

**FAQ 15-01**  
**Perry Scram, October 20, 2014**

**Plant:** Perry

**Date of Event:** October 20, 2014

**Submittal Date:**

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**Performance Indicator:** IE04, Unplanned Scrams With Complications

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

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

## **Question Section**

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

BWR flowchart question: Did an RPS actuation fail to indicate/establish a shutdown rod pattern for a cold clean core. Page 25, lines 3 through 22.

#### **Did an RPS actuation fail to indicate / establish a shutdown rod pattern for a cold clean core?**

Withdrawn control rods are required to be inserted to ensure the reactor will remain shutdown under all conditions without boron to ensure the reactor will have the required shutdown margin in a cold, xenon-free state.

Any initial evaluation that calls into question the shutdown condition of the reactor requires this question to be answered “Yes.” The required entry into the Anticipated Transient without Scram (ATWS) leg of the EOP or required use of Alternate Rod Insertion (ARI) requires this question to be answered “Yes.” Failure of the rod position indication in conjunction with the loss of full-in-lights on enough rods to question the cold clean core shutdown status would require this question to be answered “Yes.”

The basis of this step is to determine if additional actions are required by the operators to ensure the plant remains shutdown as a result of the failure of any withdrawn rods to insert (or indicate inserted). Additional actions, such as boron injection, or other actions to insert control rods to maintain shutdown, pose a complication beyond a normal scram response. This question must be evaluated using the criteria contained in the plant EOP used to verify the insertion of withdrawn control rods.

Appendix H, USwC Basis Document, Section H3.1, page H-17, lines 36 through 44, and page H-18, lines 1 through 12.

The purpose of this question is to verify that the reactor actually tripped and had sufficient indication for operations to verify the trip. As long as a plant uses the EOP questions to verify that the reactor tripped without entering the level/pressure control leg of the EOPs, the response to this question should be “No”.

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The generic BWROG EPG/SAG Revision 2 Appendix B statement is offered as an example:

Any control rod that cannot be determined to be inserted to or beyond position [02] (Maximum Subcritical Banked Withdrawal Position)] and it has not been determined that the reactor will remain shutdown under all conditions without boron, enter Level/Power Control.

For example:

Are all control rods inserted to or beyond position 02 (if no then this is a yes for this PI)? Will the reactor remain subcritical under all conditions without boron (if no then this is a “Yes” for this PI)?

For example:

All rods not fully inserted; and, the reactor will not remain shutdown under all conditions without boron then enter level/pressure control (if yes then this is a “Yes” for this PI).

**Event or circumstances requiring guidance interpretation:**

While operating at 100% power, an unplanned automatic reactor scram occurred due to Reactor Pressure Vessel (RPV) Level 3 (178”) activation of the Reactor Protection System. An electrical transient occurred impacting Feedwater Level Control. The reactor mode switch was placed in Shutdown in accordance with plant operating procedures.

Prior to the scram, Feedwater was aligned with the Reactor Feed Pump Turbines (RFPT) A & B in automatic Digital Feedwater Three Element (3E) control. The Motor Feedwater Pump (MFP) was in Standby. The RPV Level 3 signal was the result of RFPT’s A/B no longer providing adequate feedwater to the RPV due to an electrical transient. The RPV water level continued to lower to Level 2 which resulted in a valid initiation of both Reactor Core Isolation Cooling (RCIC) and High Pressure Core Spray (HPCS) and associated support systems. The RCIC initiation provided a Main Turbine trip signal as expected. The Motor Feed Pump, HPCS, and RCIC all tripped when RPV Level 8 was achieved. EOP-1, RPV Control, was entered by the Unit Supervisor due to RPV Level 2 (130”).

When Level 2 was reached ARI was automatically initiated by the Redundant Reactivity Control System as designed. This actuation is based on Level 2 only and occurs regardless of control rod position.

Upon the scram signal, the Full Core Display was indicating both Red and Green LED Lights (Rods Out and In, respectively) where the expected response was all Green LED Lights. The Rod Action Control System (RACS) was utilized to verify that the “All Rods In” LED was illuminated, and this was verified by multiple operators. The Rod Control Information System was reset utilizing the plant procedure and indication returned to normal, all Green. The erroneous indication was caused by the electrical transient that occurred from the DB1A inverter. Actuation of alternate reactivity controls by the operators was not required.

The RACS is located in a control room back panel outside of the “at the controls” area of the control room. RACS is a subsystem of Rod Control and Information System. There is two divisions of RACS. The RACS ‘All Rods In’ LED will actuate when the full-in limit switch on the position indicating probe (PIP) for all control rods has actuated. There are two limit switches per PIP each providing input to a

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separate division. Operators have received training on using the RACS ‘All Rods In’ LED to verify a shutdown rod pattern, however this use is not proceduralized.

Perry has determined that this event is not an Unplanned Scram with Complications based on the guidance on page 25 lines 17 through 22, which state:

“The basis of this step is to determine if additional actions are required by the operators to ensure the plant remains shutdown as a result of the failure of any withdrawn rods to insert (or indicate inserted). Additional actions, such as boron injection, or other actions to insert control rods to maintain shutdown, pose a complication beyond a normal scram response. This question must be evaluated using the criteria contained in the plant EOP used to verify the insertion of withdrawn control rods.”

The initial evaluation verifying the shutdown condition of the reactor utilizing the RACS indication when the Full Core Display had conflicting information was correct. The operators were able to determine that all rods were inserted and the reactor would remain shutdown under all conditions without boron and entry into the Level/Power Control leg of the EOPs was not required.

Appendix H section H3.1 supports this determination at lines 39-42 on page H-17 which states;

“The purpose of this question is to verify that the reactor actually tripped and had sufficient indication for operations to verify the trip. As long as a plant uses the EOP questions to verify that the reactor tripped without entering the level/pressure control leg of the EOPs, the response to this question should be “No”.”

Appendix H, Section H4.1, BWR Case Study 1, and Section H4.2, BWR Case Study 2, both indicate that this question is focused on the actual condition of the reactor and whether additional actions are taken to ensure the reactor would remain shutdown under cold clean conditions. In both case studies this question can be answered “No” as Alternate Rod Insertion was not indicated or required.

BWR Case Study 1 includes, as an example of an acceptable “no” answer, the following explanation: “While all rods did not fully insert, reactor engineering, using an approved procedure, ran a computer calculation that determined the reactor would remain shutdown under cold clean conditions.” In the Perry case, all rods did insert, and observing the “All Rods In” LED is less complicated than running a computer calculation

In the Perry event of October 20, 2014, operator action to initiate ARI was not indicated or required, entry into the Level/Power Control leg of the EOPs was not required and sufficient indication (RACS) was available for the operators to determine that all rods were inserted.

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

The Resident Inspector Office has contacted NRR and believes that utilizing a back-panel indication (i.e. RACS, which happens to be located in the control room at Perry but requires entry into a panel to validate indications) is an additional action not required in the immediate actions for the at-the-controls operator (ATC). As such, the requirement for additional personnel actions to validate a clean cold core, utilizing a single status indicating light on only one division of RACS as in this case, does not equate to completing the “immediate” action step on the At-the-Controls hard card to indicate a cold clean core. On page 25 of

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NEI 99-02, lines 13-15, the flowchart guidance states “Failure of the rod position indication in conjunction with the loss of full-in-lights on enough rods to question the cold clean core shutdown status would require this question to be answered ‘Yes.’” During the October 20, 2014 scram, the ATC was unable to make an initial determination that he had a cold clean core from the indications available to him and requested an additional operator to go back-panel to evaluate the indication in RACS, this demonstrated that the “initial evaluation of a cold clean core” was indeed indeterminate. With regard to the case studies, ARI was actuated at Perry during this scram because it is automatic on Level 2 which was reached during this scram so by definition it was required. Further, if the control room was at minimum manning, with no one immediately available to go back-panel, the ATC on watch in the control room would take the immediate action to actuate ARI and RPS as required by the hard card and the answer would again be “Yes” to block 1 of the flowchart for complicated scrams.

Potentially relevant FAQs: None identified.

## **Response Section**

### **Proposed Resolution of FAQ:**

Revise the response to the BWR flowchart question: Did an RPS actuation fail to indicate/establish a shutdown rod pattern for a cold clean core. Page 25, lines 3 through 22 to align with Appendix H, USwC Basis Document, Section H3.1, page H-17, lines 39 through 44, and page 18, lines 1 through 12.

Specifically, clarify that a scram with complications results only from entry into the Level/Power Control leg of the EOPs

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

We propose the following change to page 25, lines 6-7:

From:

*6 Any initial evaluation that calls into question the shutdown condition of the reactor requires this  
7 question to be answered “Yes.”*

To:

*Any initial evaluation that calls into question the shutdown condition of the reactor and results in additional operator actions intended to place the reactor in a shutdown condition requires this question to be answered “Yes” regardless of any subsequent determination that the reactor was in a shutdown condition prior to those actions. Utilizing alternative indication to clarify the status of the control rods is not considered to be an additional operator action intended to place the reactor in a shutdown condition and would not count in this indicator.*

On page 25 at line 10 delete the sentence which reads “Any initial evaluation that calls into question the shutdown condition of the reactor requires this question to be answered “Yes.””

On page 25 at line 17 revise this sentence to read “The basis of this step is to determine if additional actions are required by the operators to ensure the plant remains shutdown as a result of the failure of any withdrawn rods to insert.

**PRA update required to implement this FAQ? No**

**MSPI Basis Document update required to implement this FAQ? No**

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**NRC Response:**

This FAQ discusses the use of a second indication on the Rod Action Control System to verify rod position prior to performing a normal scram response procedure at Perry. The NRC staff agrees with the licensee that this event does not represent a complicated scram because the operators were able to verify the condition of the reactor without exiting the normal scram response procedure. The staff also agrees with the proposed revision to the NEI 99-02 guidance providing additional discussion on an initial evaluation that calls into question shutdown conditions, clarifying that this would result in a complicated scram only if it results in additional actions from the operator to place the reactor in a shutdown condition.