. (TM-OP-100-03, CT-1)	3 CEA's stuck out (their respective Rod bottom lights are extinguished) CEA indicates withdrawn on CEAC Procedurally driven from OP-902-000 step 1.c.1 OP-901-103, Emergency Boration	Initiate Emergency Boration 1) using Boric Acid Pump as follows: a) Place makeup Mode sel switch to MANUAL b) Open Emergency Boration Valve, BAM-133. c) Start one Boric Acid Pump. d) Close recirc valve for Boric Acid Pump started: BAM-126A Boric Acid Makeup Pump Recirc Valve A or BAM-126B OR 2) Initiate Emergency Boration using Gravity Feed as follows: Open the following Boric Acid Makeup Gravity Feed valves: a) BAM-113A Boric Acid Makeup Gravity Feed Valve A b) BAM-113B Boric Acid Makeup Gravity Feed Valve B 3) Close VCT Disch Valve, CVC-183.	Charging flow $\geq$ 40 gpm on CP-4

Critical Task	Safety Significance	Cueing	Measurable Performance Indicator	Performance Feedback
Critical Task (NUREG-1021, Rev. 11 Appendix D) • If an operator or the crew significantly deviates from or fails to follow procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the post-scenario review. • Causing an unnecessary plant trip or ESF actuation may constitute a CT failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG-1021.				

REFERENCES

Event	Procedures
1	OP-500-011, Control Room Cabinet M, Rev 042 (ARP) TS 3.7.6.3a
2	OP-500-005, Control Room Cabinet K, Rev 20 OP-009-007, Plant Protection System, Rev. 20 OP-901-201, SG level Control Malfunction, Rev 7 Technical Specifications 3.3.1 action 2, 3.3.2 action 19, and TRM 3.3.1 action 1
3	OP-500-008, Control Room Cabinet H, Rev 44 OP-901-110, Pressurizer level Malfunction, Rev 11
4	OP-500-001, Control Room Cabinet A, Rev 27 OP-901-221, Secondary System Transient, Rev. 8 OP-901-212, Rapid Plant Power Reduction, Rev. 16
5	OP-902-000, Standard Post Trip Actions, Rev. 16
6	OP-902-000, Standard Post Trip Actions, Rev. 16 OP-901-103, Emergency Boration, Rev 004
7	OI-038-000, EOP Operations Expectations/Guidance, Rev 19
GEN	EN-OP-115, Conduct of Operations, Rev. 24 EN-OP-115-08, Annunciator Response, Rev. 4 EN-OP-200, Plant Transient Response Rules, Rev. 4 OI-038-000, EOP Operations Expectations / Guidance, Rev. 16 TM-OP-100-03, Simulator Training, Rev. 14 OP-100-017, Emergency Operating Procedures Implementation Guide, Rev 5

Facility: Waterford 3 Scenario No.: **4** Op Test No.: 1

Examiners: Operators:

Initial Conditions: Reactor power is 100%. AB Buses are aligned to Train B.

Turnover: Protected Train is B; Maintain 100%.

Critical Tasks: (1) **Energize the 3A safety bus with EDG 'A.'** When EDG B trips on overspeed, EDG 'A' fails to energize 3A Safety Bus due to 3A-2A bus tie failing to open on under voltage. Manually open 3A-2A bus tie, allowing EDG 'A' output breaker to close and power the bus.
(2) **Manually start CCW Pump A** (when it does not energize on the sequencer) within 10 minutes of EDG 'A' start in order to prevent overheat of the 'A' EDG.

Event No.	Malf. No.	Event Type*	Event Description
1	FW05	N – BOP TS – SRO	EFW AB pump operability test - EFW AB trips on mechanical overspeed. TS 3.7.1.2 d
2	CV05B2	C – ATC	Letdown backpressure control valve, CVC-123B, fails closed
3	NI01H	I – BOP TS – SRO	Excore Nuclear Instrument ENI-IJI-0001D middle detector fails low. TS 3.3.1, 3.3.3.6
4	RC15A1	I – ATC TS-SRO	Pressurizer level transmitter, RC-ILT-110X, Fails Hi. TS 3.3.3.5a
5	TU06 ED01A-D	M – ALL	Turbine Trip, Loss Of Offsite Power after 10 seconds,
6	ED23A	C – BOP	3AS to A2 Bus Tie Breaker Fails to trip on UV **(CT1)**
7	EG10B	C – None	EDG B trips on overspeed after 20 seconds
8	CC23A	C – BOP	CCW Pump A Fails to Autostart on Sequencer **(CT2)**
9	CV02A	C – ATC	Charging Pump A fail to autostart

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

Scenario Quantitative Attributes

1. Malfunctions after EOP entry (1–2)	2
2. Abnormal events (2–4)	2
3. Major transients (1–2)	2
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)	2

The crew assumes the shift at 100% power with instructions to maintain 100% power. No equipment is out of service.

Event 1: Following crew turnover, the crew is directed to perform OP-903-046 section 5.3, EFW Pump AB Check. EFW AB will trip on mechanical over speed and cannot be reset due to linkage damage. The CRS will enter TS 3.7.1.2 action d.

Event 2: When the Tech Spec review is complete, letdown backpressure control valve, CVC-123B, fails closed. The SRO should enter OP-901-112, Charging or Letdown Malfunction, section E2 which will place the standby backpressure control valve in service.

Event 3: After the standby letdown backpressure control valve is in service, Log Power Channel D will fail low. The CRS should enter TS 3.3.1 functional unit 3 action 2 and TS 3.3.3.6 action 29 and bypass bistables 1-4 on PPS Channel D. Bistable 14 may be bypassed while in Mode 1, not applicable until Mode 2.

Event 4:. After the crew has addressed TS, Pressurizer Level Channel X, RC-ILI-0110X, fails high. The CRS will enter OP-901-110, Pressurizer Level Control Malfunction, section E1, Pressurizer Level Control Channel Malfunction. The crew will swap controlling channel to Channel Y and restore Pressurizer Control back to Auto. The CRS should enter TS 3.3.3.5 action a. TS 3.3.3.6 should be reviewed and determined to not be applicable.

Event 5: After Pressurizer Control is in auto, the Main Turbine will trip followed by a Loss Of Offsite Power. Charging Pump

Event 6: The 3A to 2A bus tie breaker will fail to open causing EDG A output breaker failing to close. The crew will take action to open the 3A to 2A bus tie breaker **(Critical Task 1**) which will allow EDG A to power the 3A Safety Bus.

Event 7: EDG B will trip on overspeed after 20 seconds from event 5.

Event 8: CCW Pump A will fail to load on the sequencer requiring the BOP to manually start CCW Pump ‘A’ within 10 minutes of output breaker closure **(Critical Task 2**) to prevent overheating of the only remaining EDG (‘A’) still powering a vital bus and prevent an SBO event.

Event 9: Charging Pump A will fail to auto start. The ATC should recognize that no charging pumps are operating and start Charging Pump A.

The scenario can be terminated after the crew has powered the 3A Safety Bus, verified proper CCW operation, conserved Steam Generator inventory and have discussed actions for restoring Main Feedwater to at least one Steam Generator per OP-902-006, Loss of Feedwater Recovery, or at the lead examiner’s discretion.

Critical Task	Safety Significance	Cueing	Measurable Performance Indicator	Performance Feedback
CT-1: Energize the 3A vital AC Bus with 'A' EDG and prevent entering OP-902-005, Station Blackout Recovery. Task is applicable when EDG 'B' over-speeds/trips and loss of offsite power occurs. This task is satisfied by manually opening bus tie breaker 3A-2A, which then allows EDG 'A" to energize the 3 A bus, prior to performing actions in OP-902-005, Station Blackout Recovery. This task becomes applicable once the Loss of Offsite power occurs.	Failure to energize at least one emergency bus will result in the plant remaining in a configuration that will not support protection if a subsequent event would occur. This lowers the mitigative capability of the plant. (WTRN-OPS-CRITTASKS, CT-03)	Breaker indication on CP-1 and control room lighting. OP-902-000, Standard Post Trip Actions	The crew takes action to manually energize the required Safety Bus by opening the required 3-2 tie breaker.	EDG status and output breaker indication
CT-2: Manually start CCW Pump 'A' (when it does not energize on the sequencer) within 10 minutes of EDG 'A' output breaker being closed in order to prevent overheat of the 'A' EDG. This task is satisfied by manually starting the 'A' CCW pump when it fails to sequence on the 3A bus. This task becomes applicable once the Loss of Offsite power occurs.	Failure to establish CCW cooling to an operating and loaded EDG within 10 minutes will overheat the EDG and put the plant in an SBO event and place the plant at increased risk of core damage. (WTRN-OPS-CRITTASKS, CT-03)	CCW pump indicating lights and CCW flow on CP-8. OP-902-000, Standard Post Trip Actions	The crew takes action to manually start the CCW 'A' pump.	CCW 'A' pump indicating lights and CCW flow.

Critical Task (NUREG-1021, Rev. 11 Appendix D)

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

REFERENCES

Event	Procedures
1	OP-903-046, Emergency Feed Pump Operability Check, Rev. 323 Technical Specification 3.7.1.2 OP-100-014, Technical Specification and Technical Requirements Compliance, Rev. 358
2	OP-901-112, Charging or Letdown Malfunction, section E2, Rev. 9
3	Technical Specification 3.3.1 Technical Specification 3.3.3.5 Technical Specification 3.3.3.6 OP-009-007, Plant Protection System, Rev. 20
4	OP-901-110, Pressurizer Level Control Malfunction, Rev. 11 OP-903-013, Monthly Channel Checks, Rev. 21 Technical Specification 3.3.3.5 Technical Specification 3.3.3.6
5	OP-902-000, Standard Post Trip Actions, Rev 17 OP-902-003, Loss of Offsite Power / Loss of Forced Circulation, Rev. 11 OP-902-009, Standard Appendices, Rev. 320
6	OP-902-000, Standard Post Trip Actions, Rev 17
7	None
8	OI-038-000, EOP Operations Expectations / Guidance, Rev. 20
9	EN-OP-115, Conduct of Operations, Rev. 30
GEN	EN-OP-115, Conduct of Operations, Rev. 30 EN-OP-115-08, Annunciator Response, Rev. 6 EN-OP-200, Plant Transient Response Rules, Rev. 7 OI-038-000, EOP Operations Expectations / Guidance, Rev. 20 OP-100-017, Emergency Operating Procedure Implementation Guide, Rev 5 EN-TQ-210, Conduct of Simulator Training, Rev. 16 WTRN-OPS-CRITTASK, Waterford 3 Critical Tasks, Rev 0