June 20, 2017

Technical Specifications Task Force
11921 Rockville Pike, Suite 100
Rockville, MD 20852

SUBJECT: DRAFT SAFETY EVALUATION OF TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER TSTF-546, REVISION 0, "REVISE APRM CHANNEL ADJUSTMENT SURVEILLANCE REQUIREMENT" (CAC NO. MF7622)

Dear Members of the Technical Specifications Task Force:

By letter dated April 21, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16112A208), the Technical Specifications Task Force (TSTF) submitted to the U.S. Nuclear Regulatory Commission (NRC) for review and approval traveler TSTF-546, Revision 0, “Revise APRM [Average Power Range Monitor] Channel Adjustment Surveillance Requirement.” The NRC staff’s draft safety evaluation (SE) of the traveler and a draft model SE are enclosed.

Thirty calendar days are provided to you to comment on any factual errors or clarity concerns contained in the enclosed draft SEs. The final SEs will be issued after making any necessary changes. The NRC staff's disposition of your comments on the draft SEs will be discussed in the final SEs. To facilitate the NRC staff's review of your comments, please provide a marked-up copy of the draft SEs showing proposed changes and provide a summary table of the proposed changes.

If you have any questions, please contact Michelle Honcharik at 301-415-1774 or via e-mail at Michelle.Honcharik@nrc.gov.

Sincerely,

Jennifer M. Whitman, Acting Chief ***/RA/***
Technical Specifications Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

Project No. 753

Enclosures:
1. NRC staff’s draft Safety Evaluation of the traveler
2. Draft model Safety Evaluation

cc: See next page

Technical Specifications Task Force Project No. 753

cc:

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Technical Specifications Task Force

SUBJECT: DRAFT SAFETY EVALUATION OF TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER TSTF-546, REVISION 0, "REVISE APRM CHANNEL ADJUSTMENT SURVEILLANCE REQUIREMENT" (CAC NO. MF7622) Dated: June 20, 2017

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ADAMS Accession No.: Package: Cover letter and Draft traveler SE: ML17135A188, draft Model SE: ML17135A189;
***concurrence from internal memo (ML17040A085)**
****concurred via e-mail** **NRR-106**

OFFICE	DSS/STSB	DSS/EICB*	DSS/SRXB**	DORL/BC**
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DATE	5/15/2017	3/9/2017	5/17/2017	5/25/2017
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NAME	JWachutka	MHoncharik *(TTjader for)*	JMWhitman	
DATE	6/9/17	06/20/17	06/20/17	

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DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER
TSTF-546, REVISION 0,
"REVISE APRM CHANNEL ADJUSTMENT SURVEILLANCE REQUIREMENT"

1.0 INTRODUCTION

By letter dated April 21, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16112A208), the Technical Specifications (TS) Task Force (TSTF) submitted Traveler TSTF-546, "Revise APRM [Average Power Range Monitor] Channel Adjustment Surveillance Requirement [SR]," Revision 0, for U.S. Nuclear Regulatory Commission (NRC) review and approval. By letter dated February 2, 2017 (ADAMS Accession No. ML17033A264), the TSTF submitted a response to the NRC staff's request for additional information (RAI). The RAI response did not result in any changes to TSTF-546.

Traveler TSTF-546 proposes changes to the Standard Technical Specifications (STS) and Bases for boiling water reactor (BWR) designs BWR/4 and BWR/6.[1] The changes would be incorporated into future revisions of NUREG-1433, Volumes 1 and 2, and NUREG-1434, Volumes 1 and 2. NUREG-1433 is based on the BWR/4 plant design, and is representative of the BWR/2, BWR/3, and, in some cases, BWR/5 designs. NUREG-1434 is based on the BWR/6 plant design, and is representative of, in many cases, the BWR/5 design.

The proposed changes would revise SR 3.3.1.1.2 in NUREGs-1433 and -1434 to only require adjustment of the APRM channels if the calculated power exceeds the APRM output by more than 2 percent rated thermal power (RTP).

Throughout this safety evaluation (SE), items that are enclosed in square brackets signify plant-specific nomenclature or values. Individual licensees would furnish site-specific nomenclature or values for bracketed items when submitting a license amendment request (LAR) to adopt the changes described in this SE.

2.0 REGULATORY EVALUATION

2.1 SYSTEM DESCRIPTION

The APRMs monitor neutron flux within the core to provide an indication of core power. As stated in the STS Bases, the APRM channels receive input signals from the local power range

[1] U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A192.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A193.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A195.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A196.

monitors (LPRM) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP.

The APRM system is a safety-related system with two purposes. One purpose is to monitor the core thermal power level. The other purpose is to provide reactor scram and control rod block signals to preserve the fuel cladding integrity. The APRM system consists of a number of APRM channels that each receive input signals from LPRMs located in the reactor core. The APRM channels average the LPRM inputs and because the LPRMs assigned to specific APRM channels are located in diverse axial and radial locations throughout the reactor core, each APRM provides a continuous indication of average reactor power. A gain adjustment can be made to each ARPM channel output allowing it to be calibrated to the calculated core thermal power. The typical allowable absolute difference between calculated core thermal power and the APRM channel output is 2 percent.

Both analog and digital neutron monitoring systems (NMS) are installed in BWRs and have different APRM system designs. Additionally, there are several different methodologies for addressing BWR instability protection including: Option I-D, Option II, Enhanced Option I-A (E1A), Option III, and Detect and Suppress Solution–Confirmation Density (DSS-CD) and the automatic backup stability protection (ABSP) for DSS-CD. The APRMs only provide input for Option I-D, Option II, Enhanced Option I-A, and the ABSP for DSS-CD.

A typical analog NMS has two groups of channels with three APRM inputs to each reactor protection system (RPS) trip system. Three channels per group allow one channel in each group to be bypassed because any one channel trip signal in each system can cause the associated trip system to be actuated. Power Range Monitor Flow Biased Simulated Thermal Power - High and the APRM Fixed Neutron Flux - High functions, four channels, with two channels in each trip system, are typically required to be operable by Limiting Condition for Operation (LCO) 3.3.1.1 to ensure that no single instrument failure will preclude a trip of the APRM system 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.

A typical digital NMS is divided into four APRM channels and four 2-out-of-4 voter channels with each channel providing input to each of the four 2-out-of-4 voter channels. The four voter channels are divided into two groups of two each; each group of two voter channels provides input to one RPS trip system. One APRM channel is allowed to be bypassed, but no voter channels are allowed 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. A trip of any two channels of APRM flow biased or neutron flux trip 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. To ensure that no single instrument failure will preclude a trip on a valid signal for the APRM Flow Biased Simulated Thermal Power - High and the APRM 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. If one or more required channels are inoperable, Condition A requires the channel be placed in the tripped condition within 12 hours.

2.2 PROPOSED CHANGES TO THE STS

The proposed changes would revise SR 3.3.1.1.2, which is associated with LCO 3.3.1.1A, "Reactor Protection System (RPS) Instrumentation (Without Setpoint Control Program)" and LCO 3.3.1.1B, "Reactor Protection System (RPS) Instrumentation (With Setpoint Control Program)."

SR 3.3.1.1.2 currently states:

> Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power is ≤ 2% RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints"] while operating at ≥ 25% RTP

The proposed SR 3.3.1.1.2 would state:

> Compare the average power range monitor (APRM) channels to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than 2% RTP while operating at ≥ 25% RTP

Corresponding changes are proposed to the STS Bases. A summary of the revised STS Bases and the NRC staff's evaluation of the revised Bases are provided in an attachment to this SE.

2.3 APPLICABLE REGULATORY REQUIREMENTS AND GUIDANCE

Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (58 *Federal Register* 39132), dated July 22, 1993, states in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> …[T]he Commission will also entertain requests to adopt portions of the improved STS [(e.g., TSTF-546)], even if the licensee does not adopt all STS improvements.
>
> …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
>
> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for [BWR designs]. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications.

> …[I]t is the Commission intent that the wording and Bases of the improved STS be used … to the extent practicable.

As described in the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," recommendations were made by NRC and industry task groups for new STS that include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STS, and provide improvements to the Bases of STS, which provides the purpose for each requirement in the specification. Improved vendor-specific STS were developed and issued by the NRC in September 1992.

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(a)(1) requires an applicant for an operating license to include in the application proposed TS in accordance with the requirements of 10 CFR 50.36. The applicant must include in the application a "summary statement of the bases or reasons for such specifications, other than those covering administrative controls…." However, per 10 CFR 50.36(a)(1), these technical specification bases "shall not become part of the technical specifications."

Additionally, 10 CFR 50.36(b) requires:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), 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 TSs until the condition can be met.

The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which 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.

Per 10 CFR 50.90, whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate.

The NRC staff's guidance for the review of TSs is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010 (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs.

3.0 TECHNICAL EVALUATION

The existing TS SR 3.3.1.1.2 requires verification that the absolute difference between the APRM channels and the calculated power is ≤ 2 percent RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints"] while operating at ≥ 25 percent RTP. If the absolute difference is greater than 2 percent, the APRM channel is declared inoperable. An acceptable way to restore operability is to adjust the gain for the APRM channel to restore the absolute difference to ≤ 2 percent. If the APRM channel is reading higher than the calculated thermal power, this adjustment would be non-conservative with respect to the RPS trip setpoint. If the APRM channel is reading lower than the calculated thermal power, this adjustment would be conservative with respect to the RPS trip setpoint.

The proposed change would require adjustment of the APRM channel only if the APRM is non-conservative with respect to calculated thermal power (i.e., reading lower than calculated thermal power). In this situation, the adjustment of the APRM channel is permitted, but not required, if the APRM channel is conservative with respect to the calculated thermal power.

The NRC staff requested additional information on whether this proposed change would affect the effectiveness of any of the stability solutions for BWRs. In the response dated February 2, 2017, the TSTF stated that stability solutions (e.g., Option III and DSS-CD) that rely on the LPRMs are not affected by this change. For stability solutions that rely on the APRMs for the main licensing basis protection (e.g., Option I-D, Option II, Enhanced Option I-A, and the ABSP for DSS-CD), this change would result in earlier (i.e., conservative) RPS actuation. The NRC staff reviewed this response and determined that it is not clear that a high APRM signal is always conservative for the ABSP. However, this backup solution is only used when the normal stability protection is inoperable and its use is limited to 120 days. Therefore, the proposed change would negligibly affect the ABSP and is acceptable to the NRC staff.

The regulation at 10 CFR 50.36(c)(3) requires that the TS contain SRs, which 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 for operation will be met. The NRC staff reviewed the changes proposed to SR 3.3.1.1.2 as described in this SE. The NRC staff determined that the SR, as modified, continues to provide appropriate controls and acceptance criteria for adjustment of the APRMs to ensure that the APRMs appropriately reflect actual reactor power. The NRC staff determined that the SR continues to verify the operability of the APRMs and provide assurance that the necessary quality of systems and components is maintained.

4.0 CONCLUSION

The NRC staff reviewed traveler TSTF-546, Revision 0, which proposed changes to NUREG-1433, Volumes 1 (STS) and 2 (Bases), and NUREG-1434, Volumes 1 (STS) and 2 (Bases). The NRC staff determined that the proposed changes to the STS meet the standards for TS in 10 CFR 50.36(b). The proposed changes to the SR 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, and satisfy 10 CFR 50.36(c)(3). Additionally, the changes to the STS were reviewed for technical clarity and consistency with customary terminology and format in accordance with SRP Chapter 16.

The proposed Bases, which will be added to future revisions to NUREG-1433, Volume 2, and NUREG-1434, Volume 2, satisfy the Commission's Policy Statement by addressing the

questions specified in the policy statement, and cite references to appropriate licensing documentation to support the Bases.

Technical contacts: Jennifer M. Whitman, NRR/DSS/SRXB
Gursharan Singh, NRR/DE/EICB

Attachment: Basis for Accepting the Proposed Changes to the Standard Technical Specification Bases, Volume 2 of NUREGs-1433 and -1434

Date: June 20, 2017

ATTACHMENT

BASIS FOR ACCEPTING THE PROPOSED CHANGES TO THE STANDARD TECHNICAL SPECIFICATION BASES, VOLUME 2 OF NUREGS-1433 AND -1434

1.0 INTRODUCTION

Traveler Technical Specifications (TS) Task Force (TSTF) TSTF-546, "Revise APRM [Average Power Range Monitor] Channel Adjustment Surveillance Requirement [SR]," Revision 0, proposes changes to the Standard Technical Specifications (STS) and Bases for boiling water reactor (BWR) designs BWR/4 and BWR/6.[2] The changes would be incorporated into future revisions of NUREG-1433, Volumes 1 and 2, and NUREG-1434, Volumes 1 and 2. NUREG-1433 is based on the BWR/4 plant design, and is representative of the BWR/2, BWR/3, and, in some cases, BWR/5 designs. NUREG-1434 is based on the BWR/6 plant design, and is representative of, in many cases, the BWR/5 design.

The proposed changes would revise SR 3.3.1.1.2 in NUREGs-1433 and -1434 to only require adjustment of the APRM channels if the calculated power exceeds the APRM output by more than 2 percent rated thermal power (RTP). The Bases for SR 3.3.1.1.2 in NUREGs-1433 and -1434 would also be revised. A summary of the revised Bases and the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the revised Bases are presented in this attachment.

2.0 REGULATORY EVALUATION

2.1 Applicable Regulations and Guidance

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(a)(1) states that each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section. 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.

In its "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," dated July 22, 1993 (58 *Federal Register* 39132), the Commission presented its policy on the scope and purpose of the TS. The Commission explained how implementation of the policy statement through implementation of the improved STS is expected to produce an improvement in the safety of nuclear power plants through the use of more operator-oriented

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[2] U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A192.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A193.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A195.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A196.

TS, improved TS Bases, reduced action-statement-induced plant transients, and more efficient use of NRC and industry resources.

The Final Policy Statement provides the following description of the scope and the purpose of the Technical Specification Bases:

> Appropriate Surveillance Requirements and Actions should be retained for each LCO [limiting condition for operation] which remains or is included in the Technical Specifications. Each LCO, Action, and Surveillance Requirement should have supporting Bases. The Bases should at a minimum address the following questions and cite references to appropriate licensing documentation (e.g., FSAR, Topical Report) to support the Bases.
>
> 1. What is the justification for the Technical Specification, i.e., which Policy Statement criterion requires it to be in the Technical Specifications?
>
> 2. What are the Bases for each LCO, i.e., why was it determined to be the lowest functional capability or performance level for the system or component in question necessary for safe operation of the facility and, what are the reasons for the Applicability of the LCO?
>
> 3. What are the Bases for each Action, i.e., why should this remedial action be taken if the associated LCO cannot be met; how does this Action relate to other Actions associated with the LCO; and what justifies continued operation of the system or component at the reduced state from the state specified in the LCO for the allowed time period?
>
> 4. What are the Bases for each Safety Limit?
>
> 5. What are the Bases for each Surveillance Requirement and Surveillance Frequency; i.e., what specific functional requirement is the surveillance designed to verify? Why is this surveillance necessary at the specified frequency to assure that the system or component function is maintained, that facility operation will be within the Safety Limits, and that the LCO will be met?
>
> Note: In answering these questions the Bases for each number (e.g., Allowable Value, Response Time, Completion Time, Surveillance Frequency), state, condition, and definition (e.g., operability) should be clearly specified. As an example, a number might be based on engineering judgment, past experience, or PSA [probabilistic safety assessment] insights; but this should be clearly stated.

The NRC staff used the guidance contained in the Final Policy Statement during its evaluation of the proposed changes to the Bases.

2.2 Description of Changes

Volumes 2 of NUREGs-1433 and -1434 contain the Bases for each Safety Limit and each LCO contained in Volumes 1 of NUREGs-1433 and -1434. The Bases for each LCO are organized into the following sections:

Background;
Applicable Safety Analyses, LCO, and Applicability;
Actions;
Surveillance Requirements; and
References.

The Bases for SR 3.3.1.1.2 in NUREGs-1433 and -1434 are proposed to be revised. The following discussion provides a summary of the revised Bases, followed by the NRC staff's evaluation of the revised Bases.

3.0 TECHNICAL EVALUATION

The Bases for SR 3.3.1.1.2 are proposed to be revised by the insertion of a description of the revised SR 3.3.1.1.2. The revised Bases state that the APRMs are 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 percent RTP. The Bases explain that, if the APRM channel cannot be adjusted to within this tolerance, the channel is declared inoperable. The revised SR 3.3.1.1.2 does not preclude adjusting the APRMs if the reactor power is less than the APRM indication, but this adjustment is not required for APRM operability.

The NRC staff reviewed the revised Bases and determined that they adequately provide an appropriate description of the SR, the conditions under which an APRM channel is considered inoperable, and the basis for the SR.

4.0 CONCLUSION

The NRC staff determined that the proposed TS Bases changes are consistent with the proposed TS changes and provide an explanation and supporting information for the SR. Therefore, the NRC staff determined that the revised Bases are consistent with the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," dated July 22, 1993 (58 *Federal Register* 39132).

DRAFT MODEL SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER

TSTF-546, REVISION 0,

"REVISE APRM CHANNEL ADJUSTMENT SURVEILLANCE REQUIREMENT"

1.0 INTRODUCTION

By application dated **[enter date]** (Agencywide Documents Access and Management System (ADAMS) Accession No. **[MLXXXXXXXXX]**), **[name of licensee]** (the licensee) requested changes to the technical specifications (TSs) for **[name of facility]**. Specifically, the licensee requested changes to the TSs to adopt Technical Specifications Task Force (TSTF) traveler TSTF-546, Revision 0, "Revise APRM [Average Power Range Monitor] Channel Adjustment Surveillance Requirement," dated April 21, 2016 (ADAMS Accession No. ML16112A208). The NRC approved the traveler on **Month, Day, 2017 (ADAMS Accession No. MLXXXX)**.

The proposed changes would revise a surveillance requirement (SR) to only require adjustment of the APRM channels if the calculated power exceeds the APRM output by more than 2 percent rated thermal power (RTP).

2.0 REGULATORY EVALUATION

2.1 SYSTEM DESCRIPTION

The APRMs monitor neutron flux within the core to provide an indication of core power. The APRM channels receive input signals from the local power range monitors (LPRM) within the reactor core to provide an indication of the power distribution and local power changes. The APRM channels average these LPRM signals to provide a continuous indication of average reactor power from a few percent to greater than RTP.

The APRM system is a safety-related system with two purposes. One purpose is to monitor the core thermal power level. The other purpose is to provide reactor scram and control rod block signals to preserve the fuel cladding integrity. The APRM system consists of a number of APRM channels that each receive input signals from LPRMs located in the reactor core. The APRM channels average the LPRM inputs and because the LPRMs assigned to specific APRM channels are located in diverse axial and radial locations throughout the reactor core, each APRM provides a continuous indication of average reactor power. A gain adjustment can be made to each ARPM channel output allowing it to be calibrated to the calculated core thermal power. The typical allowable absolute difference between calculated core thermal power and the APRM channel output is 2 percent.

Both analog and digital neutron monitoring systems (NMS) are installed in BWRs and have different APRM system designs. Additionally, there are several different methodologies for addressing BWR instability protection including: Option I-D, Option II, Enhanced Option I-A (E1A), Option III, and Detect and Suppress Solution–Confirmation Density (DSS-CD)

and the automatic backup stability protection (ABSP) for DSS-CD. The APRMs only provide input for Option I-D, Option II, Enhanced Option I-A, and the ABSP for DSS-CD.

A typical analog NMS has two groups of channels with three APRM inputs to each reactor protection system (RPS) trip system. Three channels per group allow one channel in each group to be bypassed because any one channel trip signal in each system can cause the associated trip system to be actuated. Power Range Monitor Flow Biased Simulated Thermal Power - High and the APRM Fixed Neutron Flux - High functions, four channels, with two channels in each trip system, are typically required to be operable by Limiting Condition for Operation (LCO) 3.3.1.1 to ensure that no single instrument failure will preclude a trip of the APRM system 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.

A typical digital NMS is divided into four APRM channels and four 2-out-of-4 voter channels with each channel providing input to each of the four 2-out-of-4 voter channels. The four voter channels are divided into two groups of two each; each group of two voter channels provides input to one RPS trip system. One APRM channel is allowed to be bypassed, but no voter channels are allowed 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. A trip of any two channels of APRM flow biased or neutron flux trip 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. To ensure that no single instrument failure will preclude a trip on a valid signal for the APRM Flow Biased Simulated Thermal Power - High and the APRM 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. If one or more required channels are inoperable, Condition A requires the channel be placed in the tripped condition within 12 hours.

2.2 PROPOSED TECHNICAL SPECIFICATION CHANGES

The proposed changes would revise SR 3.3.1.1.2, which is associated with LCO 3.3.1.1, “Reactor Protection System (RPS) Instrumentation”.

SR 3.3.1.1.2 currently states:

> Verify the absolute difference between the average power range monitor (APRM) channels and the calculated power 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

The proposed SR 3.3.1.1.2 would state:

> Compare the average power range monitor (APRM) channels to the calculated power. Adjust the APRM channels if the calculated power exceeds the APRM output by more than 2% RTP while operating at ≥ 25% RTP

2.3 REGULATORY REQUIREMENTS AND GUIDANCE

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(a)(1) requires an applicant for an operating license to include in the application proposed TS in accordance with the requirements of 10 CFR 50.36. The applicant must include in the application a "summary statement of the bases or reasons for such specifications, other than those covering administrative controls...." However, per 10 CFR 50.36(a)(1), these technical specification bases "shall not become part of the technical specifications."

Additionally, 10 CFR 50.36(b) requires:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include limiting conditions for operation (LCOs), which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), 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 TSs until the condition can be met.

The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which 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.

The NRC staff's guidance for the review of TSs is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010 (ADAMS Accession No. ML100351425).

3.0 TECHNICAL EVALUATION

The existing TS SR 3.3.1.1.2 requires verification that the absolute difference between the APRM channels and the calculated power is ≤ 2 percent RTP [plus any gain adjustment required by LCO 3.2.4, "Average Power Range Monitor (APRM) Setpoints"] while operating at ≥ 25 percent RTP. If the absolute difference is greater than 2 percent, the APRM channel is

declared inoperable. An acceptable way to restore operability is to adjust the gain for the APRM channel to restore the absolute difference to ≤2 percent. If the APRM channel is reading higher than the calculated thermal power, this adjustment would be non-conservative with respect to the RPS trip setpoint. If the APRM channel is reading lower than the calculated thermal power, this adjustment would be conservative with respect to the RPS trip setpoint.

The proposed change would require adjustment of the APRM channel only if the APRM is non-conservative with respect to calculated thermal power (i.e., reading lower than calculated thermal power). In this situation, the adjustment of the APRM channel is permitted, but not required, if the APRM channel is conservative with respect to the calculated thermal power.

[NOTE: During the review of the traveler, the NRC staff requested additional information on whether this proposed change would affect the effectiveness of any of the stability solutions for BWRs. In the response dated February 2, 2017, the TSTF stated that stability solutions (e.g., Option III and DSS-CD) that rely on the LPRMs are not affected by this change. For stability solutions that rely on the APRMs for the main licensing basis protection (e.g., Option I-D, Option II, Enhanced Option I-A, and the ABSP for DSS-CD), this change would result in earlier (i.e., conservative) RPS actuation. The NRC staff reviewed this response and determined that it is not clear that a high APRM signal is always conservative for the ABSP. However, this backup solution is only used when the normal stability protection is inoperable and its use is limited to 120 days. Therefore, the proposed change would negligibly affect the ABSP and is acceptable to the NRC staff.]

The regulation at 10 CFR 50.36(c)(3) requires that the TSs contain SRs, which 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 for operation will be met. The NRC staff reviewed the changes proposed to SR 3.3.1.1.2 as described in this SE. The NRC staff determined that the SR, as modified, continues to provide appropriate controls and acceptance criteria for adjustment of the APRMs to ensure that the APRMs appropriately reflect actual reactor power. The NRC staff determined that the SR continues to verify the operability of the APRMs and provide assurance that the necessary quality of systems and components is maintained.

3.1 VARIATIONS FROM THE APPROVED TRAVELER

[NOTE: Technical reviewers and/or project manager to discuss variations from the approved traveler and whether they are acceptable.]

3.2 CONCLUSION

The NRC staff reviewed the proposed changes to the TSs, and determined that they meet the standards for TSs in 10 CFR 50.36(b). The proposed changes to the SR 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, and satisfy 10 CFR 50.36(c)(3). Additionally, the changes to the TSs were reviewed for technical clarity and consistency with customary terminology and format in accordance with SRP Chapter 16.

4.0 STATE CONSULTATION

[Note: This section is to be prepared by the PM.]

In accordance with the Commission's regulations, the **[Name of State]** State official was notified of the proposed issuance of the amendment on **[enter date]**. The State official had **[no]** comments. **[If comments were provided, they should be addressed here]**.

5.0 ENVIRONMENTAL CONSIDERATION

[Note: This section is to be prepared by the PM. As needed, the PM should coordinate with NRR's Environmental Review and Projects Branch (RERP) to determine the need for an EA. Specific guidance on preparing EAs and considering environmental issues is contained in NRR Office Instruction LIC-203, "Procedural Guidance for Preparing Categorical Exclusions, Environmental Assessments, and Considering Environmental Issues."]

The amendment changes a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 or changes to SRs. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding **[(XX FR XXX)]**. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that 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.

7.0 REFERENCES

Optional section to be prepared by the PM and technical reviewers. If document is publicly available, the ADAMS Accession No. should be listed.

[NOTE: Replace principal contributor names with the individual(s) who prepare the plant-specific SE.]

Principal Contributors: Jennifer M. Whitman, NRR/DSS/SRXB
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