U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE

PRESSURIZED WATER REACTOR OWNERS GROUP

TOPICAL REPORT PWROG-22021-P/NP, REVISION 0,

"JUSTIFICATIONS FOR THE PROPOSED CHANGES TO THE

QUADRANT POWER TILT RATIO TECHNICAL SPECIFICATIONS,"

PROJECT NO. 99902037; EPID: L-2023-TOP-0060

1. BACKGROUND

By letter dated December 4, 2023, (Agencywide Documents Access and Management System Accession (ADAMS) No. ML23338A205), the Pressurized Water Reactor Owners Group (PWROG) submitted Topical Report (TR) PWROG -22021-P/NP, Revision (Rev.) 0, "Justifications for the Proposed Changes to the Quadrant Power Tilt Ratio [QPTR] Technical Specification [TS]" (ADAMS Nos. ML23338A206 and ML23338A207), for U.S. Nuclear Regulatory Commission (NRC) staff review and approval.

The TR proposes changes to NUREG-1431, "Standard Technical Specifications Westinghouse Plants" that would perform the following: (1) add a NOTE to the Limiting Condition for Operation (LCO) for TS 3.2.4 so that the LCO will not be applicable prior to performing the incore-excore calibration during initial core startup; (2) add an alternate action if the QPTR exceeds the LCO limit of 1.02; (3) consolidate surveillance requirements (SRs) 3.2.4.1 and 3.2.4.2; and (4) delete Required Actions D.1.2, D.2.1 and D.2.2 in TS 3.3.1.

As a result of NRC staff's technical review of the TR, the NRC staff has determined that responses to the following requests for additional information (RAI) are needed in order to complete the next phase of the review. In addition, see NRC staff's comment in the footnote regarding a minor format change in Appendix A.[1]

[1] *Appendix A of the TR – Sample TS Mark-Ups*- On page A-5 of the TR additions and deletions to STS are indicated in red font or red strikethrough font, respectively. The word "to" in NOTE 1 is in black font, but it is an addition. The word "is", after "Verify QPTR" is in red font. NRC would like to request a change font of the word "to" in NOTE 1 to red font and font of the word "is" after "Verify QPTR" to black font.

2. TECHNICAL SPECIFICATION BRANCH (STSB) REQUESTS FOR ADDITIONAL INFORMATION

2.1. Regulatory Basis for Requests Related to Technical Specification

The regulations provided in Title 10 of the Code of Federal Regulations (10 CFR), section 50.36, require that TSs include items in the following categories as stated: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements; (4) design features; (5) administrative controls; (6) decommissioning; (7) initial notification; and (8) written reports.

The regulation provided in 10 CFR 50.36 (c)(2) states that LCOs are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.

10 CFR 50.36 (c)(2)(ii) requires the LCOs to be established for each item meeting one or more of four criteria. Criterion 2 states: "A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier."

The regulation at 10 CFR 50.36 (c)(3) states SRs are requirements relating to test, calibration, or inspection, to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met.

Therefore, the regulatory basis for the RAIs in this section is directly related to technical specification requirements for the QPTR in accordance with the regulations listed in this section.

RAI 01 (STSB) - ***Section 5 of TR, "Revise the QPTR Value from 1.00 to 1.02 in Required Action A.1"***

NRC Comment:
Pages 5-1 and 5-2 of the TR contain statements referring to certain aspects required for design procedures, it appears these aspects become the justification to change the QPTR limit, however Section 5 of the TR does not provide a means for staff to confirm that all plants that may adopt the TR would follow the same requirements.

NRC Request:
Provide additional language and/or information for this section of the TR that describes a QPTR limit that is generically applicable to all plants that may adopt in the case of TR adoption.

RAI 02 (STSB) - ***Section 6.2 of the TR, "Application of the Proposed Change"***

NRC Comment:
The second paragraph of Section 6.2 states:

> However, if at least 3% operating margin to the core peaking factor limits was available based on the last measurement, a second option would be available to

ensure the core peaking factors remained within their LCO limits while still remaining at 100% RTP. The core peaking factor limits would be administratively reduced by 3% for each 1% that the QPTR value exceeded 1.02 if margin was available.

NRC Request: (Parts a and b)

a. Provide a detailed description of how the 3% operating margin can be verified prior to taking advantage of the second option as defined in Section 6.2.

b. Provide discussion on whether a TS NOTE above the Required Action A.1.2 is needed to ensure the second option is only available when margin exists. Is there additional information that could be added to the TR to provide these details?

RAI 03 (STSB) - ***Section 7 of the TR, "Justification for Revising the 12 Hour Frequency for SR 3.2.4.2."***

NRC Comment:
Page 7-1 contains no justification for the deletion of a sentence in the TS Bases that states: "Large tilts are likely detected with the remaining channels, but the capability for detection of small power tilts in some quadrants is decreased."

NRC Request:
Provide an explanation, including the basis, that describes the reason the deletion of the sentence in the TS Bases.

RAI 04 (STSB) - ***Section 7 of the TR, "Justification for Revising the12 Hour Frequency for SR 3.2.4.2."***

NRC Comment:
Section 7 states that the new second frequency of the consolidated SR 3.2.4.1 will be specified as "Once within 12 hours…" The existing frequency of SR 3.2.4.2 is "12 hours OR In accordance with the Surveillance Frequency Control Program." SR 3.0.2 provides an extension to most frequencies except those specified as "once." The SR 3.0.2 extension would appear to apply to the existing frequency of SR 3.2.4.2, but not the new second frequency of the consolidated SR 3.2.4.1.

NRC Request:
Provide clarification, with an appropriate basis, explaining that the SR 3.0.2 extension is either applicable or not applicable to the consolidated SR 3.2.4.1. Is there additional information that could be added to the TR to provide these details?

RAI 05 (STSB) - ***Section 7 of the TR, "Justification for Revising the12 Hour Frequency for SR 3.2.4.2."***

NRC Comment:
Section 7 refers to the retention of the 7-day frequency of SR 3.2.4.1 in justifications for the new second frequency of the consolidated SR 3.2.4.1. The existing frequency of SR 3.2.4.1 is stated as "7 days OR In accordance with the Surveillance Frequency Control Program [SFCP]."

NRC Request:
Provide information that would describe the change for plants that have extended the interval of SR 3.2.4.1 beyond 7 days using their SFCP (verification of QPTR only once within 12 hours after control rods are moved more than 12 steps with power above 75% RTP and the input to the QPTR alarm from one Power Range channel inoperable).

RAI 06 (STSB) - ***Section 8 of the TR, "Delete Required Actions D.1.2, D.2.1 and D.2.2 in Technical Specification 3.3.1".***

NRC Comment:
Section 8 describes the proposed removal of the alternative Required Actions for operators when a Power Range Neutron Flux High channel (NI) is inoperable. Required Actions D.1.1 with D.1.2 and D.2.1 with D.2.2 provide operators clear and complete alternative sets of remedial measures the operators can take to address an inoperable NI. It has been accepted that presenting operators with alternatives to address a given situation and continue plant operation is appropriate guidance for industry implementation of 10 CFR 50.36, identified in NUREG-1431, and not duplicative. Deleting the options to either reduce power or verify QPTR would possibly create incomplete guidance to address an inoperable NI.

NRC Request:
Provide an explanation discussing why options to either reduce power or verify QPTR, after placing the NI in trip, were not proposed to be maintained in the TS 3.3.1 ACTIONS table.

3. NUCLEAR METHODS AND FUELS BRANCH (SFSB) REQUEST FOR ADDITIONAL INFORMATION

RAI 07 (SFSB) - ***Section 4 of the TR, "Justification for Adding a NOTE to LCO 3.2.4 to State That it is Not Required to be Met Until the Initial Calibration of the Excore Channels is Performed per SR 3.3.1.6 Subsequent to a Refueling"***

NRC Comment:
Section 4 of the TR states:

> One proposed change to TS 3.2.4 is to add a NOTE stating that LCO 3.2.4 is not applicable until the initial calibration of the excore channels is performed per SR 3.3.1.6 subsequent to refueling.

Other TS changes may also increase the time between refueling and the first QPTR surveillance.

NUREG-800 15.4.7 "Inadvertent Loading and Operation of a Fuel Assembly in an Improper Position," interprets General Design Criteria (GDC) 13 to mean that each licensee shall have methods/procedures for detecting a misloaded fuel assembly.

NRC Request:

Provide a brief discussion that describes and explains any potential effect that the proposed TS changes may have on the efficacy of detecting a mislocated fuel assembly following a core reload.

4. NUCLEAR SYSTEMS PERFORMANCE BRANCH (SNSB) REQUESTS FOR ADDITIONAL INFORMATION

4.1. Regulatory Basis for Requests Related to Nuclear Systems Performance

The regulatory basis for RAIs by the Nuclear Systems Performance Branch(SNSB) is provided in 10 CFR Appendix A, GDC 10, "Reactor Design" which states that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

RAI 08 (SNSB) - *Section 3 of the TR, "Relationship of QPTR to the Core Peaking Factors"*

NRC Comment:
Section 3.0 of the TR states:

> A QPTR value that exceeds the LCO limit of 1.02 may indicate that a change has occurred in the gross radial power distribution but does not necessarily mean that the core peaking factors have exceeded their LCO limits.

The current STS LCO 3.2.4, Required Action A.1 specifies reduction in thermal power when QPTR exceeds 1.00. The proposed LCO 3.2.4 Required Action A.1.1 allows the QPTR to exceed 1.02 before the rated thermal power is reduced. A higher QPTR will result in higher differences in the radial power distribution between the quadrants of the core and therefore would lead to increased cross-flow in the core.

NRC Request:
Provide a discussion of the impact associated with increased cross-flow on the thermal-hydraulic performance of the core.

RAI 09 (SNSB) - *Section 4.1 of the TR, "*Application of the Current TS"

NRC Comment:
The current QPTR ≤ 1.02 in the STS 3.2.4 is to control power in the core quadrants so that power generation is approximately equal in the quadrants, and the core power does not exceed the licensed power. In the event QPTR exceeds 1.00, the burnup in a core quadrant would increase.

NRC Request:
Provide a discussion of the impact of higher differences in the burnup between the core quadrants on the core performance.

RAI 10 (SNSB)- *Section 2.5 of the TR, "QPTR and Quadrant Power Tilt"*

NRC Comment:
In the event that QPTR exceeds its limit due to QPT in two or more quadrants consider the following request.

NRC Request:
Provide an explanation describing how the power would be controlled in the quadrants to maintain 100% licensed power.

RAI 11 (SNSB) – Section 6 of the TR, "Add a New Required Action A.1.2, That Applies a Penalty to F_Q and $F_{\Delta H}$ as an Alternative to Current Required Action A.1, with a QPTR Value of 1.02"

NRC Comment:
The proposed Required Action A.1.2 in STS 3.2.4, states:

> Reduce the limits for $F_Q(Z)$ and $F^N_{\Delta H}$ ≥ 3% for each 1% QPTR > 1.02.

NRC Request:
Provide an explanation and technical basis describing why the reduction in the limits for $F_Q(Z)$ and $F^N_{\Delta H}$ by at least 3% is conservative.

RAI 12 (SNSB) – Section 2.4 of the TR, "When the QPTR Exceeds the LCO Limit"

NRC Comment:
Section 2.4 of the TR states that:

The bases for Required Action A.4 for TS 3.2.4 states:

> When the QPTR exceeds its limit, it does not necessarily mean a safety concern exists.

NRC Request:
Provide an explanation describing why a safety concern does not exist when QPTR exceeds its current LCO limit of 1.02 in MODE 1 for all applicable plant types.

RAI 13 (SNSB) Section 2.4 of the TR, "When the QPTR Exceeds the LCO Limit"

NRC Comment:
Section 2.4 of the TR states that:

> It is, however, conservative to assume that when the QPTR exceeds its limit of 1.02, the core peaking factors, $F_Q(Z)$ and $F_{\Delta H}$ may have exceeded the limits of LCOs 3.2.1 and 3.2.2 and action is required to restore the core peaking factors to within their limits. Required Action A.1 requires a power reduction within 2 hours which is intended to reduce the peak linear power.

As stated above, the core peaking factors may have exceeded their limits since their monitoring is according to the surveillance frequency control program. Given the time between surveillances, the limits could have been exceeded for several hours without a power reduction.

Section 2.4 of the TR also states:

> Since it is possible that the core peaking factors, $F_Q(Z)$ and $F_{\Delta H}$ may have exceeded their LCO limits, Required Action A.4 requires a re-evaluation of the safety analysis to confirm that the results remain valid for the duration of operation when the QPTR LCO limit is not met. Required Action A.4 must be completed prior to increasing THERMAL POWER above the limit of Required Action A.1.

NRC Request:
For STS 3.2.4, Required Action A.4, specify which safety analysis, including methodology, needs to be re-evaluated and when should it be done.

RAI 14 (SNSB) – Section 3 of the TR, ”Relationship of QPTR to the Core Peaking Factors”

NRC Comment:
The moderator temperature coefficient (MTC) of reactivity is an important operational parameter connected with safety considerations. The MTC is defined as the change of reactivity per degree change of the core-averaged moderator temperature.

NRC Request:
Provide a detailed explanation describing how the MTC affects the QPTR during an operating cycle and from cycle to cycle.