FAQ 24-01

Proposed NRC Response

Plant: Waterford 3

Date of Event: 3/21/2024

Submittal Date: 8/08/2024

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Performance Indicator: 1E04, Unplanned Scrams with Complications

Site-Specific FAQ (see Appendix D)? ( )Yes or (X) No

FAQ requested to become effective (X) when approved or (other date) _____

Question Section

NEI 99-02 Guidance needing interpretation (include page and line citation):

- NEI 99-02, Revision 7, Page 21, Lines 10-14

  The USwC indicator is defined as the number of unplanned scrams while critical, both manual and automatic, during the previous four quarters that require additional operator actions or involve the unavailability of or inability to recover main feedwater as defined by the applicable flowchart (Figure 2) during the scram response (see definition of scram response in the Definitions of Terms section) and the associated flowchart questions.

- NEI 99-02, Revision 7, Page 23, Lines 38-42

  The question's purpose is to determine if the operator had to respond to an abnormal condition that required a safety injection or respond to the actuation of additional equipment that would not normally actuate on an uncomplicated scram. This question would include any condition that challenged Reactor Coolant System (RCS) inventory, pressure, or temperature severely enough to require a safety injection.

- NEI 99-02, Revision 7, Appendix H, Page H-1, Lines 4-8

  This question is designed to verify that the plant conditions are stable and do not require the actuation of the emergency injection system (safety injection for Westinghouse plants, SIAS for CE). Plant conditions that result from a loss of inventory or loss of pressure control in the RCS or Steam Generator (SG) would likely require actuation of the emergency injection systems and would be considered a complication.

Event or circumstances requiring guidance interpretation:

On March 21, 2024, with the unit at ~98% power, a failure of a bushing on "B" main generator transformer occurred resulting in a main generator lock out and subsequent turbine and reactor trip. The reactor protection system automatically actuated, and the unit tripped as designed. All control rods fully inserted. The main transformer failure resulted in a fire and subsequent damage to the "B" startup transformer. A fast transfer from the "A" unit auxiliary transformer to the "A" startup transformer occurred as design. The damage to the "B" startup transformer prevented the fast transfer to occur however upon the loss of power to the "B" electrical safety buses, the "B" emergency diesel generator automatically started and restored power to the safety bus as designed with no operator action required.

To protect against overcooling the reactor coolant system on a reactor trip, the reactor trip override (RTO) system replaces the automatic flow demand signal with a fixed flow demand signal, closes the main feedwater control valve and reduces flow through the startup feedwater control valve. However, if the individual valve M/A control station is in "Manual", the control valve will not reposition. During the plant transient, both steam generator water level detector systems sensed a momentarily level deviation which caused the feed water level control valves to transfer from "automatic" to "manual" control. While the momentarily level deviation was not expected for this transient, the response of the system was as designed. As a result, the steam generators were overfed causing the reactor coolant system pressure to decrease to the Safety Injection Actuation Signal (SIAS) setpoint but not below the shutoff head of the high pressure safety injection (HPSI) pumps. A post-trip reviewed determined that no safety injection occurred or was required to maintain reactor coolant inventory, pressure, or temperature during the plant transient.

A review of the NEI 99-02 "Regulatory Assessment Performance Indicator Guideline", Figure 2 flowchart decision block "Was a Safety Injection signal received?" raised a licensee question regarding the intent of the decision block. While the question posed appears to be straightforward, the guidance provided in NEI 99-02 page 23-24 could lead to a potential "no" answer to the question even if a safety injection signal is received. Specifically,

> "*The question's purpose is to determine if the operator had to respond to an abnormal condition that required a safety injection or respond to the actuation of additional equipment that would not normally actuate on an uncomplicated scram. This question would include any condition that challenged Reactor Coolant System (RCS) inventory, pressure, or temperature severely enough to require a safety injection.*"

There are two parts to this guidance 1) did the operators have to respond to an abnormal condition that required a safety injection and 2) did the operators have respond to the actuation of additional equipment that would not normally actuate on an uncomplicated scram.

<u>Operators have to respond to an abnormal condition that required a safety injection</u>

The Waterford 3 station is a Combustion Engineering (CE) design where a safety injection actuation signal alone does not cause an injection into the system--reactor coolant system pressure must also lower significantly. During the plant transient, the HPSI pumps did not inject during the plant transient due to reactor coolant system pressure not lowering below the shutoff head of the HPSI pumps. Based

upon a review of plant computer trends, the lowest RCS lowest pressure during the transient was 1,663 psia with HPSI Shutoff Head being 1,470 psia.

Guidance in NEI 99-02 and NEI 99-02 Appendix H, USwC Basis Document is silent on whether the receipt of a safety injection signal with no actual safety injection should be counted as uncomplicated or complicated. While a SIAS was received during the March 21, 2024 plant trip, a review of the plant parameter data, plant response to the reactor trip and operating crew response to the reactor trip indicated that safety injection flow into the RCS did not occur and was not required to control RCS inventory, pressure, or temperature.

Additionally, the higher feedwater flow caused by the unexpected level deviation was resolved as part of the standard post trip actions and a review of operator's response was determined to be acceptable and the overfeeding of the steam generators was not viewed as an operator error. Additionally, at no time during the transient were additional charging pumps started to maintain RCS inventory.

<u>Operator response to the actuation of additional equipment that would not normally actuate on an uncomplicated scram</u>

As defined by NEI 99-02, the "Unplanned Scrams with Complications" performance indicator is defined "as the number of unplanned scrams while critical, both manual and automatic, during the previous four quarters that require additional operator actions or involve the unavailability of or inability to recover main feedwater as defined by the applicable flowchart (Figure 2) during the *scram response*".

NEI 99-02 further defines "scram response" as the period of time that starts with the scram and concludes when operators have completed the scram response procedures and the plant has achieved a stabilized condition in accordance with approved plant procedures and as demonstrated by meeting the following criteria for a PWR plants:

- Pressurizer pressure is within the normal operating pressure band.
- Pressurizer level is within the no-load pressurizer band.
- Level and pressure of all steam generators are within the normal operating bands.
- RCS temperature is within the allowable RCS no-load temperature band (Tave if any RCS pump running, Tcold if no RCS pumps running).

While it is acknowledged that upon the receipt of the SIAS, several safety systems actuated and align to required positions including high pressure safety injection (HPSI), low pressure safety injection (LPSI) pumps and emergency feedwater. However as previously stated, RCS pressure did not lower below the shutoff heads of the HPSI pumps and these systems were not required to control RCS inventory, pressure, or temperature during the plant transient.

Additionally, the operators were not required to respond to the actuation of these systems until after the scram response had concluded and plant conditions were stabilized as defined by the NEI definition of "scram response". Following the stabilization of the key plant parameters, operators realigned the systems that actuated when the SIAS signal was received to their "standby" position per the applicable operating procedures.

In summary, following the March 21, 2024 the automatic scram, the operators were not required to take additional operator actions other than those taken during a normal scram or had to respond to an abnormal condition that required a safety injection during the scram response period of time. Even though a SIAS was received following the scram, systems that actuated were not required to support plant conditions and were not operated until after the key plant parameters (pressurizer level and pressure, steam generator pressures and levels, and RCS temperature) had stabilized. All actions completed to stabilize the plant were performed in accordance with the standard post trip actions procedure. Based upon operator actions and plant response following the scram, the March 21, 2024 Waterford 3 scram should be categorized as "not complicated".

If licensee and NRC resident/region do not agree on the facts and circumstances, explain:

The NRC resident's position is that the March 21, 2024 scram should be considered complicated as defined by the NEI 99-02 "IE04 Unplanned Scrams with Complications-Flowchart." Specifically, the flowchart has a decision block that states "Was a Safety Injection signal received?" Answering this question "yes" drives counting the scram as complicated per the flowchart. As previously discussed, a safety injection signal was received during the scram due to reactor coolant system pressure lowering to the actuation setpoint as a result of the steam generators being overfed.

However, the licensee position is that even though SIAS was received, the intent of the of the flowchart decision block is to evaluate whether or not safety injection was required to maintain/restore key reactor coolant system parameters. NEI 99-02 page 23, lines 38-42 appear to support the licensee's position. During the March 21, 2024 scram, reactor coolant system pressure did not lower below the shutoff head of the HPSI pumps and a safety injection did not occur.

In discussions between NRC resident and licensee, there was a general acknowledgement that there is some ambiguity between the flowchart and the supporting text in the NEI document and pursuing a FAQ could help eliminate the ambiguity.

Potentially relevant FAQs:

None identified.

Response Section

Proposed Resolution of FAQ:

Entergy: Waterford 3 proposes to not count the March 21, 2024 reactor trip against the IE04 performance indicator.

If appropriate, provide proposed rewording of guidance for inclusion in next revision:

N/A

PRA update required to implement this FAQ?

No

MSPI Basis Document update required to implement this FAQ?

N/A

Proposed NRC Response:

The event in question was reported as a scram with complications based on answering 'Yes' to the question "Was a safety injection signal received?" A valid safety injection actuation signal was received since RCS pressure did drop to the SIAS setpoint and the safety injection system did start and align for injection, though the NRC does acknowledge the licensee's view that no actual safety injection flow entered the RCS since RCS pressure remained above the high-pressure safety injection pump shutoff head. In addition to reviewing the specific question at issue, the staff considered the overall objective of the unplanned scrams with complications performance indicator to determine whether a 'Yes' answer is consistent with the intent of the PI. The purpose of this indicator is to trend the subset of scrams that require additional operator actions beyond that of a normal scram or involve the unavailability of or inability to recover main feedwater. Such events or conditions have the potential to present additional challenges to the plant operations staff and therefore, may be more risk-significant than uncomplicated scrams. The NRC reviewed the circumstances presented to operators surrounding the March 21, 2024, scram: failure of B train 4kV bus fast transfer, a transformer fire and activation of the emergency plan, and unexpected steam generator level control system response that resulted in a main feedwater isolation and overfeeding the steam generators, which resulted in a safety injection actuation. Given that the conditions to answer a question 'Yes' were present and considering the totality of this scram and plant response, the staff concludes that this scram does meet the intent of this performance indicator and should be counted as a complicated scram.