

FAQ 18-05
Turkey Point Unit 3 Shutdown Rev. 1 – Proposed NRC Response

Plant: Turkey Point Unit 3

Date of Event: November 20, 2017

Submittal Date:

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Performance Indicator: IE03 Unplanned Power Changes per 7,000 Critical Hours

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

FAQ to become effective (☒) when approved or (other date)

Question Section

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

Page 14 - Unplanned power change definition:

The number of unplanned changes in reactor power of greater than 20% of full-power, per 7,000 hours of critical operation excluding manual and automatic scrams.

Unplanned changes in reactor power, for the purposes of this indicator, is a change in reactor power that:

(1) was initiated less than 72 hours following the discovery of an off- normal condition that required or resulted in a power change, of greater than 20% of full power to resolve, and
(2) has not been excluded from counting per the guidance below. Unplanned changes in reactor power also include uncontrolled excursions of greater than 20% of full power that occur in response to changes in reactor or plant conditions and are not an expected part of a planned evolution or test.

Page 15 – Examples of occurrences that would be counted against this indicator include:

- Power reductions that exceed 20% of full power and are not part of a planned and documented evolution or test. Such power changes may include those conducted in response to equipment failures or personnel errors or those conducted to perform maintenance.
- Power reductions due to equipment failures that are under the control of the nuclear unit are included in this indicator.

Event or circumstances requiring guidance interpretation:

On November 20, 2017, with Turkey Point Unit 3 operating at 100% power, control room operators noted a reduction in Reactor Coolant Pump (RCP) Seal Flow. The plant procedure, 3-ONOP-041.1 “Reactor Coolant Pump Off-Normal,” directs shutdown of the unit following “General Operating Procedure” 3-GOP-100 “Fast Load Reduction” fast power reduction section. The intent is to protect the equipment and shut down the reactor so that repairs can be made. It should be noted that the procedure directs immediate trip of the reactor if RCP

temperatures exceed acceptable limits. However, since RCP temperatures remained within those limits, plant operators commenced Unit 3 shutdown using a normal shutdown procedure.

Timeline:

- 0323 Control Room alarm on RCP Controlled Bleed Off (CBO) high temperature and entered procedure 3-ONOP-041.1 for RCP off-normal condition
- 0738 Control Room alarm for RCP Trouble, 3C RCP CBO flow changed from 2.4 gpm to 0. For that condition, 3-ONOP-041.1 directs operations to "commence unit shutdown using (normal plant shutdown procedure) 3-GOP-100, Fast Load Reduction section.
- 0742 Operations briefed the plan to shutdown the reactor and entered the procedure 3-GOP-100.
- 0844 Control Room Operators completed a power reduction using 3-GOP-100 and then inserted a manual scram at 18% power.

Unit 3 was shutdown in accordance with plant procedure for equipment protection. Since the unit was initially at 100% power and the shutdown exceeded a 20% power change, the power change was appropriately counted against the Unplanned Power Changes per 7000 Hrs Critical Performance Indicator (IE02).

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

NRC Resident Inspector does not agree with the licensee. The Resident Inspector believes the licensee did not fully address the applicable item in NEI 99-02. Specifically, while the scram occurred at less than 35% power level and was inserted using normal operating procedures, the licensee did not address whether this was a planned shutdown. The plant was shut down following the rapid load reduction procedure, 3-GOP-100 and the procedure used for normal planned shutdowns is 3-GOP-103. Because the licensee did not use the normal method of implementing a planned shutdown, the occurrence should count in the unplanned scrams performance indicator.

Potentially relevant FAQs:

Perry FAQ 440
Date of Event: June 2007
Entered: 3/19/2008

Response Section

Proposed Resolution of FAQ:

Turkey Point Unit 3 shutdown should count against the Unplanned Power Changes Performance Indicator. It was a planned shutdown to address an equipment issue which utilized a normal shutdown procedure. The equipment required a plant shutdown to repair and would not allow for 72 hours for planning. The operating procedure directed Operators to commence shutdown in order to be able to remove the RCP from service. The condition did not warrant insertion of an immediate (unplanned) plant scram and so should be counted as an

Unplanned Power Change, as operators were given the time necessary to conduct an orderly reactor shutdown. The scram was inserted at 18% power, well below the 35% threshold.

The Unplanned Power Changes and Unplanned Scrams Performance Indicators are included in the set of "Initiating Events" and are both intended to provide indication of off normal conditions that can present challenges to plant operators. However, the distinction is that Unplanned Power Changes "monitors the number of unplanned power changes (excluding scrams) that could have, under other plant conditions, challenged safety functions." By contrast, Unplanned Scrams "measures the rate of scrams per year of operation at power and provides an indication of initiating event frequency."

The definition of Unplanned Scram implies a plant transient or other condition necessitating immediate trip of the reactor (manual scram in anticipation of automatic scram). The exceptions make it clear that a condition that allows time for operators to take deliberate action to reduce power and then manually manual trip the reactor, should not be counted against the Indicator. This conclusion is further confirmed in the examples of scrams to be included (page 10 of NEI 99-02, rev 7, lines 38-41) and the examples of scrams that are not included (page 11 of NEI 99-02, rev 7, lines 12-14).

NRC inspection Manual Chapter (IMC) 308, contains additional information that helps to inform the understanding of the Unplanned Scrams PI. Page 14 of Attachment 1 states "Some industry representatives indicated that including manual scrams in the current scram PIs could result in non-conservative decision-making by operators during a plant event for which a manual scram is warranted." From this quote, it is clear that the PI was expanded to capture manual scrams that are initiated to preclude and automatic scram. Since the Turkey Point Unit 3 shutdown was neither automatic, nor to avoid an automatic trip, it should not be counted in the Unplanned Scrams PI.

Turkey Point reduced power in accordance with their general operating procedure and shutdown Unit 3 at 18% power and within less than 72 hours from the initial indication of equipment issue. Thus the shutdown was counted in the Unplanned Power Changes per 7000 hours Critical PI.

FPL Comments

FPL found the NRC Staff draft resolution to be thorough and well-written. However, FPL respectfully requests consideration of the following points:

The referenced FAQ 17-02 was initiated to resolve a disagreement over whether the shutdown should count against *both* the Unplanned Scrams and Unplanned Power Changes PIs. While FAQ 17-002 was similar, the question posed was whether both indicators should be affected; not which one. In that case, the licensee had already counted the event as an Unplanned Scram, so the question of which PI was not debated. Following is the question:

Does an unplanned power change caused by a main turbine trip that ends in an elective manual scram and is counted as an unplanned scram also need to be counted as an unplanned power change?

Since FAQ 17-02 did not specifically discuss which PI should be counted, its resolution is not directly applicable to this FAQ.

The discussion relative to FAQ 440 seems to indicate that the decision point is whether the usual plant shutdown *procedure* is used versus the normal plant shutdown process. FAQ 440 resolution seems to hinge on whether the shutdown procedure is the usual one for Refuel Outages. If that logic is followed, then nearly every forced outage will count as Unplanned Scram.

At Turkey Point, the procedure that was used for the shutdown is designated within the class of Operating Procedures as a “normal procedure” and not within the Off-Normal or Emergency Operating Procedures classes. Further, the shutdown process for Turkey Point is the same in this procedure as the one used for refuel outages, except that it results in reaching the point of manual scram more rapidly (i.e., the normal alignments and operator actions are completed, with the omission of certain surveillances and equipment checks, prior to reactor shutdown and separation from the grid prior to scram). Consequently, FPL believes the deciding factor should be the process versus the actual procedure and the November 20, 2017 shutdown more appropriately should be counted against the Unplanned Power Changes PI.

In preparation for this FAQ, FPL researched the historical development of the Unplanned Scrams PI. Initially, it was only to include automatic scrams. SECY 99-007 contained the following:

Initiating Events - The objective of this cornerstone is to limit the frequency of those events that upset plant stability and challenge critical safety functions, during shutdown as well as power operations. If not properly mitigated and multiple barriers are breached, a reactor accident could result which would compromise the public health and safety. Licensees can reduce the likelihood of a reactor accident by maintaining a low frequency of these initiating events. Such events include reactor trips due to turbine trips, loss of feedwater, loss of off-site power, and other reactor transients. (p. 4)

1. Scrams - unplanned automatic and manual scrams while critical per 7, 000 Critical Hours¹ and risk-important scrams.

This measure is a count of events that upset plant stability and challenge safety functions. The indicator includes all scrams while the reactor is critical that are not directed by a normal operating or test procedure. It also includes scrams that occur during the execution of procedures in which there is a high probability of a scram but the scram was not planned. Examples of the types of scrams included are those that result from unplanned transients, equipment failures, spurious signals, human error, or those directed by abnormal, emergency, or annunciator response procedures. This is the same as the WANO indicator that is used by all U.S. plants, except that it also counts manual scrams because, from a risk perspective, they are just as important as automatic scrams. Also, a separate count is made of risk-important scrams over a 12 quarter moving sum to differentiate these scrams from the scrams without any complications. Risk-Significant Scrams = Scrams with LOCA, SGTR, LOOP, Total Loss of Heat Sink, Total Loss of Feedwater; or Scrams with a failure one or more trains of the SSPI systems. The SSPI systems are: BWRs -Emergency AC Power; High Pressure Coolant Injection Systems (HPCI, HPCS, FWCI); High Pressure Heat Removal Systems (RCIC, IC); and RHR for the suppression pool and shutdown cooling functions. PWRs - Emergency AC Power, HPSI, AFW, and RHR for the post-accident recirculation and shutdown cooling functions. (p. A-4)

2. Transients - unplanned changes in reactor power of greater than 20% per 7,000 Critical Hours.

This indicator counts unplanned events (excluding scrams) that could, in certain plant conditions, challenge safety functions. It may be a leading indicator of risk-significant events. The PI includes all changes in reactor power of greater than 20% that are not planned. It includes uncontrolled excursions in reactor power as well as unplanned controlled power reductions and shutdowns. Unplanned power reductions and shutdowns are those that are initiated before the end of the weekend following the discovery of an off-normal condition. Examples of the types of transients included are runbacks, power oscillations, power reductions conducted in response to equipment failures or personnel errors, and unplanned power reductions to perform maintenance. It does not include manual or automatic scrams or load following power changes. This is similar to the information that is included by all licensees in their monthly operating reports. (pp. 4-5)

During initial development of the ROP, NRC added manual scrams that are inserted to avoid automatic trips. This decision elicited some high level comments from the industry, because of the potential negative incentive for Operators to manually trip, as discussed briefly in SECY-99-007A, Attachment 1, page 2.

In October 2000, NRC communicated potential changes to two of the PIs via RIS 2000-021: "Changes to the Unplanned Scram and Unplanned Scram with Loss of Normal Heat Removal Performance Indicators." That document contained the proposal that Unplanned Scrams PI be renamed Unplanned Shutdowns:

Indicator Definition

The number of unplanned shutdowns of the reactor in response to off-normal conditions or events during the previous four quarters while critical per 7,000 hours.

Examples of off-normal conditions or events include —

Turbine Trip

Loss of Main Feedwater Flow

Loss of Normal Heat Sink (main condenser)

MSIV Closure

Loss of Offsite Power

Loss of Electrical Load (includes generator trip)

Excessive Feedwater (overcooling transient)

Loss of Auxiliary/Station Power

Small Loss of Coolant Accident (includes reactor/recirculation pump seal failures)

Loss of Service Water/Component Cooling Water

Loss of Vital AC/DC bus

Secondary/balance-of-plant Piping/Component Ruptures

Reactivity Control Anomaly (e.g., dropped or misaligned rod)

Other Initiators Leading to Automatic Actuation of Reactor Protection System

Unplanned shutdowns made in response to plant conditions in accordance with off-normal procedures (e.g., emergency procedures, abnormal operating procedures, and alarm response procedures)

Reactor shutdowns that are not included:

Reactor shutdowns that are planned to occur as part of a test (e.g., a reactor protective system actuation test).

Reactor shutdowns that are part of a normal evolution made in accordance with normal plant procedures.

From 2002 ROP Annual Assessment, SECY-02-0062

Performance Indicators

• Potential unintended consequences of the two scram PIs

The staff completed its evaluation of the pilot test of proposed replacements for the “Unplanned Scrams per 7,000 Critical Hours” and the “Scrams With Loss of Normal Heat Removal” PIs. The staff determined that the proposed replacement PIs would have missed about 14 percent of the scrams in 2000 and were as likely, if not more likely, to produce unintended consequences as the original PIs. For these reasons, the staff concluded that the proposed replacement PIs should not be implemented, although the staff expressed its willingness to consider future industry proposals on this subject. The improved definition of “loss of normal heat removal” used in the pilot, however, did prove to be an improvement and was incorporated into the existing PI. (Attachment 1, p. 1)

The changes proposed in RIS 2000-021 were ultimately not adopted, but would have been much closer to the current interpretation of NEI 99-02.

While the guidance in NEI 99-02 has not changed substantially, FPL concludes that the original intent was to count three types of scrams:

1. automatic scrams
2. manual scrams inserted in anticipation of automatic scram
- 4.3. manual scrams directed by abnormal procedures (e.g., a procedure that directs immediate initiation of manual scram in response to some plant parameters)

FPL does not believe the original intent of the PI was to count manual scrams inserted as a part of a shutdown that follows the normal shutdown process, which includes controlled power reduction, making necessary switching arrangements of power supplies and the controlled initiation of a manual scram.

It is FPL’s position that the current practice of counting plant shutdowns in the Unplanned Scrams PI should be discontinued, as it was not part of the initial development of the Performance Indicators program. In fact, it was explicitly considered and rejected, as discussed above. The current interpretation of NEI 99-02, through FAQs, has expanded and should be reviewed to assure that the PI is truly representative of “events that upset plant stability and challenge safety functions.” (SECY 99-007).

Since the Turkey Point Unit 3 manual scram on November 20, 2017 was inserted in accordance with a shutdown procedure within the class of “normal” operating procedures, FPL does not believe it should be counted as an Unplanned Scram. It is correct that the off-normal procedure for the Reactor Coolant Pumps directed plant shutdown based on the observed conditions, but did not direct insertion of an immediate manual scram. Consequently, FPL believes that since that the shutdown resulted in a power change greater than 20% it was correctly counted as an Unplanned Power Change.

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?

No

Proposed NRC Response:

The NRC staff reviewed the information provided in this FAQ and the details of the November 20, 2017, event at Turkey Point. Turkey Point Unit 3 was operating at 100% power, when control room operators received an alarm for reactor coolant pump (RCP) control bleed-off (CBO) high temperature at 0323 and operators entered 3-ONOP-041.1, "RCP Off Normal." At 0738 operators received an RCP trouble alarm when the 3C RCP CBO step changed from 2.4 gpm to 0.0 gpm. At this point, step 20 of 3-ONOP-041.1 directed operators to perform a unit shutdown per General Operating Procedure (GOP) 3-GOP-100, "Fast Load Reduction." In accordance with step 26 of the GOP, at 0742 operators commenced a rapid load reduction to roughly 18% power then manually tripped the reactor at 0844.

The licensee stated in FAQ 18-05 that "Unit 3 was shutdown in accordance with plant procedure for equipment protection. Since the unit was initially at 100% power and the shutdown exceeded a 20% power change, the power change was appropriately counted against the Unplanned Power Changes per 7000 Hrs Critical Performance Indicator (IE02)."

The licensee also provided the following points to support their conclusion:

1. This was a planned shutdown to address an equipment issue which utilized a normal shutdown procedure.
2. The equipment required a plant shutdown to repair and would not allow for 72 hours for planning and the operating procedure directed operators to commence shutdown in order to be able to remove the RCP from service.
3. The condition did not warrant insertion of an immediate (unplanned) plant scram and so should be counted as an Unplanned Power Changes, as operators were given the time necessary to conduct an orderly Rx shutdown.
4. The scram was inserted at 18% power, well below the 35% threshold.

The NRC staff reviewed in detail the applicable guidance in NEI 99-02, Revision 7, and potentially applicable previous FAQ decisions. Because this event involved a downpower that led to a plant shutdown, the inspectors reviewed the NEI guidance for both the unplanned scrams and unplanned downpowers performance indicators. The staff noted that this event meets the definition of an unplanned power change, which is defined in NEI 99-02, Revision 7 as:

a change in reactor power that (1) was initiated less than 72 hours following the discovery of an off-normal condition that required or resulted in a power change of greater than 20% of full power to resolve, and (2) has not been excluded from counting per the guidance below. Unplanned changes in reactor power also include uncontrolled excursions of greater than 20% of full power that occur in response to changes in reactor or plant conditions and are not an expected part of a planned evolution or test.

The inspectors reviewed the Clarifying Notes for the unplanned downpower performance indicator. The guidance states on page 17, lines 1-2, that "off-normal conditions that begin with one or more power reductions and end with an unplanned reactor trip are counted in the

unplanned reactor scram indicator only. However, if the cause of the downpower(s) and the scram are different, an unplanned power change and an unplanned scram must both be counted.” In this case, both the downpower and reactor trip were a result of the RCP CBO equipment issue, thus it is clear that the event would count as an unplanned downpower or an unplanned scram, but not both.

The staff reviewed FAQ 17-02, “Palo Verde Unit 3 Scram,” which dealt with this same question. The event in question was described in FAQ 17-02 as:

On September 19, 2016, the Palo Verde Nuclear Generating Station (PVNGS) Unit 3 main turbine tripped from 100% power resulting in an automatic reactor power cutback, which reduced power greater than 20%. The reactor power cutback system automatically reduced unit power to approximately 50%, and operators subsequently initiated a power reduction to 12% power in accordance with the load rejection abnormal operating procedure. During the power reduction to 12%, PVNGS management elected to complete a reactor shutdown to troubleshoot and repair the cause of the turbine trip, which was not known. PVNGS counted this event as an unplanned scram because the staff was using an abnormal operating procedure to direct plant actions.

The NRC response for that FAQ stated that the initial downpower was caused by an unknown fault on the turbine control system and the decision to trip the reactor was predicated by that initial event. The FAQ response concluded that, “This event should count as one unplanned scram and no unplanned power changes.” The inspectors determined that FAQ 17-02 is applicable to this FAQ. The guidance in NEI 99-02, Revision 7, and the NRC response to FAQ 17-02 lead to the conclusion that this event should count in the unplanned scrams performance indicator only.

The staff also reviewed FAQ 440 since the licensee identified that FAQ as potentially applicable. FAQ 440 stated that if the licensee does not follow its normal method of shutting down the plant due to problems that challenge plant operations, the scram should be included in the unplanned scram performance indicator. In the Turkey Point event that is the source of this FAQ, the operators entered the applicable ONOP, which directed a unit shutdown via fast power reduction per 3-GOP-100. Based on reviewing operations logs from a recent refueling outage, the staff believes the procedure the licensee uses for normal planned shutdowns is 3-GOP-103, “Power Operation to Hot Standby.” The staff’s review of FAQ 440 also leads to the conclusion that the event in question should count as an unplanned scram.

Following discussion of the staff’s proposed response to FAQ 18-05, at the October 15, 2018, ROP Task Force public meeting, FPL submitted Revision 1 of FAQ 18-05 with additional comments. The staff reviewed the additional background information and discussed the information with additional staff, from the headquarters and Region II offices.

The staff did not base their review and conclusion solely on the type or classification of procedure used, and noted that different facilities may classify the rapid load reduction procedure used during this event differently. With regard to the additional points raised by FPL, the staff continues to view FAQs 17-02 and 440 as applicable, as noted in the initial proposed response. The staff does not view a rapid load reduction from full power to shutdown within an hour, when there was no intention to do so just shortly prior, as the normal method of shutdown, nor a planned evolution. After the review of the new information, the staff did not change their conclusion discussed during the October 15, 2018 ROP Task Force public meeting.

In summary, the NRC staff concludes that the unplanned rapid plant shutdown due to the off-normal 3C RCP condition counts in the Unplanned Scrams per 7,000 Critical Hours performance indicator since (1) the off-normal condition began with one or more power reductions and ended with a reactor trip and (2) the shutdown was not conducted in the same manner the licensee conducts planned shutdowns (i.e. refueling outages, maintenance outages, tech spec shutdowns). This event does not count in the unplanned power changes performance indicator. The staff acknowledges that consideration of additional clarification to the guidance on performance indicator reporting may be beneficial.