

April 21, 2016

TSTF-15-06
PROJ0753

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Transmittal of TSTF-546, Revision 0, "Revise APRM Channel Adjustment Surveillance Requirement"

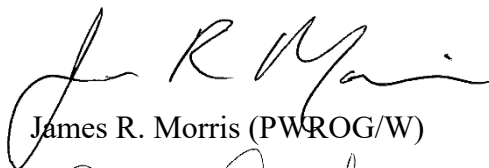
Enclosed for NRC review is Revision 0 of TSTF-546, "Revise [Average Power Range Monitor] APRM Channel Adjustment Surveillance Requirement." TSTF-546 is applicable to Boiling Water Reactor plants.

The following information is provided to assist the NRC staff in prioritizing their review of TSTF-546:

- Applicability: TSTF-546 is applicable to all Boiling Water Reactor plants.
- Classification: TSTF-546 will revise the Technical Specifications to no longer require an immediate plant shutdown when an APRM channel is providing a conservative indication of reactor power, but is not within 2% of the calculated thermal power. The current action is not commensurate with the safety significance of the situation and can lead to an unnecessary plant transient associated with a shutdown.
- Specialized Resource Availability: The TSTF requests approval of the traveler within one year. NRC approval of TSTF-546 will reduce the burden on licensees and the NRC in the preparation and NRC review of license amendment requests.

The TSTF requests that the NRC bill the Boiling Water Reactor Owners' Group for the review of this Traveler.

Should you have any questions, please contact us.



James R. Morris (PWROG/W)



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Enclosure

cc: Michelle Honcharik, Licensing Processes Branch, NRC
Alex Klein, Technical Specifications Branch, NRC

Technical Specifications Task Force Improved Standard Technical Specifications Change Traveler

Revise APRM Channel Adjustment Surveillance Requirement

NUREGs Affected: ☐ 1430 ☐ 1431 ☐ 1432 ☒ 1433 ☒ 1434

Classification: 1) Technical Change

Recommended for CLIIP?: Yes

Correction or Improvement: Improvement

NRC Fee Status: Not Exempt

Changes Marked on ISTS Rev 4.0

See attached justification.

Revision History

OG Revision 0

Revision Status: Active

Revision Proposed by: Monticello

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 21-Oct-14

Owners Group Comments

Based on Owners Group comments, the justification was revised to clarify the treatment of operability during adjustment.

Owners Group Resolution: Approved Date: 28-Jul-15

TSTF Review Information

TSTF Received Date: 05-Aug-15

Date Distributed for Review 31-Mar-16

OG Review Completed: ☒ BWOG ☒ WOG ☒ CEOG ☒ BWROG

TSTF Comments:

Resolved TSTF comments.

TSTF Resolution: Approved

Date: 21-Apr-16

NRC Review Information

NRC Received Date: 21-Apr-16

Affected Technical Specifications

SR 3.3.1.1B.2

RPS Instrumentation (With Setpoint Control Program)

21-Apr-16

| | |
|---------------------|--|
| SR 3.3.1.1A.2 | RPS Instrumentation (Without Setpoint Control Program) |
| SR 3.3.1.1B.2 Bases | RPS Instrumentation (With Setpoint Control Program) |
| SR 3.3.1.1A.2 Bases | RPS Instrumentation (Without Setpoint Control Program) |

21-Apr-16

1. SUMMARY DESCRIPTION

The proposed change alters Surveillance Requirement (SR) 3.3.1.1.2 of Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," in the Boiling Water Reactor (BWR) 4 and 6 Improved Standard Technical Specifications (ISTS) (References 1 and 2). This proposed change revises the SR to compare the calculated (i.e.; calorimetric heat balance) power to the average power range monitor (APRM) indications, and to adjust the APRM consistent with the heat balance power if the calculated power is more than 2% greater than the APRM channel output when operating at $\geq 25\%$ of Rated Thermal Power (RTP). This change revises the SR to require adjustment only if the APRM indication deviates from the calculated power in the nonconservative direction. The SR is considered met if it can be adjusted to within the limit.

2. DETAILED DESCRIPTION

2.1 Average Power Range Monitor Design and Operation

The APRM channels provide the primary indication of neutron flux within the core and respond almost instantaneously to neutron flux increases. The APRM channels average the input signals from local power range monitors (LPRM) in the reactor core to provide a continuous indication of reactor power. The APRM channels also approximate the core thermal power being transferred to the reactor coolant. The APRM channels are used as inputs to two reactor trip signals: Average Power Range Monitor Flow Biased Simulated Thermal Power - High, and Average Power Range Monitor Fixed Neutron Flux – High. The Average Power Range Monitor Flow Biased Simulated Thermal Power - High function monitors neutron flux and is electronically filtered with a time constant representative of the fuel heat transfer dynamics to generate a signal proportional to the thermal power in the reactor. The function provides protection against transients where thermal power increases slowly. For rapid neutron flux increase events, the thermal power lags the neutron flux and the Average Power Range Monitor Fixed Neutron Flux - High function provides a scram signal before the Average Power Range Monitor Flow Biased Simulated Thermal Power - High function setpoint is exceeded.

2.2 Current Technical Specifications Requirements

The Average Power Range Monitor Flow Biased Simulated Thermal Power - High and Average Power Range Monitor Fixed Neutron Flux – High functions are both required to be operable in Mode 1. To ensure that the APRMs are conservatively indicating core power, the APRMs are adjusted to the reactor thermal power calculated from a heat balance by performance of SR 3.3.1.1.2 every 7 days or at a frequency specified in the Surveillance Frequency Control Program. The allowable absolute difference between the calculated core thermal power and the APRM channel output is typically 2% RTP.

If the APRM inputs to the Average Power Range Monitor Flow Biased Simulated Thermal Power - High and Average Power Range Monitor Fixed Neutron Flux – High

functions are outside the acceptance criteria of SR 3.3.1.1.2, the Actions of TS 3.3.1.1 are followed.

If one or more required channels are inoperable, Condition A requires the channel or trip system be placed in the tripped condition within 12 hours. If one or more functions with one or more required channels are inoperable in both RPS trip systems, Condition B requires that the channel(s) or trip system(s) be placed in the tripped condition within six hours. If multiple RPS channels are inoperable and the RPS trip capability is not maintained, Required Action C.1 allows one hour to restore RPS trip capability and then a plant shutdown to Mode 2 must commence.

2.3 Reason for the Proposed Change

The SR does not distinguish between APRM settings that are conservative (i.e., actual thermal power is less than the reactor power indicated by the APRMs) or nonconservative (i.e., actual thermal power is greater than the reactor power indicated by the APRMs). This could result in a plant shutdown to Mode 2 even though the channels are fully capable of performing their specified safety functions. Further, the one hour time period in Required Action C.1 does not provide adequate time to adjust the gains on multiple APRM channels, which could be required during a plant startup after refueling.

2.4 Description of the Proposed Change

The proposed change revises SR 3.3.1.1.2. TS 3.3.1.1A (Without Setpoint Control Program) and TS 3.3.1.1B (With Setpoint Control Program) are revised. The proposed change revises the SR as shown:

(Deletions shown in ~~strikeout~~ text and additions are in *italics*):

~~"Verify the absolute difference between~~ *Compare* the average power range monitor (APRM) channels ~~and to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than is~~ $\leq 2\%$ RTP ~~[plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints"]~~ while operating at $\geq 25\%$ RTP."

The proposed change is supported by changes to the TS Bases. The regulation at Title 10 of the Code of Federal Regulations (10 CFR), Part 50.36, states, "A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications." A licensee may make changes to the TS Bases without prior NRC staff review and approval in accordance with the Technical Specifications Bases Control Program. The proposed TS Bases changes are consistent with the proposed TS changes and provide the purpose for each requirement in the specification consistent with the Commission's Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, dated July 2, 1993 (58 FR 39132). Therefore, the Bases changes are provided for information and approval of the Bases is not requested.

A model application is included in the proposed change as Enclosure 1. The model may be used by licensees desiring to adopt the traveler following NRC approval.

3. TECHNICAL EVALUATION

3.1 APRM System Detailed Description

The APRM channels monitor the neutron flux within the core to approximate the core thermal power being transferred to the reactor coolant. The APRM channels respond almost instantaneously to neutron flux increases. The APRM channels receive input signals from local power range monitors (LPRM) in the reactor core. These LPRM signals are averaged by the APRM averaging circuit to provide a continuous indication of average reactor power. An APRM gain adjustment is provided to adjust each APRM channel output. The allowable absolute difference between the calculated core thermal power and the APRM channel output is typically 2% RTP. The APRM channel gain is adjusted to calibrate the output to within the allowable limits.

For units with an analog Neutron Monitoring System (NMS), the typical APRM system is divided into two groups of channels with three APRM inputs to each RPS trip system. The system is designed to allow one channel in each trip system to be bypassed. Any one APRM channel in a trip system can cause the associated trip system to actuate. For the Average Power Range Monitor Flow Biased Simulated Thermal Power - High and the Average Power Range Monitor Fixed Neutron Flux - High functions, four channels, with two channels in each trip system, are typically required to be operable by LCO 3.3.1.1 to ensure that no single instrument failure will preclude a trip on a valid signal. If one or more required channels are inoperable, Condition A requires the channel or trip system be placed in the tripped condition within 12 hours. If one or more functions with one or more required channels are inoperable in both RPS trip systems, Condition B requires that the channel(s) or trip system(s) be placed in the tripped condition within six hours.

For units with a digital NMS, the typical APRM system is divided into four APRM channels and four 2-out-of-4 voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each; each group of two voter channels providing input to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one APRM channel that is not bypassed will result in a "half-trip" in all four of the voter channels, but no trip inputs to either RPS trip system. An APRM flow biased or neutron flux trip from any two APRM channels that are not bypassed will result in a full trip in each of the four voter channels, which in turn results in two trip inputs to each RPS trip system logic channel. For the Average Power Range Monitor Flow Biased Simulated Thermal Power - High and the Average Power Range Monitor Fixed Neutron Flux - High functions, three of the four APRM channels and all four voter channels are typically required to be operable by TS LCO 3.3.1.1 to ensure that no single instrument failure will preclude a trip on a valid signal. If one or more required channels are inoperable, Condition A requires the channel be placed in the tripped condition within 12 hours.

3.2 Discussion of Proposed Change

Currently, the APRMs are verified to be calibrated to within 2% of the calculated thermal power by SR 3.3.1.1.2, plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints". When the absolute difference between the calculated thermal power and the APRM calibrated power is outside the limit, the APRM channel is inoperable and the output gain is adjusted to within the allowable limits. Calibrating an APRM channel to a power value less than the calculated thermal power is nonconservative for RPS actuation. Calibrating an APRM channel to a power value greater than the calculated thermal power is conservative for RPS actuation. The allowable difference currently specified by SR 3.3.1.1.2, in either case, is 2% RTP.

The proposed change does not affect the requirement to compare the APRM channels to calculated thermal power. As with the current requirements, if calculated thermal power exceeds the indicated APRM power by more than 2% RTP, the APRM channels must be adjusted consistent with the heat balance calculated power. Under the proposed change, however, if an APRM channel indicates power greater than the heat balance calculated power (i.e., the difference is conservative), adjustment is no longer required by the SR. As a result of this change, the SR no longer considers any gain adjustment required by LCO 3.2.4, since this gain adjustment can only increase a APRM reading as compared to the calculated reactor power (i.e., adjusts the APRMs in a conservative manner compared to calculated power). Adjustment of the channel will be part of the performance of the SR. As long as the APRM channel can be adjusted to within the acceptance criteria, the APRM channel is operable during the adjustment. If the channel cannot be adjusted to within the SR acceptance criteria, it is inoperable.

The proposed change will allow operation with the APRM indicated power greater than thermal power. However, in this condition reactor output is reduced and licensees will typically want to maintain APRM indicated power close to actual thermal power.

In some plant TS, SR 3.3.1.1.2 use a different power level than 25% RTP in the Note and in the Surveillance. This has no effect on the proposed change.

Note 2 of the Surveillance Requirements Table allows entry into the TS Actions to be delayed for up to six hours when one or more RPS channels are rendered inoperable for Surveillance testing provided RPS trip capability is maintained. However, no provision is provided to delay entry into the TS Actions to adjust the gain of a channel if the instrument channel is discovered to be outside the SR acceptance criteria, even if the instrument channel is outside the acceptance criteria in the conservative direction.

The proposed change to SR 3.3.1.1.2 requires that the APRM channels be compared to the calculated power, and adjusted if the calculated power exceeds the APRM output by more than 2% RTP; i.e., nonconservative for RPS actuation. The APRM channel is declared inoperable if it cannot be properly adjusted. The calculated power is a function of feedwater flow and change in enthalpy from water to steam. There are inherent uncertainties in measuring feedwater flow. For this reason, it is not necessary to declare the APRM channel inoperable prior to making the adjustment, since all that is known is

that the channel is nonconservative relative to calculated power, not that the channel is incapable of performing its required functions. In addition, the adjustment will only be required if the calculated power exceeds the APRM output by more than 2% RTP, thus negating the requirement for conservative conditions where the APRM output exceeds the calculated power. Finally, the requirement no longer considers the gain adjustment required by LCO 3.2.4, since this gain adjustment can only increase the APRM indication compared to calculated reactor power.

If the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP, the APRM must be adjusted consistent with the heat balance calculated power. If the APRM channel output cannot be properly adjusted, the channel is inoperable.

This Surveillance does not preclude making APRM channel adjustments, if desired, when the heat balance calculated reactor power is less than the APRM channel output. To provide close agreement between the APRM indicated power and to preserve operating margin, the APRM channels are normally adjusted to within +/-2% of the heat balance calculated reactor power [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM Setpoints)"]. However, this agreement is not required for operability when APRM output indicates a higher reactor power than the heat balance calculated reactor power because it is a conservative condition. This approach to the comparison and required adjustment closely aligns with the approach taken in the Westinghouse Standard Technical Specifications (STS) NUREG-1431, as detailed in Section 3.4. Upon discovery that an APRM channel cannot be adjusted to within the acceptance criteria of SR 3.3.1.1.2, the applicable Condition(s) will be entered and Required Actions performed. Thus, this proposed change does not affect application of the required TS Actions once a channel has been determined to be inoperable.

3.3 APRM Measurement Uncertainties and Safety Analyses

The proposed change does not affect the adjustment frequency or uncertainties derived for the APRM instrumentation. Thus, there is no impact to the safety analyses due to this change.

3.4 Precedents

The Westinghouse ISTS, NUREG-1431, provides a similar Surveillance that currently includes the type of allowance proposed herein with no specific time period to perform the channel adjustment (Reference 3). SR 3.3.1.2 requires comparison of the results of the calorimetric heat balance calculation to the power range channel output every 24 hours when reactor power is greater than 15% RTP. SR 3.3.1.2 states, in part, "Adjust power range channel output if calorimetric heat balance calculations results exceed power range channel output by more than +2% RTP."

The TS Actions are not applied upon discovery that the power range instruments are not within the required limit, but rather, the power range channel outputs are adjusted to restore the instrument channel to within the limit.

The TS Bases for SR 3.3.1.2 of NUREG-1431 states, in part:

If the calorimetric heat balance calculation results exceed the power range channel output by more than 2% RTP, the power range channel is not declared inoperable, but must be adjusted. The power range channel output shall be adjusted consistent with the calorimetric heat balance calculation results if the calorimetric calculation exceeds the power range channel output by more than +2% RTP, If the power range channel output cannot be properly adjusted, the channel is declared inoperable. [emphasis added]

This change was added to NUREG-1431 by TSTF-371-A, Revision 1, "NIS Power Range Channel Daily SR TS Change to Address Low Power Decalibration," (ADAMS Accession No. ML020670275), which was approved by the NRC on April 2, 2002 (ADAMS Accession No. ML020940096).

The proposed change is consistent with the PWR example. If the APRM channel, similar to the PWR power range channel, is nonconservative with respect to the heat balance calculated power, the channel must be adjusted consistent with the heat balance calculated power. If the APRM channel or PWR power range channel is conservative with respect to the core thermal power, there is no requirement to adjust the channel.

4. REGULATORY EVALUATION

The following regulatory requirements have been considered:

- Title 10 of the Code of Federal Regulations (10 CFR), Section 50.36, "Technical specifications," in which the Commission established its regulatory requirements related to the contents of the TS. Specifically, 10 CFR 50.36(c)(3) states that, "Surveillance requirements 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 limiting conditions of operation will be met."

The RPS functions associated with the proposed change are tested, calibrated, and inspected in accordance with the applicable surveillance requirements.

The applicable 10 CFR Part 50, Appendix A, General Design Criteria, are considered as follows:

- Criterion 13 -Instrumentation and control. Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall

be provided to maintain these variables and systems within prescribed operating ranges.

- Criterion 20 -Protection system functions. The protection system shall be designed (1) to initiate automatically the operation of appropriate systems, including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.
- Criterion 21 -Protection system reliability and testability. The protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single-failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.
- Criterion 22 -Protection system independence. The protection system shall be designed to assure that the effects of natural phenomena, and of normal operating, maintenance, testing, and postulated accident conditions on redundant channels do not result in loss of the protection function, or shall be demonstrated to be acceptable on some other defined basis. Design techniques, such as functional diversity or diversity in component design and principles of operation, shall be used to the extent practical to prevent loss of the protection function.
- Criterion 29 -Protection against anticipated operational occurrences. The protection and reactivity control systems shall be designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

The proposed change does not alter the design or operation of the APRMs or the RPS. Therefore, the APRM system and the affected RPS function's reliability, testability, and independence are not altered or adversely affected.

5. REFERENCES

1. NUREG-1433, "Standard Technical Specifications General Electric Plants, BWR/4 – Specifications," Volume 1, Revision 4.
2. NUREG-1434, "Standard Technical Specifications General Electric Plants, BWR/6 – Specifications," Volume 1, Revision 4.
3. NUREG 1431, "Standard Technical Specifications Westinghouse Plants – Specifications," Volume 1, Revision 4.

Enclosure 1

Model Application

[DATE]

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: PLANT NAME
DOCKET NO. 50-[xxx]
Application to Revise Technical Specifications to Adopt TSTF-546,
"Revise APRM Channel Adjustment Surveillance Requirement"

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

The proposed change is consistent with TSTF-546, "Revise APRM Channel Adjustment Surveillance Requirement." The proposed amendment alters Surveillance Requirement (SR) 3.3.1.1.2 of Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." This proposed change revises the SR to verify that calculated (i.e.; calorimetric heat balance) power is no more than 2% greater than the average power range monitor (APRM) channel output. The SR requires the APRM channel to be adjusted such that calibrated power is no more than 2% greater the APRM indicated power when operating at $\geq 25\%$ of Rated Thermal Power (RTP). This change revises the SR to distinguish between APRM indications that are consistent with the accident analyses and those that provide additional margin.

Attachment 1 provides a description and assessment of the proposed changes.
Attachment 2 provides the existing TS pages marked up to show the proposed changes.
Attachment 3 provides revised (clean) TS pages.
Attachment 4 provides TS Bases pages marked up to show the associated TS Bases changes and is provided for information only.

Approval of the proposed amendment is requested by [date]. Once approved, the amendment shall be implemented within [] days.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated [STATE] Official.

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Attachments:

1. Description and Assessment
2. Proposed Technical Specification Changes (Mark-Up)
3. Revised Technical Specification Pages
4. Proposed Technical Specification Bases Changes (Mark-Up) – Information Only

cc: NRC Project Manager
NRC Regional Office
NRC Resident Inspector
State Contact

ATTACHMENT 1 - DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

The proposed amendment alters Surveillance Requirement (SR) 3.3.1.1.2 of Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." This proposed change revises the SR to compare the calculated (i.e.; calorimetric heat balance) power to the average power range monitor (APRM) indications, and to adjust the APRM consistent with the heat balance power if the calculated power is more than 2% greater than the APRM channel output when operating at $\geq 25\%$ of Rated Thermal Power (RTP). This change revises the SR to require adjustment only if the APRM indication deviates from the calculated power in the nonconservative direction.

2.0 ASSESSMENT

2.1 Applicability

[LICENSEE] has reviewed the safety evaluation provided to the Technical Specifications Task Force in a letter dated [DATE] (NRC ADAMS Accession No. XXXXXXXXX). This included a review of the NRC staff's evaluation, as well as the information provided in TSTF-546. As described herein, [LICENSEE] has concluded that the justifications, plant design description, and safety analysis description presented in TSTF-546 and the safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

2.2 Variations

[LICENSEE is not proposing any variations from the TS changes described in the TSTF-546 or the NRC staff's safety evaluation.] [LICENSEE is proposing the following variations from the TS changes described in the TSTF-546, Revision 0, or the NRC staff's safety evaluation dated [DATE]. These variations do not affect the applicability of TSTF-546 or the NRC staff's safety evaluation to the proposed license amendment.]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-546 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-546 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-546 to the [PLANT] TS.]

[The Traveler and Safety Evaluation discuss the applicable regulatory requirements and guidance, including the 10 CFR 50, Appendix A, General Design Criteria (GDC). [PLANT] was not licensed to the 10 CFR 50, Appendix A, GDC. The [PLANT] equivalents of the referenced GDC are [references including UFSAR location, if applicable]. [Discuss the equivalence of the referenced plant-specific requirements to the 10 CFR 50, Appendix A GDC as related to the proposed change.] This difference does not alter the conclusion that the proposed change is applicable to [PLANT].]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

[LICENSEE] requests adoption of TSTF-546, Revision 0, "Revise APRM Channel Adjustment Surveillance Requirement," which is an approved change to the standard technical specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed change alters Surveillance Requirement (SR) 3.3.1.1.2 of Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation." This proposed change revises the SR to compare the calculated (i.e.; calorimetric heat balance) power to the Average Power Range Monitoring (APRM) indications, and to adjust the APRM consistent with the heat balance power if the calculated power is more than 2% greater than the APRM channel output when operating at $\geq 25\%$ of Rated Thermal Power (RTP). This change revises the SR to require adjustment only if the APRM indication deviates from the calculated power in the nonconservative direction.

The proposed change has been evaluated against the criteria of 10 CFR 50.92(c) to determine if the proposed change results in any significant hazards. The following is the analysis of each of the 10 CFR 50.92(c) criteria:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The APRM system and the RPS are not initiators of any accidents previously evaluated. As a result, the proposed change does not affect the probability of any accident previously evaluated. The APRM system and the RPS functions act to mitigate the consequences of accidents previously evaluated. The reliability of APRM system and the RPS is not significantly affected by removing the gain adjustment requirement on the APRM channels when the APRMs are calibrated conservatively with respect to the calculated heat balance. This is because the actual core thermal power at which the reactor will automatically trip is lower, thereby increasing the margin to the core thermal limits and the limiting safety system settings assumed in the safety analyses. The consequences of an accident during the adjustment of the APRM instrumentation are no different from those during the existing surveillance testing period or the existing time allowed to restore the instruments to operable status. As a result, the ability of the APRM system and the RPS to mitigate any accident previously evaluated is not significantly affected.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any previously evaluated?

Response: No

The proposed change does not alter the protection system design, create new failure modes, or change any modes of operation. The proposed change does not involve a physical alteration of the plant; no new or different kind of equipment will be installed. Consequently, there are no new initiators that could result in a new or different kind of accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The margin of safety provided by the APRM system and the RPS is to ensure that the reactor is shut down automatically when plant parameters exceed the setpoints for the system. Any reduction in the margin of safety resulting from the adjustment of the APRM channels while continuing operation is considered to be offset by delaying a plant shutdown (i.e., a transient) for a short time with the APRM system, the primary indication of core power and an input to the RPS, not calibrated. Additionally, the short time period required for adjustment is consistent with the time allowed by Technical Specifications to restore the core power distribution parameters to within limits and is acceptable based on the low probability of a transient or design basis accident occurring simultaneously with inaccurate APRM channels.

The proposed change does not alter setpoints or limits established or assumed by the accident analyses. The Technical Specifications continue to require operability of the RPS functions, which provide core protection for postulated reactivity insertion events occurring during power operating conditions consistent with the plant safety analyses.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, [LICENSEE] concludes that the proposed amendment presents no significant hazards considerations under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

3.2 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in

the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.0 ENVIRONMENTAL EVALUATION

The proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

Proposed Technical Specifications and Bases Changes

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

| SURVEILLANCE | | FREQUENCY |
|--------------|--|--|
| SR 3.3.1.1.1 | Perform CHANNEL CHECK. | [12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.2 | <p>-----NOTE----- Not required to be performed until 12 hours after THERMAL POWER \geq 25% RTP. -----</p> <p>Verify the absolute difference between Compare the average power range monitor (APRM) channels and to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than is \leq 2% RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints"] while operating at \geq 25% RTP.</p> | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.3 | Adjust the channel to conform to a calibrated flow signal. | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

| SURVEILLANCE | | FREQUENCY |
|--------------|---|--|
| SR 3.3.1.1.1 | Perform CHANNEL CHECK. | [12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.2 | <p>-----NOTE----- Not required to be performed until 12 hours after THERMAL POWER \geq 25% RTP. -----</p> <p>Verify the absolute difference between Compare the average power range monitor (APRM) channels and to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than is \leq 2% RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints"] while operating at \geq 25% RTP.</p> | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.3 | Adjust the channel to conform to a calibrated flow signal. | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |

BASES

SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are ~~calibrated~~ *adjusted* to the reactor power calculated from a heat balance *if the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP. If the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP, the APRM is not declared inoperable, but must be adjusted consistent with the heat balance calculated power. If the APRM channel output cannot be properly adjusted, the channel is declared inoperable.*

This Surveillance does not preclude making APRM channel adjustments, if desired, when the heat balance calculated reactor power is less than the APRM channel output. To provide close agreement between the APRM indicated power and to preserve operating margin, the APRM channels are normally adjusted to within +/-2% of the heat balance calculated reactor power [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM Setpoints)"]. However, this agreement is not required for OPERABILITY when APRM output indicates a higher reactor power than the heat balance calculated reactor power.

~~LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD. [The Frequency of once per 7 days is~~

based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.6.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

A restriction to satisfying this SR when $< 25\%$ RTP is provided that requires the SR to be met only at $\geq 25\%$ RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when $< 25\%$ RTP. At low power levels, a

BASES

SURVEILLANCE REQUIREMENTS (continued)

increases, the system design will prevent further increases (by initiating a rod block) if adequate overlap is not maintained. Overlap between IRMs and APRMs exists when sufficient IRMs and APRMs concurrently have onscale readings such that the transition between MODE 1 and MODE 2 can be made without either APRM downscale rod block or IRM upscale rod block. Overlap between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are above mid-scale on Range 1 before SRMs have reached the upscale rod block.

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current MODE or condition should be declared inoperable.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are ~~calibrated-adjusted~~ to the reactor power calculated from a heat balance *if the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP. If the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP, the APRM is not declared inoperable, but must be adjusted consistent with the heat balance calculated power. If the APRM channel output cannot be properly adjusted, the channel is declared inoperable.*

This Surveillance does not preclude making APRM channel adjustments, if desired, when the heat balance calculated reactor power is less than the APRM channel output. To provide close agreement between the APRM indicated power and to preserve operating margin, the APRM channels are normally adjusted to within +/-2% of the heat balance calculated reactor power [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM Setpoints)". However, this agreement is not required for OPERABILITY when APRM output indicates a higher reactor power than the heat balance calculated reactor power.

~~LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD.~~ [The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.6.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

A restriction to satisfying this SR when < 25% RTP is provided that requires the SR to be met only at $\geq 25\%$ RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when < 25% RTP. At low power levels, a high degree of accuracy is unnecessary because of the large, inherent margin to thermal limits (MCPR and APLHGR). At $\geq 25\%$ RTP, the Surveillance is required to have been satisfactorily performed in accordance with SR 3.0.2. A Note is provided which allows an increase in THERMAL POWER above 25% if the Frequency is not met per SR 3.0.2. In this event, the SR must be performed within 12 hours after reaching or exceeding 25% RTP. Twelve hours is based on operating experience and in consideration of providing a reasonable time in which to complete the SR.

SR 3.3.1.1.3

The Average Power Range Monitor Flow Biased Simulated Thermal Power - High Function uses the recirculation loop drive flows to vary the trip setpoint. This SR ensures that the total loop drive flow signals from the flow unit used to vary the setpoint are appropriately compared to a calibrated flow signal and, therefore, the APRM Function accurately reflects the required setpoint as a function of flow. Each flow signal from the respective flow unit must be $\leq 105\%$ of the calibrated flow signal. If the flow unit signal is not within the limit, the APRMs that receive an input from the inoperable flow unit must be declared inoperable.

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

| SURVEILLANCE | | FREQUENCY |
|--------------|---|--|
| SR 3.3.1.1.1 | Perform CHANNEL CHECK. | [12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.2 | <p>-----NOTE----- Not required to be performed until 12 hours after THERMAL POWER \geq 25% RTP. -----</p> <p>Verify the absolute difference between Compare the average power range monitor (APRM) channels and to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than \leq 2% RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints"] while operating at \geq 25% RTP.</p> | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.3 | Adjust the channel to conform to a calibrated flow signal. | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |

SURVEILLANCE REQUIREMENTS

-----NOTES-----

1. Refer to Table 3.3.1.1-1 to determine which SRs apply for each RPS Function.
2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains RPS trip capability.

| SURVEILLANCE | | FREQUENCY |
|--------------|---|--|
| SR 3.3.1.1.1 | Perform CHANNEL CHECK. | [12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.2 | <p>-----NOTE----- Not required to be performed until 12 hours after THERMAL POWER \geq 25% RTP. -----</p> <p>Verify the absolute difference between Compare the average power range monitor (APRM) channels and to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than \leq 2% RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints"] while operating at \geq 25% RTP.</p> | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |
| SR 3.3.1.1.3 | Adjust the channel to conform to a calibrated flow signal. | [7 days <u>OR</u> In accordance with the Surveillance Frequency Control Program] |

BASES

SURVEILLANCE REQUIREMENTS (continued)

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are ~~calibrated~~*adjusted* to the reactor power calculated from a heat balance *if the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP. If the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP, the APRM is not declared inoperable, but must be adjusted consistent with the heat balance calculated power. If the APRM channel output cannot be properly adjusted, the channel is declared inoperable.*

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~~LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD.~~ [The Frequency of once per 7 days is based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.6.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

-----]

A restriction to satisfying this SR when $< 25\%$ RTP is provided that requires the SR to be met only at $\geq 25\%$ RTP because it is difficult to accurately maintain APRM indication of core THERMAL POWER consistent with a heat balance when $< 25\%$ RTP. At low power levels, a high degree of accuracy is unnecessary because of the large inherent margin to thermal limits (MCPR and APLHGR). At $\geq 25\%$ RTP, the Surveillance is required to have been satisfactorily performed in accordance with SR 3.0.2. A Note is provided which allows an increase

BASES

SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
-----]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.1.1.2

To ensure that the APRMs are accurately indicating the true core average power, the APRMs are ~~calibrated~~ *adjusted* to the reactor power calculated from a heat balance *if the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP. If the heat balance calculated reactor power exceeds the APRM channel output by more than 2% RTP, the APRM is not declared inoperable, but must be adjusted consistent with the heat balance calculated power. If the APRM channel output cannot be properly adjusted, the channel is declared inoperable.*

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~~LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," allows the APRMs to be reading greater than actual THERMAL POWER to compensate for localized power peaking. When this adjustment is made, the requirement for the APRMs to indicate within 2% RTP of calculated power is modified to require the APRMs to indicate within 2% RTP of calculated MFLPD.~~ [The Frequency of once per 7 days is

based on minor changes in LPRM sensitivity, which could affect the APRM reading between performances of SR 3.3.1.1.6.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----REVIEWER'S NOTE-----

Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.

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