Catawba Nuclear Station
2017 NRC Exam
Post Exam Comments

Senior Reactor Operator Written Exam

Question 79

The original intent of the question was to test knowledge of a failure of the Reactor Protection System by describing a failed Reactor Trip due to a signal generated by failed instrumentation in conjunction with a vital AC channel failure. During exam administration, an applicant requested status of the main turbine. This request prompted further discussion between the CNS Exam Team and Chief Examiner, and it was determined that the incorrect answer had been identified during the original submittal for this question.

Explanation: Safety Injection and Reactor Trip signals would be generated due to the initial failed instrumentation and subsequent loss of a vital AC channel. Additionally, a Main Turbine trip signal would be generated directly from the Safety Injection signal. Since no information regarding the Main Turbine was provided in the stem, the applicant is required to determine that it has tripped. Given that a separate Reactor Trip signal is generated based on a Main Turbine Trip greater than 69% power, the failed Reactor Trip listed in the question is no longer only based on instrument/vital channel failure. An ATWS would exist under these conditions due to the Unit being in a “transient” following the main turbine trip.

Resolution: Request the correct answer for Question 79 to be changed from “D” to “C”.

Note to Examiner: The preliminary grades provided via “Written Exam Performance Analysis” include this change.

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Operating Exam

Scenario #2, Event 3 1B S/G PORV Failure

Based on the failure of 1B S/G PORV, no applicable Tech Spec/ SLC determination was identified in the CNS original submittal documents. Following exam administration, it has been determined that the required actions of T.S. 3.7.4, Condition "A" should be declared.

Explanation:
The following information was documented by CNS Operations Management (Wayne Jarman, Assistant Operations Manager – Shift) and forwarded to the Regulatory Affairs Department for concurrence/clarification.

It is Operations Management position that when a SG PORV has failed open and is subsequently isolated by the associated PORV block valve, the affected SG PORV is inoperable. This conclusion was reached for the following reasons:

- Technical Specification 3.7.4 (Steam Generator Power Operated Relief Valves (SG PORVs) contains Surveillance Requirement (SR) 3.7.4.2 which states: *Verify one complete cycle of the SG PORV.*

  The Tech Spec Bases for this Surveillance Requirement states the following: *To perform a controlled cooldown of the RCS, the SG PORVs must be able to be opened remotely and throttled through their full range using the safety-related nitrogen gas supply. This SR ensures that the SG PORVs are tested through a full control cycle at least once per fuel cycle. Performance of inservice testing or use of an SG PORV during a unit cooldown may satisfy this requirement. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program*. With a SG PORV failed open (and unable to close) this Surveillance Requirement cannot be met, thus the affected PORV is inoperable.

- Technical Specification 5.5.8 (In Service Testing Program) requires SG PORVs to be stroked from open to closed on a quarterly basis. The procedure governing this valve stroke is PT/1(2)/4200/031 (SV Valve Inservice Test). Per this test procedure, should a SG PORV not stroke within the allowable stroke time, the affect PORV is declared inoperable.

Conclusion: When a SG PORV is failed open, the surveillance for a valve stroke cannot be met. The SG PORV is also not available for a "controlled" cooldown.

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The following response was received from regulatory affairs (Cecil Fletcher, Regulatory Affairs Manager):

I agree with your original conclusion regarding the SG PORV being **Inoperable**. Specifically, for the reasons that you stated for not being able to meet the TS surveillance and another reason that I will discuss as well.

Addressing the TS surveillance issue first. IMC 326 Section 03.08 states in part:
"An SSC that does not meet an SR must be declared inoperable because the LCO operability requirement(s) are not met…When an SSC capability is degraded to a point where it cannot perform with reasonable expectation or reliability, the SSC should be judged inoperable, even if at this instantaneous point in time the system could provide the specified safety function."

Also, IMC 326 Section C.05 states the following regarding the use of temporary manual actions in place of automatic actions in support of operability:
"Automatic action is frequently provided as a design feature specific to each SSC to ensure that specified safety functions will be accomplished. Limiting safety system settings for nuclear reactors are defined in 10 CFR Part 50.36, "Technical Specifications," as settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. ***Accordingly, it is not appropriate to consider SSCs operable by taking credit for manual action in place of automatic action for protection of safety limits****. This does not forbid operator action to put the plant in a safe condition, but operator action cannot be a substitute for automatic safety limit protection."*

CNS TS section B 2.0 SAFETY LIMITS specifically states in part that the safety analyses assumes that the safety valves on the secondary plant are assumed to open when the steam pressure reaches the secondary plant safety valve settings…"

Resolution: Request the applicable ES-D-2 be updated to include required application of T.S. 3.7.4 Condition A following the failure of the 1B S/G PORV.

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Scenario #3, Event 4 1B S/G Tube Leak

During administration of Scenario #3 of the operating exam, an approximate 50-60 GPM S/G Tube Leak on 1B S/G was given to the applicants. The original submittal identified Tech Spec 3.4.13 (RCS Operational Leakage) condition 'B' and SLC 16-7.9 (Standby Shutdown System (SSS)) condition 'B' as being the applicable Tech Specs and SLCs for this failure. It has since been determined that Tech Spec 3.4.18 (SG Tube Integrity) Condition 'B' is also applicable for this particular scenario. The following information is from the Tech Spec 3.4.18 Bases:

"A SG tube has tube integrity when it satisfies the SG performance criteria. The SG performance criteria are defined in Specification 5.5.9, "Steam Generator (SG) Program," and describe acceptable SG tube performance. The Steam Generator Program also provides the evaluation process for determining conformance with the SG performance criteria.

There are three SG performance criteria: structural integrity, accident induced leakage, and operational LEAKAGE. Failure to meet any one of these criteria is considered failure to meet the LCO."

Based on the fact that the operational LEAKAGE for this scenario exceeded the limit of 150 Gallons Per Day identified in Tech Spec 3.4.13, it is the opinion of the station (Operations Management and Regulatory Affairs) that Tech Spec 3.4.18 LCO is also not met, and that Condition 'B' is applicable.

Resolution: Request the applicable ES-D-2 be updated to include required application of T.S. 3.4.18 Condition B following the 1B S/G Tube Leak.