

**SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR**

**REGULATION OF GE HITACHI LICENSING TOPICAL REPORT NEDE-33633P, "LICENSING**

**TOPICAL REPORT GEH METHODOLOGY FOR**

**IMPLEMENTING TSTF-493 REVISION 4"**

**GE-H REFERENCE: MFN 11-028**

**PROJECT NO. 710**

1.0 **INTRODUCTION**

By letter dated February 23, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110560302) General Electric-Hitachi Nuclear Energy (GEH) submitted a licensing topical report (TR) NEDE-33633P, "Licensing Topical Report GEH Methodology for Implementing TSTF-493 Revision 4," dated February 2011 for U.S. Nuclear Regulatory Commission (NRC) review and approval (GEH Letter Reference MFN 11-028). This TR describes the methodology developed by GEH for calculating the as-found and as-left tolerances (AFT/ALT) for setpoints in boiling water reactor (BWR) plant technical specifications (TS) that comply with the guidance of TSTF-493, Revision 4. GEH states that this TR is applicable for all BWR/2-6 licensees.

In November of 1995, the NRC staff approved the General Electric Report NEDC-31336P, "General Electric Instrument Setpoint Methodology" (Reference NRC Letter dated November 6, 1995, ADAMS Accession No. ML072950103), which documents a methodology and basis for calculating trip setpoints for selected types of BWR protection system setpoints. The TR NEDE-33633P submitted with the February 23, 2011 GEH letter complements the previously approved setpoint methodology GE NEDC-31336P-A (ADAMS Accession No. ML072950103) (the designation "-A" indicates the NRC-approved version) and provides the basis for determining AFT/ALT associated with these calculated trip setpoints. TR NEDE-33633P states that the setpoint calculation methodology used in NEDC-31336P-A (approved) is addressed as "GEH Setpoint Methodology" and remains applicable for determining the TS allowable values (AVs) and related nominal trip setpoints (NTSPs) applicable to operating plants for which the licensee has chosen to implement the approved 1995 GE Setpoint Methodology. This NRC staff safety evaluation (SE) does not address the acceptability of future license amendment requests referencing the GE NEDC-31336P-A methodology for determining trip setpoints, but is limited to an evaluation of the use of the methodology described in TR NEDE-33633P for establishing nominal trip setpoints and calculating AFT/ALT for setpoints in BWR plant TS that are intended to comply with the guidance of TSTF-493, Revision 4.

In Regulatory Issue Summary (RIS) 2006-17, "NRC Staff Position on the Requirements of 10 CFR [Title 10 of *Code of Federal Regulations*] 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels," dated August 24, 2006 (ADAMS Accession No. ML051810077), the NRC expressed concerns that the current operating plant TS requirements for limiting safety system settings (LSSS) may not be fully in compliance with the intent of 10 CFR 50.36. Specifically, this RIS

discusses issues that could occur during testing of LSSs and which may have an adverse effect on equipment operability. To address the NRC concerns, the pressurized water reactor (PWR) and BWR Owner's Groups TS Task Force (TSTF) issued the following letters:

1. Transmittal of Revised TSTF-493 Revision 4, TSTF-09-29, dated January 5, 2010 (ADAMS Accession No. ML100060064)
2. Transmittal of TSTF-493 Revision 4, Errata, TSTF-10-07, dated April 23, 2011 (ADAMS Accession No. ML101160026)

The TSTF-493 Revision 4 guidance provides for two notes regarding operability determination that should be placed on specific instrument functions contained within the Standard TS (STS) Surveillance Requirements for instrument channel (loop) and trip unit (if applicable) calibrations. Further, the TSTF-493 Revision 4 guidance provides an acceptable method for identifying the as-left and as-found tolerances that is consistent with RIS 2006-17. TSTF-493 Revision 4 also provides the specific actions to be taken if the as-found channel setpoint is outside either the predefined ALT/AFT.

## 2.0 REGULATORY REQUIREMENTS

The NRC staff evaluated TR NEDE-33633P against the regulatory requirements and guidance listed below to ascertain whether there is reasonable assurance that the systems and components affected by the TR will perform their required safety functions when called upon to do so.

### 2.1 Regulatory Requirements

The staff considered the following regulatory requirements:

The regulation of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," establishes the fundamental regulatory requirements. Specifically, Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 provides, in part, that an application for a design certification, combined license, design approval, or manufacturing license, respectively, must include the principal design criteria for a proposed facility. The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

In 10 CFR 50.36, "Technical Specifications," the Commission established its regulatory requirements related to the contents of the TS. Specifically, 10 CFR 50.36 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." Specifically, 10 CFR 50.36(c)(1)(ii)(a) states, "Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor." Additionally, 10 CFR 50.36(c)(3) states, "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.”

General Design Criterion (GDC) 13, “Instrumentation and Control,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50 requires that instrumentation be provided to monitor variables and systems and that controls be provided to maintain these variables and systems within prescribed operating ranges.

GDC 20, “Protection System Functions,” of Appendix A to 10 CFR Part 50 requires that the protection system be designed to initiate the operation of appropriate systems to ensure that specified acceptable fuel design limits are not exceeded.

The NRC staff reviewed the proposed TR against these requirements to ensure that there is reasonable assurance that the systems affected by the proposed TR will perform their required safety functions.

## 2.2 Regulatory Guidance

Regulatory Guide (RG) 1.105, “Setpoints for Safety-Related Instrumentation,” Revision 3, describes a method that the NRC staff finds acceptable for use in complying with the NRC’s regulations for ensuring that setpoints for safety-related instrumentation are initially within, and will remain within, the TS limits. RG 1.105 endorses Part I of Instrument Society of America (ISA)-S67.04-1994, “Setpoints for Nuclear Safety Instrumentation,” which is subject to NRC staff clarifications.

In RIS 2006-17 the NRC addresses requirements on LSSS that are assessed during the periodic testing and calibration of instrumentation.

In a letter dated September 7, 2005, from Patrick L. Hiland (NRC) to the Nuclear Energy Institute’s Setpoint Methods Task Force, “Technical Specification for Addressing Issues Related to Setpoint Allowable Values” (ADAMS Accession No. ML052500004), footnotes are described that should be added to surveillance requirements related to setpoint verification for instrument functions on which a safety limit has been placed. This letter also addresses the information that should be included within TS to ensure operability of the instruments following surveillance tests related to instrument setpoints.

## 2.3 Supplemental Guidance

PWR and BWR Owner’s Groups’ TSTF-493, Revision 4, dated January 5, 2010 and an errata sheet, dated April 23, 2010, (ADAMS Accession No. ML100060064) addresses staff concerns stated in RIS 2006-17 and Federal Register Notice, “Notice of Availability of the Models for Plant-Specific Adoption of Technical Specifications Task Force Traveler TSTF-493, Revision 4, ‘Clarify Application of Setpoint Methodology for LSSS Functions,’” Vol. 75, No. 90 / Tuesday, May 11, 2010, documents NRC’s position on adoption of TSTF-493, Revision 4.

### 3.0 TECHNICAL EVALUATION

TR NEDE-33633P states that the GEH TSTF-493 Methodology it contains was developed based on the consideration that previously-approved GEH Instrument Setpoint Methodology remains applicable for determining TS AVs and related NTSPs for operating plants. Therefore, this NRC staff SE does not re-consider or modify the conclusions reached by the NRC staff regarding the previously-approved GE Instrument Setpoint Methodology NEDC-31336P-A (ADAMS Accession No. ML072950103), but simply evaluates the TSTF-493-related aspects of the determination of final NTSPs and as-found/as-left tolerances identified within TR NEDE-33633P.

To implement the GEH TSTF-493 Methodology for new or revised setpoint calculations of operating reactors, the previously-approved GE Instrument Setpoint Methodology in NEDC-31336P-A (referred to henceforth as “GEH Instrument Setpoint Methodology”) is first used to establish the following relationships among safety related instrument setpoints:

1. Allowable Value (AV) and Required AV Margin. The Required AV Margin establishes the AV specified in the Technical Specifications with sufficient margin to ensure that there is a high probability that the Analytical Limit will not be exceeded if the as-found value of the instrument setting established by the methodology in NEDC-31336P-A were to be at the AV.
2. First Nominal Trip Setpoint (NTSP1) and Required NTSP Margin, which is equivalent to the Limiting Trip Setpoint (LTSP) described in TSTF-493. The Required NTSP Margin establishes NTSP1 with sufficient margin to ensure there is a high probability that the Analytical Limit will not be exceeded for the limiting event occurring from normal operations, and represents the minimum margin between the NTSP and the analytical limit required by the GE Instrument Setpoint Methodology NEDC-31336P-A.

TR GEH NEDE-33633P provides a methodology for determining the ALT and AFT associated with the criteria established in TSTF-493. The methodology for determining ALT/AFTs addresses aspects of current plant TS, instrument loop configuration, plant surveillance procedures and processes, and the criteria contained in the PWR and BWR Owners Groups TSTF-493 and the NRC RIS 2006-17.

The calculation methodology in NEDE-33633P (henceforth referred to as “GEH TSTF-493 Methodology”) is then used to determine the AFT and ALT based on TSTF-493 guidance for instrument performance monitoring and instrument resetting or to confirm that similar margins in the GEH Instrument Setpoint Methodology to NEDC-31336P-A are consistent with limits provided for in the TSTF-493 guidance. The GEH TSTF-493 Methodology is dependent on the instrument loop (channel) configuration [ ], and the specific plant procedures used to demonstrate compliance with the TS surveillance requirements for loop and trip unit (if applicable) calibration. The GEH TSTF 493 Methodology to NEDE-33633P only applies to the calculation of the AFT and ALT values for the specific instrument functions identified in TSTF-493, and does not affect the setpoints calculated by GEH Instrument Setpoint Methodology (NEDC-31336P-A).

### **Specific Requirements and Guidelines Addressed in the Staff's Technical Evaluation**

The specific requirement of 10 CFR 50.36 (c)(3)/Regulatory Guide 1.105 being addressed by TSTF-493 Revision 4 to incorporate the NRC staff's position expressed in NRC RIS 2006-17 is to implement appropriate surveillance 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." Guidance in TSTF-493 Revision 4 that has been endorsed by the NRC staff directs licensees to add two notes to the TS tables associated with instrument channels performing LSSS functions of Reactor Protection System and Engineered Safeguards Features systems identifying the method for performing channel operability determinations during surveillance testing. The operability determination notes are as follows:

1. If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.
2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as found and as-left tolerances apply to the actual setpoint implemented in the Surveillance Procedures (NTSP) to confirm channel performance. The LTSP and the methodologies to determine the as-found and the as-left tolerances are specified in [insert the facility FSAR [final safety analysis report] reference or the name of any document incorporated into the facility FSAR by reference].

The NRC staff position regarding the determination of AFT/ALT tolerances is as follows:

1. The AFT is a band around the nominal trip setpoint (or the previous as left setting) of the instrument within which the as-found trip point is expected to fall during a technical specification surveillance of the instrument channel. The band accounts for the uncertainties such as instrument reference accuracy, measuring & test equipment (M&TE), readability, normal environmental effect, and drift of the instrument components which are being tested and accounts only for the uncertainty in loop performance occurring under normal conditions throughout the duration of time occurring between successive surveillance tests.
2. The ALT is the band around the Limiting Trip Setpoint (LTSP) or any value which is more conservative than the LTSP (i.e., the nominal trip setpoint, or NTSP) within which the as-left setpoint must fall at the conclusion of a channel test. The band accounts for the ALT which some licensees define as leeway given to instrument technician or calibration tolerance or setting tolerance. The setting tolerance can be based upon

certain uncertainties such as reference accuracy, M&TE, and readability, but the total loop uncertainty analysis must explicitly account for each of these uncertainty terms no matter whether the setting tolerance incorporates these uncertainties or does not. The setting tolerance may also be an arbitrary value selected on the basis of engineering judgment or other consideration.

The GEH TSTF-493 Methodology addresses this guidance in the following manner:

For an instrument loop that consists only of a single device (e.g., a bistable device, such as a pressure switch or differential pressure switch), the “loop” and trip unit surveillance tests are the same. [ ]

The AFT is [ ]  
or the expression:

$$AFT_{TSTF} = (A_C^2 + C_{TSTF}^2 + D^2)^{1/2}, \text{ where:}$$

$A_C$  = Instrument Accuracy

$C_{TSTF}$  = Calibration Error determined using the TSTF-493 methodology, and

$D$  = Instrument Drift

The ALT is the expression:

$$ALT_{TSTF} = (A_C^2 + C_{TSTF}^2)^{1/2}$$

[

$AV$  = Allowable Value

$NTSP_F$  = Final Nominal Setpoint

[

]

]

where:

[

]

The NRC staff finds that the TR NEDE-33633P uses methodologies for establishing ALT and AFT that are either consistent with or more conservative than the methodology recommended within the NRC-approved BWR and PWR Owners Group TSTF-493, Revision 4, and is consistent with the NRC staff's guidance in RIS 2006-17. Hence, licensees implementing the methodology specified in the TR would be in compliance with the requirements and guidance addressed in Section 2.0 of this SE.

### **Conformation to TSTF-493 Notes**

NEDE-33633P states that it is anticipated that a licensee's plant-specific license amendment request "will incorporate similar wording" to that as stated in TSTF-493, Revision 4 notes, consistent with their plant-specific TS requirements. The staff has evaluated this statement and it is the NRC staff's understanding that licensees using NEDE-33633P for plant-specific applications will comply with the specific wording requirements as agreed to by the BWR and PWR Owners Groups as depicted in its submittals of April 23, 2010, "TSTF-493, Revision 4, Clarify Application of Setpoint Methodology for LSSS Functions" (ADAMS Accession No. ML101160026) including the notes to be added to the TS setpoint tables, surveillance notes, and TS Bases sections in a manner consistent with the plant licensing basis.

### **Compatibility with Site Calibration Procedures**

The NEDE 33633P states:

The GEH TSTF-493 methodology for calculating the AFT and ALT [ ] does not require any change to the way the devices are currently calibrated. The GEH TSTF-493 Methodology is compatible with existing plant surveillance procedures for calibration [ ] and is consistent with the guidance in TSTF-493. Licensees implementing the GEH TSTF-493 Methodology only need to ensure that the AFT and ALT in the plant surveillance procedures are consistent with the values calculated using this methodology and that the TS notes are implemented. No other changes to the existing calibration procedures are required.

The NRC staff has evaluated this statement and finds the conditions stipulated as acceptable. The staff notes that in the event that the AFT cannot be accommodated between the existing AV and NTSP, then the NTSP will be adjusted more conservative such that the AFT can be accommodated. Similarly, in the event that the [ ]

cannot be accommodated between the existing AV and NTSP, then the NTSP will be adjusted more conservative such that the [ ] can be accommodated.

### **Application to Other Setpoint Methodologies**

As described above, the methodology for calculating the final NTSP and the AFT and ALT [ ] described in this TR is based on setpoints that are initially calculated by the GEH Instrument Setpoint Methodology described in GE NEDC 31336P-A. However, the methodology can be applied to AV and NTSPF setpoints determined by another NRC-approved setpoint methodology because the formulation for determining the AFTs and ALTs [ ] consists of the statistical combination of the uncertainties consistent with the guidance in TSTF-493, and is not dependent on the methodology used to determine the AV and NTSPF values. Therefore, the setpoint tolerances [ ] determined by the GEH TSTF-493 Methodology can be applied to AV and NTSPF values calculated by other NRC-approved setpoint methodologies.

The NRC staff has evaluated this statement and finds the conditions stipulated are acceptable.

#### **4.0 CONCLUSION**

Based on the findings of Section 3.0 of this SE, the NRC staff concludes that, when properly used for compliance with the TSTF-493 operability determination notes in the plant Technical Specifications and the conditions stipulated in Section 3.0 of this SE, the GEH Topical Report NEDE-33633P can be referenced by licensees to describe the licensee determination of AFT and ALT calculations and the relationship between NTSPs and AVs in a manner consistent with the guidelines of BWR and PWR Owners Group TSTF-493, Revision 4 and the NRC requirements specified in Section 2.0 of this SE.

Attachment: Resolution of Comments Table (Non-Proprietary)

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