

Braidwood 2019 Initial License Exam Outline Review Comments

1. Simulator Scenario Outline Comments

a. General Comments

- 1) **NRC:** 2019 NRC Exam Scenario #1 does not meet the target quantitative attribute standard for “EOPs entered/requiring substantive actions”, specifically in that this scenario contains no events of this type (the target band is 1-2). NUREG-1021 Appendix D, section C.2.f, specifies that the primary scram response procedure that serves as the entry point for the EOPs (in this case, 1BwEP-0) is not counted within the “EOPs Used” category of events. According to section C.2.g (1), 1BwFR-H.1 is counted within the “EOP Contingency Procedures Used” category. That being said, section C.2 also states that “the ranges are not absolute limitations; some scenarios may be an excellent evaluation tool but may not fit within the ranges.” Based upon the information available at this stage of review, the overall scenario appears to still provide an adequate evaluation tool, however, this will need to be confirmed following submittal of the operating test by the facility and also during scenario validation.

Facility: Performing 1BwFR-H.1 bleed and feed until restoration of a SG feed source will give adequate evaluation opportunities to observe the applicants though it does not meet the suggested band of EOP procedures following the scram response procedure.

NRC: Based upon discussion with the facility, the overall attributes of this scenario appears to be acceptable from a qualitative perspective at the present (outline) stage. The acceptability of this scenario will be confirmed during on-site validation.

- 2) **NRC:** Additional detail will be needed on 2019 NRC Exam Scenario #1, Event #10, to ensure that this event contains sufficient diagnosis and verifiable action to allow for crediting as a component malfunction event for the applicant in the ATC position. NUREG-1021 ES-301, section D.5.d, states that “an applicant should only be given credit for those items that require the applicant to perform verifiable actions (refer to Attachment 2 of this examination standard) that provide insight to the applicant’s competence. The required instrument and component failures are normally complete before starting the major transient; those that are initiated after the major transient should be carefully reviewed because they may require little action on the part of the applicant and provide little insight on their performance.” Attachment 2 further clarifies that the actions performed by the applicant must “...provide insight for the examiner to be able to determine whether the applicant is capable of actually operating the equipment/equipment controls and controlling the system response.” If, for example, the component malfunction event in question solely consists of the applicant attempting to start a pump that fails to start, then this event would not be acceptable in light of the aforementioned considerations.

Facility: The failure of the 1A AF pump to start should prompt the ATC to attempt to start the 1A AF pump. Once it is determined that the 1A AF pump cannot be started the ATC should recognize entry criteria being met for 1BwFR-H.1. An additional instrument or component failure could be added prior to the major event.

NRC: 2019 NRC Exam Scenario #1, Event #10 will not be counted for ATC malfunction credit. The associated D-1 form will be revised to list the event will be

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revised to list an “Event Type” of “C-ALL” for this event, indicating that no applicant will be receiving malfunction credit for the event (although the event will be retained due to scenario progression considerations. An additional malfunction will be added to the scenario (prior to the major transient) to replace the lost I/C malfunction opportunity for the ATC. **Changes incorporated by facility in revised D-1 form submitted on 1/24/19. Additionally, the initial condition power level was modified to 75% based upon scenario validation by the facility (specifically, due to observations made during the validation of Event #5).**

- 3) **NRC:** NUREG-1021 Form ES-301-5, Instruction 3 (see footnotes on form), states “whenever practical, both instrument and component malfunctions should be included...” Appendix D, section C.2.b, clarifies that instrument malfunctions consist of nuclear, control, or process-related instrumentation failures while, in contrast, component malfunctions consist of pump, motor, valve, or pipe failures. Excluding the spare scenario, the current distribution of malfunctions between these types is currently 1 instrument malfunction (5% of total for simulator exam) and 19 component malfunctions (95% of total simulator for exam). The facility will need to provide a justification as to why a more balanced distribution of instrument and component malfunctions is not practical.

Facility: The installation of the ovation digital control system has drastically reduced the impact of instrument failures. Many instrument failures now only require the operators to remove the channel from service, in ovation. This task does not clearly meet NUREG-1021 ES-301, section D.5.d requirements (see above). Previously, almost all instrument failures resulted in a significant plant transient which required the operator to take manual action to mitigate. For an instrument failure to cause a significant transient, with the ovation control system, another instrument in the same control logic must be taken out of service (OOS). Then one of the remaining instruments, in the same control logic must fail very slowly (over ~10 minutes) This will cause ovation to recognize the failure and insert a value that would require the operator to take manual control of the parameter (value from 120 seconds ago which would be incorrect for plant conditions). Since there was uncertainty regarding NUREG compliance, and potential cueing concerns regarding instruments being OOS as part of the IC, few instrumentation failures were utilized in development of the outlines. Should it be determined that the removal of a channel from service, in ovation, does meet the intent of the NUREG for “verifiable actions that provide insight to the applicant’s competence” more of these types of failures could be utilized and a more balanced distribution would be possible.

NRC: The facility’s justification regarding the impact of the Ovation system on the ability to run instrument malfunction events (and resultant heavy reliance on component malfunction events) is noted. Facility will correct the classification of 2019 NRC Exam Scenario #3, Event #3, to reflect that the malfunction event is an instrument (instead of a component). Additionally, the replacement malfunction being added to 2019 NRC Exam Scenario #2 for the BOP applicant to address comment 1.b.3 (0A PW Pump Trip) will be an instrument type malfunction. These changes will somewhat improve the distribution of malfunction types during the exam. **Changes incorporated by facility in revised D-1 forms submitted on 1/24/19.**

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- b. Potential Duplication/Overlap Concerns (additional details from facility and NRC review needed to determine acceptability):

- 1) **NRC:** 2019 NRC Exam Scenario #1, Event #7 appears to be similar to 2016 NRC Exam Scenario #3, Events #8 and 10. Additional details on these events will be required in order to ensure that the requirements of NUREG-1021 Appendix D, section C.1.f, regarding the repetition of major events from the previous two NRC exams will be met.

Facility: WOG 2 required direct entry into bleed and feed if no CV pumps are running. This criteria was removed in WOG 3, and the initiation of bleed and feed is now based solely on SG wide range levels. This, combined with the turbine auto trip failure, require different conditions to implement bleed and feed requirements. The scenario could be modified, by removing the feedline break (along with the MSIV failures and turbine trip failure) and causing the 1A AF pump to trip after entry into 1BwEP ES-0.1. This would also help address comment # 1.a.1 from above regarding # of EOPs entered past 1BwEP-0.

NRC: In addition to the aforementioned facility comments, the progression of the major transient and associated events for 2019 NRC Exam Scenario #1 will be further modified due to a change being made to address comment 2.a.2 (below). Specifically, the crew will “get back” the 1B AFW pump following the transition to feed-and-bleed, which is an additional difference from 2016 NRC Exam Scenario #3. Based upon discussion with the facility, this potential overlap concern has been alleviated. *Change incorporated by facility in revised D-1 form submitted on 1/24/19.*

- 2) **NRC:** 2019 NRC Exam Scenario #3, Event #8 appears to be similar to 2016 NRC Exam Scenario #2, Event #7. Additional details on these events will be required in order to ensure that the requirements of NUREG-1021 Appendix D, section C.1.f, regarding the repetition of major events from the previous two NRC exams will be met.

Facility: The 2019 NRC event takes place from ~2-3% reactor power, while the 2016 event took place from ~50%. This will cause a greater pressure rise in containment due to the increased mass in the steam generators. Additionally, the 2019 NRC exam has an auto reactor trip and a failure of the 1PM05J reactor trip switch, where the 2016 scenario has a failure of CS to actuate. This is a significant change to the IC and subsequent malfunctions, as stated in NUREG-1021 Appendix D, section C.1.f.

NRC: Based upon discussion with the facility, the major transient in question has been modified sufficiently to alleviate this potential overlap concern.

- 3) **NRC:** Three of the events included in the Audit/Cert Exam Spare Scenario overlap with events in the 2019 NRC Exam scenarios. NUREG-1021 ES-301, section D.1.a, states that “Operating tests may not duplicate test items (simulator scenarios of JPMs) from the applicants’ audit test...” and also that “Simulator events... that are similar to those that were tested on the audit examination are permitted provided that the actions required to mitigate the transient... are significantly

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different from those required during the audit examination.” Specifically the three events that present the overlap concern are as follows:

- Audit/Cert Exam Spare Scenario, Event #3, and 2019 NRC Exam Scenario #2, Event #5 (1A CV Pump failure / TS event)
- Audit/Cert Exam Spare Scenario, Event #6, and 2019 NRC Exam Scenario #2, Event #4 (0A PW Pump trip)
- Audit/Cert Exam Spare Scenario, Event #7, and 2019 NRC Exam Spare Scenario, Event #3 (PZR Pressure Channel failure / TS event)

Either the applicable Audit/Cert Exam Spare Scenario events or 2019 NRC Exam Spare Scenario events will need to be significantly modified or replaced to address this concern.

Facility: Overlap concern #1 – The initiating cues for the charging pump trip vs shaft shear are significantly different and different actions within the procedural flowpath should be executed. An additional direction to the booth operator could be utilized to ensure the 1A CV pump discharge pressure appears to be fluctuating (by throttling open and closed, the 1CV121 or 182 bypass valves). This would require the crew to take the actions for a gas bound charging pump, vice a simple electrical trip.

Overlap concern #2 – The IC and AND order for the NRC scenario could be modified to start from 50% power and direct a ramp to 75% power. In this scenario the PW pump trip would have much greater implications for overall plant operation, since the crew would be diluting to raise Tave.

Overlap concern #3 – The TS determination is similar, though the instrument fails in a different direction. The NRC spare scenario failure can be replaced with a different instrument failure (such as a RCS hot leg indication failure).

NRC:

- Resolution of 1A CV Pump failure / TS event concern: The component failure will be switched to the 1B CV Pump. Based upon that change, as well as differences in diagnosis resulting from a different mode of failure, the potential overlap concern associated with the ATC component malfunction aspect of this event has been alleviated. With regard to the overlap concern associated with the SRO TS determination aspect of this event, an additional, separate TS call opportunity will be added for the SRO in this scenario. 2019 NRC Exam Scenario #2, Event #5, will not be counted as a SRO TS determination opportunity should the Audit/Cert Exam Spare Scenario be used. **Changes incorporated by facility in revised D-1 form submitted on 1/24/19.**
- Resolution of 0A PW Pump trip concern: facility will replace this event due to overlap. **Change incorporated by facility in revised D-1 form submitted on 1/24/19.**
- PZR Pressure Channel failure / TS event – Based upon further discussion with the facility, the TS determination is sufficiently different to alleviate the overlap concern. Specifically, the additional LCO 3.3.4.A entry is unique to the 1PT-455A channel.

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c. Technical Specification Event Concerns (additional details from facility and NRC review needed to determine acceptability):

- 1) **NRC:** Additional detail will be needed on 2019 NRC Exam Scenario #2, Event #1, to ensure that this event will provide sufficient discriminatory value for a technical specification event evaluation. For example, if the procedural guidance associated with this normal evolution provides the specific technical specification condition that is applicable to the applicant, then insufficient insight into the technical specification competency might be gained through this event. Specifically, NUREG-1021 Appendix D, section E.2.f, states that the technical specification competency “involves the ability to *recognize* plant conditions covered by TS and inoperable equipment. It includes the ability to *locate* the appropriate specifications for inoperable equipment and *correctly interpret and ensure compliance* with any limiting conditions for operation and action statements.” NUREG-1021 Form ES-303-4 further clarifies the manner in which this competency must be observed and evaluated.

Facility: BwOP AR/PR-19, ROUTINE SKID MOUNTED PROCESS RADIATION MONITOR OPERATIONS, does not specifically dictate which LCO condition is applicable for each rad monitor removed from service. The references section lists 6 tech specs by number (i.e. 3.6.3) but does not associate them with a rad monitor. Similarly, the annunciator response procedures for many alarms list tech specs to reference, but do not list the applicable condition.

NRC: Based upon further discussion with the facility, this TS determination event appears to be acceptable. This will be confirmed during on-site validation.

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2. JPM Outline Comments

- a. Potential Duplication/Overlap Concerns (additional details from facility and NRC review needed to determine acceptability)

- 1) **NRC:** System JPM 'b' (SIM-224) involves aligning ventilation systems for emergency operation. This appears to potentially overlap with 2019 NRC Exam Scenario #1, Event #9, which involves the crew having to manually swap ventilation trains under emergency conditions. Additional details will be needed will be needed to evaluate this potential overlap.

Facility: JPM 'b' aligns auxiliary building ventilation with a component failure. Scenario 1 has a failure in the control room ventilation system requiring different mitigating actions.

NRC: Based upon further discussion with the facility, an overlap concern has been determined to not exist.

- 2) **NRC:** In-Plant JPM 'i' (IP-200) involves the resetting of a feedwater isolation under emergency conditions. This appears to potentially overlap with 2019 NRC Exam Scenario #1, Event #7, which involves an inadvertent feedwater isolation during emergency conditions. Additional details will be needed will be needed to evaluate this potential overlap.

Facility: This JPM is performed in the plant and will not overlap with the actions performed in the simulator by the crew.

NRC: Facility to modify the 2019 NRC Exam Scenario #1 major transient and associated events in order to "give back" the 1B AFW pump to the crew following the transition to feed-and-bleed. This will allow the restoration of feed via AFW and thus avoid crew actions to reset the feedwater isolation. Based upon these changes, this overlap concern has been alleviated. **Change incorporated by facility in revised D-1 form submitted on 1/24/19.**

- 3) **NRC:** *Note: following the initial outline submittal by the facility, systems JPMs 'c' (C-301) and 'd' (C-401Sa) replaced the prior JPMs associated with the associated safety functions for the purposes of testing differences between units at the facility.* System JPMs 'c' (C-301) involves a pressurizer pressure malfunction. This appears to potentially overlap with 2019 NRC Exam Scenario #3, Event #3, which involves the master pressurizer pressure controller setpoint failing high. Additional details will be needed will be needed to evaluate this potential overlap.

Facility: The JPM (conducted in the Unit 2 Control Room) involves an instrument failing low, necessitating that a 7300 series control station be taken to manual followed by manually raising the controller setting. The scenario event (note that the simulator is modeled after the Unit 1 Control Room) involves a failure of the Master Pressurizer Pressure Controller itself, necessitating that an Ovation control station be taken to manual with subsequent adjustment (if needed at all) occurring by lowering the controller setting. Procedural differences exist between both responses as well.

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NRC: Final acceptability of both the JPM and scenario event in question to be determined during onsite validation.

3. Written Exam Outline/Audit Exam Outline

- a. **NRC:** Due to the following K/As being duplicated between the written exam outlines for the NRC and Audit exams, the Audit exam questions written for the following outline K/As will require comparison with those written for the NRC exam in order to check for duplication/overlap:

- 1) 059 A1.03 (Audit exam question #32, NRC exam question #45)
- 2) 071 K5.04 (Audit exam question #9, NRC exam question #63)
- 3) 000051 / Generic 2.4.31 (Audit exam question #43, NRC exam question #83)
- 4) Generic 2.1.1 (Audit exam question #65)
- 5) Generic 2.3.13 (Audit exam question #98, NRC exam question #83)
- 6) Generic 2.4.23 (Audit exam question #100)
- 7) Generic 2.4.11 (Audit exam question #99, NRC exam question #100)

Facility: All NRC questions will be written with significant difference to the audit exam questions to prevent overlap. The audit exam questions will be provided to allow for determination of overlap. Audit exam question #43 is in the RO portion of the exam, the KA for the NRC exam is in the SRO portion of the exam. This should allow for sufficient differences between the questions.

NRC: Facility to provide the aforementioned questions from the audit/cert exam in conjunction with submittal of the NRC written exam to allow for comparison. **Following written exam submittal on 3/20/19, Audit exam question #9 and NRC exam question #63 (K/A 071 K5.04) were identified to overlap excessively; resolution of this issue was tracked via Form ES-401-9. The remainder of the questions associated with the aforementioned duplicated K/A statements were determined to be acceptable.**