# Industry/TSTF Standard Technical Specification Change Traveler

**NIS Power Range Channel Daily SR TS Change to Address Low Power Decalibration**

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

Classification: 1) Technical Change

Recommended for CLIIP?: No

Priority: 2)Medium

Simple or Complex Change: Complex

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## 1.0 Description

When operating above 15% Rated Thermal Power (RTP), the ISTS (NUREG-1431) Nuclear Instrumentation System (NIS) Power Range daily Surveillance Requirement requires the adjustment of the Power Range channel(s) when the absolute difference between Power Range indicated power and secondary side calorimetric power is greater than 2% RTP. Compliance with this Technical Specifications requirement may result in a non-conservative channel calibration during reduced power operations. The proposed change will resolve this undesirable condition by requiring adjustment of the NIS Power Range channel(s) only when the calorimetric heat balance calculated power is greater than the Power Range indicated power by + 2%.

See Attached Document for Justification.

## Revision History

### OG Revision 0 Revision Status: Closed

Revision Proposed by: Farley

Revision Description:
Original Issue

#### Owners Group Review Information

Date Originated by OG: 01-Dec-98

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 01-Aug-00

#### TSTF Review Information

TSTF Received Date: 01-Aug-00 Date Distributed for Review

OG Review Completed: ☐ BWOG ☑ WOG ☐ CEOG ☐ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Superceeded Date: 29-Nov-00

### OG Revision 1 Revision Status: Closed

## OG Revision 1 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
At the 11/29/00 MERITS Working Group meeting, additional changes were made to the wording of Note 1 to SR 3.3.1.2. Based on these wording changes, the Bases were modified and the evaluation modified. In addition, the justification was expanded to provide Safety Evaluation quality information.

### Owners Group Review Information

Date Originated by OG: 29-Nov-00

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 29-Nov-00

### TSTF Review Information

TSTF Received Date: 05-Dec-00 Date Distributed for Review 12-Dec-00

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

TSTF Comments:

While the problem is applicable to all OGs, the solution is Westinghouse specific. The other OGs will investigate how their OGs are addressing the problem.

TSTF had editorial comments.

TSTF Resolution: Superceeded Date: 18-Jan-01

## OG Revision 2 Revision Status: Closed

Revision Proposed by: WOG

Revision Description:
During TSTF review of WOG 130, Rev. 1, comments were made that since changes are being proposed to SR 3.3.1.2, that the changes should be made such that there is consistency among the NUREGs (i.e., Note 1 relocated to the SR text). This recommendation was provided to the MERITS Core Group and based on 4 responses to make NUREG-1431 consistent with the other NUREGs, Rev. 2 was initiated to relocate the text of Note 1 to SR 3.3.1.2 to the text of the SR. In addition, this necessitated the need to revise SR 3.3.1.3 to move Note 1 to the SR text for consistency. The SRs, TS Bases, and evaluation were modified to support these changes. At the 1/18/01 TSTF meeting, the TSTF approved the proposed changes with N. Clarkson wanting to review the final version. The TSTF indicated that the changes may be applicable to the CEOG and BWROG NUREGs, however, additional evaluation of the issue and proposed changes were necessary. Since the evaluation was specific to Westinghouse plants, the decision was to proceed with the change as a WOG only change. The WOG was assigned as TSTF-371.

### Owners Group Review Information

Date Originated by OG: 01-Feb-01

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 01-Feb-01

## OG Revision 2 Revision Status: Closed

### TSTF Review Information

TSTF Received Date: 12-Feb-01 Date Distributed for Review 12-Feb-01

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

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 14-Feb-01

### NRC Review Information

NRC Received Date: 10-Apr-01

NRC Comments:

10/17/01 - initial telecon discussion regarding 2 questions from the staff. The questions related to (1) specifying in the TS to readjustment of the NIS power range trip setpoints if power is reduced below [70]% RTP, and (2) loss of UFM/leading edge flow meters (not specifically related to TSTF-371).

10/29/01 - e-mail responses to the two questions discussed on 10/17/01

11/7/01 - telecon to discuss the responses provided on 10/29/01. NRC requested additional justification to support not specifying the adjustment in the TSs.

12/12/01 - e-mailed additional justification to C. Schulten

1/24/02 - Telecon (C. Schulten- NRC TS Branch, H. Garg-NRC I&C Branch, T. Attard-NRC Rx Systems, F. Astulewicz-NRC Reactor Systems, S. Wideman-WCNOC, P. Adam-WCNOC, Rx Eng., J. Andrachek-West., R. Tuley-West) - discussion on lowering Rx Trip Setpoints wording in Bases. Agreed to modify the Bases wording provide additional justification.

2/8/02 - TSTF provided draft proposed revision to NRC.

Final Resolution: Superceded by Revision Final Resolution Date: 17-Oct-01

## TSTF Revision 1 Revision Status: Active Next Action: NRC

Revision Proposed by: WOG

Revision Description:
The Bases and Justification were revised to address NRC comments.

### TSTF Review Information

TSTF Received Date: 08-Feb-02 Date Distributed for Review 28-Feb-02

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

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 01-Mar-02

### NRC Review Information

**TSTF Revision 1** **Revision Status: Active** **Next Action: NRC**

NRC Received Date: 04-Mar-02

## Affected Technical Specifications

| | |
|---|---|
| SR 3.3.1.2 | RTS Instrumentation |
| SR 3.3.1.2 Bases | RTS Instrumentation |
| SR 3.3.1.3 | RTS Instrumentation |
| SR 3.3.1.3 Bases | RTS Instrumentation |

## 1.0 Description

When operating above 15% Rated Thermal Power (RTP), the ISTS (NUREG-1431) Nuclear Instrumentation System (NIS) Power Range daily Surveillance Requirement requires the adjustment of the Power Range channel(s) when the absolute difference between Power Range indicated power and secondary side calorimetric power is greater than 2% RTP. Compliance with this Technical Specifications requirement may result in a non-conservative channel calibration during reduced power operations. The proposed change will resolve this undesirable condition by requiring adjustment of the NIS Power Range channel(s) only when the calorimetric heat balance calculated power is greater than the Power Range indicated power by + 2%.

## 2.0 Proposed Change

The proposed Power Range surveillance change impacts Surveillance Requirement (SR) 3.3.1.2 of the ISTS, which states, "Compare results of calorimetric heat balance calculation to Nuclear Instrumentation System (NIS) channel output." SR 3.3.1.2 Note No. 1 states, "Adjust NIS channel if absolute difference is > 2%." SR 3.3.1.2 Note No. 2 states, "Not required to be performed until 24 hours after THERMAL POWER is ≥ 15% RTP." This surveillance is only applicable to RTS Function No. 2.a, Power Range Neutron Flux High (see Table 3.3.1-1).

The proposed change will revise SR 3.3.1.2 to move the contents of Note No. 1 to the SR. The SR is revised to state:

> "Compare results of calorimetric heat balance calculation to power range channel output. Adjust power range channel output if calorimetric heat balance calculation results exceed power range channel output by more than + 2% RTP."

A Bases change is also required. The Bases change provides a summary justification for the surveillance change and clarifies when channel adjustments must be made. Specifically, the first paragraph of Bases SR 3.3.1.2 will be revised as follows:

> "SR 3.3.1.2 compares the calorimetric heat balance calculation to the power range channel output every 24 hours. 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."

The following two paragraphs will be inserted between the first paragraph and the second paragraph of Bases SR 3.3.1.2.

> "If the calorimetric is performed at part power (< [70]% RTP), adjusting the power range channel indication in the increasing power direction will assure a reactor trip below the safety analysis limit (≤ [118]% RTP). Making no adjustment to the power range channel in the decreasing power direction due to a part power calorimetric assures a reactor trip consistent with the safety analyses.
>
> This allowance does not preclude making indicated power adjustments, if desired, when the calorimetric heat balance calculation is less than the power range channel output. To provide close agreement between indicated power and to preserve operating margin, the power range channels are normally adjusted when operating at or near full power during steady-state conditions. However, discretion must be exercised if the power range channel output is adjusted in the decreasing power direction due to a part power calorimetric (< [70]% RTP). This action may introduce a non-conservative bias at higher power levels which may result in an NIS reactor trip above the safety analysis limit ( > [118]% RTP). The cause of the potential non-conservative bias is the decreased accuracy of the calorimetric at reduced power conditions. The primary error contributor to the instrument uncertainty for a secondary side power calorimetric measurement is the feedwater flow measurement, which is typically a ΔP measurement across a feedwater venturi. While the measurement uncertainty remains constant in ΔP as power

decreases, when translated into flow, the uncertainty increases as a square term. Thus a 1% flow error at 100% power can approach a 10% flow error at 30% RTP even though the ΔP error has not changed. An evaluation of extended operation at part power conditions would conclude that it is prudent to administratively adjust the setpoint of the Power Range Neutron Flux - High bistables to ≤ [85]% RTP when: 1) the power range channel output is adjusted in the decreasing power direction due to a part power calorimetric below [70]% RTP; or 2) for a post refueling startup. The evaluation of extended operation at part power conditions would also conclude that the potential need to adjust the indication of the Power Range Neutron Flux in the decreasing power direction is quite small, primarily to address operation in the intermediate range about P-10 (nominally 10% RTP) to allow enabling of the Power Range Neutron Flux - Low setpoint and the Intermediate Range Neutron Flux reactor trips. Before the Power Range Neutron Flux - High bistables are reset to ≤ [109]% RTP, the power range channel calibration must be confirmed based on a calorimetric performed at ≥ [70]% RTP.

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- REVIEWER'S NOTE-

A plant-specific evaluation based on the guidance in Westinghouse Technical Bulletin ESBU-TB-92-14 is required to determine the power level below which power range channel adjustments in a decreasing power direction become a concern. This evaluation must reflect the plant-specific RTS setpoint study. In addition, this evaluation should determine if additional administrative controls are required for Power Range Neutron Flux-High trip setpoint setting changes.

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The second paragraph of Bases SR 3.3.1.2 will be revised for consistency with the surveillance wording changes proposed in the first paragraph. In addition, the Bases information pertaining to the basis for not requiring performance of a secondary power calorimetric measurement until reaching 15% RTP is being changed to reflect the correct licensing basis for Westinghouse PWR's. That is, 15% RTP was chosen as the minimum power level for the NIS Power Range daily surveillance based on the Westinghouse NSSS design basis capability requirement of being able to achieve stable control system operation in the automatic control mode. The revision is as follows.

"The Note clarifies that this Surveillance is required only if reactor power is ≥ 15% RTP and that 12 hours are allowed for performing the first Surveillance after reaching 15% RTP. A power level of 15% RTP is chosen based on plant stability, i.e., automatic rod control capability and turbine generator synchronized to the grid."

The third paragraph of Bases SR 3.3.1.2 will also be revised for consistency with the surveillance wording changes proposed in the first paragraph as follows.

"The Frequency of every 24 hours is adequate. It is based on unit operating experience, considering instrument reliability and operating history data for instrument drift. Together these factors demonstrate that a difference between the calorimetric heat balance calculation and the power range channel output of more than + 2% RTP is not expected in any 24 hour period."

The fourth paragraph of Bases SR 3.3.1.2 will not be revised.

The proposed change also revises SR 3.3.1.3 to move the text of Note 1 to the SR for consistency with the change made in SR 3.3.1.2 for moving Note 1. The SR is revised to state:

"Compare results of the incore detector measurements to Nuclear Instrumentation System (NIS) AFD. Adjust NIS channel if absolute difference is ≥ 3%."

The SR 3.3.1.3 Bases are revised to reflect moving the text of Note 1 to the SR.

## 3.0 Background

Westinghouse Technical Bulletin ESBU-TB-92-14-R1, "Decalibration Effects Of Calorimetric Power Measurements On The NIS High Power Reactor Trip At Power Levels Less Than 70% RTP," dated February 6, 1996, identified potential effects of decalibrating the NIS Power Range channels at part power operation. The decalibration can occur due to the increased uncertainty of the secondary side power calorimetric when performed at part power (less than approximately 70% RTP). When NIS channel indication is reduced to match calculated power, the decalibration results in a non-conservative bias. The proposed change to the Technical Specifications removes the requirement to adjust the NIS Power Range channels when the indicated power is greater than the calorimetric heat balance calculation by an absolute difference of > 2% RTP.

Westinghouse Technical Bulletin 92-14, "Instrumentation Calibration At Reduced Power," dated January 18, 1993, was revised as a result of Westinghouse's review of ABB-CE Infobulletin 94-01, "Potential Nonconservative Treatment Of Power Measurement Uncertainty," dated June 21, 1994. Both bulletins addressed the potential decalibration effects on NIS Power Range indications and reactor trip setpoints due to increased uncertainties associated with secondary side power calorimetric measurements performed at low power levels. After review of the ABB-CE bulletin, Westinghouse determined that further information and clarification would be advisable and issued ESBU-TB-92-14-R1.

The primary error contributor to the instrument uncertainty for a secondary side power calorimetric measurement is the feedwater flow measurement, which is typically a $\Delta P$ measurement across a feedwater venturi. While the measurement uncertainty remains constant in $\Delta P$ as power decreases, when translated into flow, the uncertainty increases as a square term. Thus a 1% flow error at 100% power can approach a 10% flow error at 30% RTP even though the $\Delta P$ error has not changed. ESBU-TB-92-14-R1 depicted how the potential effects of this error increase at lower power levels. In the example presented, for a 10% error in secondary side power calorimetric, the NIS power range could be sufficiently biased in the non-conservative direction to preclude a reactor trip within the assumptions of the safety analyses. Typically, this event is the Rod Withdrawal From 10% RTP.

There are six recommendations in the revised bulletin. Recommendation No. 6 suggests that if the NIS Power Range indicates a higher power than the secondary side power calorimetric measurement at power levels below approximately 70%, the Power Range channel(s) should not be adjusted. This recommendation is in conflict with the Standard Technical Specifications Power Range daily Surveillance Requirement, which requires channel adjustment whenever the absolute difference is > 2% above 15% RTP.

Some plants have identified and implemented interim administrative controls to address this conflict with the Technical Specifications. For long-term resolution, the WOG initiated a program (MUHP-3034) to obtain NRC approval to relax the present Technical Specifications requirements to always adjust NIS channels when indicated power differs from calorimetric heat balance calculated power by more than 2%. This Technical Specification change was submitted by Southern Nuclear Operating Company (SNC) for Farley Units 1 and 2 on November 6, 1998. The NRC approved the proposed change for Farley in License Amendment No. 144 (Unit 1)/135 (Unit 2), dated October 1, 1999.

## 4.0 Technical Analysis

### Operational and Safety Analysis Considerations

When gain adjustments are performed on a power escalation, the NIS Power Range daily surveillance results in the NIS channel reflecting the calorimetric heat balance calculation with increasing accuracy up to approximately 100% RTP. When gain adjustments are performed at steady-state 100% RTP conditions, the NIS Power Range daily surveillance will adjust the Power Range channel for variations in indicated power due to changes in core power distributions with increasing burnup.

Normally, adjustment of the NIS channel output in the decreasing power direction will be performed for operational

reasons, such as, when operating at 100% RTP to restore operational margin to trip. Another example is when decreasing power and approaching Permissive P-10 reset (which automatically reinstates the Power Range High Neutron Flux Low setpoint reactor trip) and there is a mismatch between NIS Power Range and NIS Intermediate Range indicated power levels. Adjustment of NIS channel output in the decreasing power direction to more closely match the calorimetric heat balance calculation may result in a closer agreement between the NIS Power Range and Intermediate Range channels, thus decreasing the possibility of an adverse interaction.

To ensure that the Power Range High Neutron Flux High setpoint reactor trip signal will be generated prior to the safety analysis limit of 118% RTP, should operating conditions require that indicated power be decreased to match calorimetric heat balance calculated power based on data obtained below [70]% RTP, plant operating procedures will continue to specify that the Power Range High Neutron Flux High reactor trip setpoint be reduced to ≤ [85]% RTP on all channels. The proposed ITS Bases change includes this administrative control requirement.

An evaluation of scenarios of extended part power operation concluded that the probability of the need to adjust the NIS Power Range indicated power in the decreasing power direction is quite small. In fact only one scenario clearly requires the adjustment and it involves several atypical conditions be present at the same time. Several plausible extended part power operation scenarios were evaluated and it was determined that adjustment of the NIS Power Range indicated power in the decreasing power direction is not required. For example, on loss of a feedwater heater, the plant could be required to reduce power but if the NIS Power Range indicated power was greater than the calorimetric power, there would be sufficient margin to the full power trip setpoint such that even with a five or ten percent differential between the two measurements, there would be no explicit need to adjust the NIS Power Range in the decreasing power direction.

The only scenario that has an explicit need is part power operation in the P-10 power region. Under normal circumstances operation in that power range would be expected as a transitory condition, i.e., startup or controlled shutdown. However, it is possible that for some unforeseen reason, the plant decreases power to approximately 10% RTP as indicated by the secondary side calorimetric measurement and the NIS Intermediate Range channels, but the NIS Power Range channels indicate significantly above 10% RTP. In this set of circumstances, it would be advantageous to adjust the NIS Power Range channels to match the secondary side calorimetric such that P-10 could be reset and the NIS Power Range - Low setpoint and NIS Intermediate Range reactor trips could be enabled. At that low power level, it would be more conservative to rely on the 25 - 35% RTP trip setpoints of these two low power functions rather than the 109% RTP trip setpoint of the NIS Power Range - High function. Under these circumstances, it would be prudent to administratively adjust the NIS Power Range - High trip setpoint to < [85]% RTP to address any decalibrating aspects associated with the adjustment in the decreasing power direction. This would allow the plant to operate in a conservative mode at or below 10% RTP and on the return to power above 10% RTP until the NIS Power Range could be normalized with a calorimetric performed at ≥ [70]% RTP. As noted, this is envisioned as an infrequent scenario and thus the administrative control of the NIS Power Range - High setpoint is considered prudent and sufficient.

**Analysis**

The purpose of this analysis is to assess the impact of the proposed NIS Power Range surveillance change on the licensing basis and demonstrate that the change will not adversely affect the subsequent safe operation of the plant.

NIS Power Range Indication and RTS Functions

When operating above 15% RTP, each Power Range channel is normalized (i.e., calibrated) daily to match the thermal power calculation results based on the secondary heat balance (i.e., calorimetric). The calibration is accomplished by adjusting the gain of each channel summing amplifier, such that the NIS channel output matches the calorimetric heat balance calculated power. The amplifier output (0% to 120% RTP) provides the input signals to the associated channel reactor trip, permissive and control interlock bistables, and the associated power indicators. Therefore, the proposed change to the NIS Power Range daily surveillance potentially impacts the Power Range indications, RTS functions, control system functions, and miscellaneous alarm functions. These functions include: High Flux High Setpoint, High Flux Low Setpoint, High Positive Rate and High Negative Rate Reactor Trips; Permissives P-8, P-9 and P-10; Control

Interlock C-2 (i.e., Power Range High Flux Rod Stop); automatic Reactor Control System nuclear power input; and Power Range Channel Deviation, Quadrant Power Tilt Ratio, and [N-16 Leakage Detection System alarms].

Reactor power is monitored by the plant operators to ensure that the unit is operated within the limits of the Facility Operating License and safety analyses. The revision to the criteria for implementation of the daily surveillance will have a conservative effect on the Power Range channel indication (i.e., indicated power will be greater than actual power). With regard to the core safety limits, reactor power is one of four operating parameters with uncertainties explicitly used in the [Revised Thermal Design Procedure (RTDP)]. The [RTDP] and safety analyses assume a reactor power uncertainty of
[± 2%] RTP. Plant-specific calculations presented in [the plant specific instrument uncertainty calculations or setpoint study] demonstrate that the secondary side power calorimetric measurement uncertainty at full power conditions is less than the [RTDP] assumption. Since the uncertainty calculation is not invalidated by the proposed Power Range surveillance method change, the [RTDP] and safety analyses reactor power uncertainty assumption of [± 2%] RTP continues to be a bounding allowance for the core safety limits and safety analyses. Therefore, the NIS Power Range indications are not adversely impacted by the proposed change.

The calculation assumptions associated with the methodology used to calculate the RTS Trip setpoints account for the daily Power Range calibration specified by the Technical Specifications. The setpoint uncertainty calculations demonstrate conservative margin between the associated Technical Specifications nominal trip setpoints and, when applicable, the corresponding safety analysis limits. Since the daily calibration will continue to be performed and the maximum non-conservative error (i.e., when NIS channel output is less than calorimetric heat balance calculated power) will be ≤ 2% RTP, the Power Range setpoint calculations, setpoints, and applicable safety analysis limits are not affected by the surveillance change. With respect to the Power Range High Positive Rate and High Negative Rate Reactor Trips, these trip functions are generated by time-delay relative-comparison circuits. As such, the NIS Power Range rate trips are not affected by the proposed change. One potential non-conservative impact on the NIS RTS functions is evaluated herein. If the channel indication is greater than the calorimetric heat balance calculated power during a unit shutdown, the proposed change could delay the reset of Permissive P-10. Reset of P-10 (≈ 8% RTP) is required to enable the Power Range High Neutron Flux Low setpoint and IR High Neutron Flux reactor trips, which afford reactor protection for uncontrolled reactivity excursions from subcritical and low power (i.e., < 10% RTP). It is unlikely that a subcritical condition would be achieved before P-10 would reset. Nevertheless, if NIS channel output is greater than calorimetric heat balance calculated power by a sufficient magnitude (resulting in subcriticality without P-10 reset), the time duration until P-10 reset would be very short. During this brief time interval, the Power Range High Neutron Flux High setpoint reactor trip would provide core protection, as demonstrated by event specific analyses. Based on an analysis of a Westinghouse 3 loop plant and evaluation of 2 loop and 4 loop plants, the proposed scenario is less limiting than the conditions currently considered and bounded by existing FSAR Rod Withdrawal from Subcritical and Hot Zero Power rod ejection analyses. This evaluation is applicable to any Westinghouse PWR that has plant Technical Specifications requiring all reactor coolant pumps to be in operation in MODES 1 and 2, and the current licensing basis Rod Withdrawal from Subcritical and Hot Zero Power rod ejection analyses bound lower MODES of operation by specifically assuming only one of two RCPs are in operation for a 2-loop plant, two of three RCPs are in operation for a 3-loop plant, and two of four RCPs are in operation for a 4 loop plant. Diverse protection is also afforded by the Power Range High Positive Rate, OTΔT and OPΔT reactor trips. Therefore, the Power Range RTS functions are not adversely affected by the proposed change.

The Power Range input functions to the Reactor Control System are: Control Interlock C-2 (i.e., Power Range High Flux Rod Stop), which blocks automatic and manual control rod withdrawal; and the nuclear power input signal to the power mismatch circuits associated with automatic reactor coolant system temperature control. These are control system functions that are not required for safety [FSAR Chapter 7.7]. Nevertheless, the proposed Power Range surveillance change continues to limit the maximum allowed non-conservative calibration error; therefore, the change will not adversely impact the NIS Power Range control system functions.

Miscellaneous alarm functions also use input signals from the NIS Power Range channel(s). The functions are: Power Range Channel Deviation; Quadrant Power Tilt Ratio (QPTR); and [N-16 Leakage Detection System]. The Channel

Deviation and QPTR alarms are generated by comparison of the Power Range channel output signals. In that these are relative comparisons between channels, these alarm functions are not adversely affected by the proposed daily calibration change.

[The N-16 Leakage Detection System associated with the steam line radiation monitors may be impacted by the proposed change since the proposed calibration change allows NIS channel output to be greater than calorimetric heat balance calculated power. When greater than 20% power, the N-16 Leakage Detection System provides a continuous trend of the estimated "power-corrected" primary-to-secondary leak rate, and it generates control room alarms if the leak rate increases above three threshold levels (alert, high, high-high). The nuclear power signal is provided from a NIS Power Range channel. A potential non-conservative impact on the leakage detection system is acceptable based on the following.

1. The N-16 Leakage Detection System is a non-safety-related indication system that is considered to be an operational aid.

2. Other radiation monitors, such as the air ejector and steam generator blowdown monitors, provide diverse continuous primary-to-secondary leakage indication.

3. Reactor Coolant System leakage is periodically monitored by performance of the surveillance tests required by the Technical Specifications.

4. Actual primary-to-secondary leak rates are determined by radiochemistry analysis in accordance with plant procedures.

5. Normally, when operating at or near full power, the NIS Power Range channel will be adjusted on a daily basis to match NIS channel output with calorimetric heat balance calculated power. This plant practice results in the optimum channel calibration.]

<u>LOCA and LOCA-Related Analyses</u>

The following LOCA and LOCA-related analyses are not adversely affected by the proposed modification of NIS Power Range daily surveillance: large and small break LOCA; reactor vessel and loop LOCA blowdown forces; post-LOCA long term core cooling subcriticality; post-LOCA long term core cooling minimum flow; and hot leg switchover to prevent boron precipitation. The proposed modification does not effect the normal plant operating parameters, the safeguards systems actuation or accident mitigation capabilities important to LOCA mitigation, or the assumptions used in the LOCA-related accidents. The surveillance change does not create conditions more limiting than those assumed in these analyses. In addition, the proposed modification does not affect the Steam Generator Tube Rupture (SGTR) analysis methodology or assumptions, and it does not alter the SGTR event analysis results.

<u>Non-LOCA Related Analyses</u>

The non-LOCA safety analyses presented in Chapter 15 of the FSAR are not adversely affected by the proposed NIS Power Range surveillance modification. This modification does not affect normal plant operating parameters, accident mitigation capabilities, the assumptions used in the non-LOCA transients, or create conditions more limiting than those enveloped by the current non-LOCA analyses. Therefore, the conclusions presented in the FSAR remain valid.

<u>Mechanical Components and Systems</u>

The surveillance modification as described does not affect the reactor coolant system component integrity or the ability of the system to perform its intended safety function. The modification as described does not affect the integrity of a plant auxiliary fluid system or the ability of the auxiliary systems to perform their design functions.

I&C Protection and Control Systems

With the specific exception of the NIS Power Range reactor trip and indication functions, the proposed NIS Power Range daily surveillance change does not directly or indirectly involve additional electrical systems, components, or instrumentation considerations. Direct effects as well as indirect effects on equipment important to safety have been considered. Indirect effects include conditions or activities which involve non-safety-related electrical equipment which may affect Class 1E, PAMS, or plant control electrical equipment. Consideration has been given to seismic and environmental qualification, design and performance criteria per IEEE standards, functional requirements, and plant Technical Specifications.

The proposed change does not affect the plant normal operating design transients, margin to trip analysis, or low temperature overpressure protection system.

An evaluation herein determined that the proposed surveillance modification will ensure the performance of the NIS Power High Neutron Flux High setpoint reactor trip function consistent with the safety analysis assumptions. Deletion of the requirement to adjust the NIS Power Range channel(s) when NIS channel output is greater than calorimetric heat balance calculated power allows the channel(s) to not be adjusted in the non-conservative direction at part power. This allowance prevents the introduction of an error that has not been accounted for in the setpoint uncertainty calculations and the safety analyses associated with the NIS Power Range High Neutron Flux High setpoint reactor trip function. If NIS channel output is decreased to match a part power calorimetric performed below [70]% RTP, plant administrative controls ensure the Power Range High Neutron Flux High setpoint is reduced to ≤ [85]% RTP. Thus, the proposed modification does not have a potential for identification of an unreviewed safety question as it would relate to the safety-related function of I&C systems.

RTS and ESFAS Setpoints

With the specific exception of the NIS Power Range indication and reactor trip functions, the proposed modification to the Power Range daily surveillance, does not affect the Reactor Trip System (RTS) or the Engineered Safety Feature Actuation System (ESFAS) setpoints. This proposed modification does not change the current trip setpoints or instrument operability requirements identified in the Technical Specifications. The modification should ensure the operability of the NIS Power Range reactor trip at part power conditions after normalization at 100% RTP conditions consistent with the safety analysis assumptions. Therefore, the proposed modification has no effect on the RTS and ESFAS safety functions.

Other Safety-Related Areas and Analyses

The following safety-related areas and analyses are not affected by the proposed surveillance modification: Containment Integrity Analyses (Short Term/Long Term LOCA Release); Main Steamline Break (MSLB) Mass and Energy Release; Radiological Analyses; Probabilistic Risk Assessment; and Emergency Response Procedures.

The proposed Technical Specifications change modifies the Power Range daily Surveillance Requirement by only requiring a calibration adjustment when Power Range indicated power is less than the calculated secondary calorimetric power by > 2% RTP. The detailed analysis presented herein assessed the potential impact of the proposed daily surveillance change on applicable safety analyses and NIS Power Range indications, RTS functions, and control system functions. The assessments demonstrated that the change will not adversely affect the design basis safety analyses, Power Range functions, or the subsequent safe operation of the plant.

## 5.0 Regulatory Analysis

### 5.1 No Significant Hazards Consideration

The proposed change to the ISTS will revise SR 3.3.1.2 to move the contents of Note 1 to the SR and to revise the SR to state: "Compare results of calorimetric heat balance calculation to power range channel output. Adjust power range channel output if calorimetric heat balance calculation results exceed power range channel output by more than + 2 % RTP." Associated Bases changes provide a summary justification for the surveillance change and clarify when channel adjustments must be made. These changes are made to address potential effects of decalibrating the NIS Power Range channels at part power operation identified in Westinghouse Technical Bulletin ESBU-TB-92-14-R1, "Decalibration Effects of Calorimetric Power Measurements On the NIS High Power Reactor Trip At Power Levels Less Than 70 % RTP." Moving the contents of Note 1 in SR 3.3.1.2 and specifying the power range channel provides for consistency with the other Owners Group NUREGs. SR 3.3.13 is also revised to move the test of Note 1 to the SR for consistency. Associated SR 3.3.1.3 Bases changes are made to reflect the relocation of Note 1.

When operating above 15% RTP, each Power Range channel is normalized (i.e., calibrated) daily to match the thermal power calculation results based on the secondary heat balance (i.e., calorimetric). The calibration is accomplished by adjusting the gain of each channel summing amplifier, such that the NIS channel output matches the calorimetric heat balance calculated power. The amplifier output (0% to 120% RTP) provides the input signals to the associated channel reactor trip, permissive and control interlock bistables and the associated power level indications. Therefore, the proposed change to the NIS Power Range daily surveillance potentially impacts the Power Range indications, RTS functions, control system functions, and miscellaneous alarm functions. These functions include: High Flux High Setpoint, High Flux Low Setpoint, High Positive Rate, and High Negative Rate Reactor Trips; Permissives P-8, P-9 and P-10; Control Interlock C-2 (i.e., Power Range High Flux Rod Stop); automatic Reactor Control System nuclear power input; and Power Range Channel Deviation, Quadrant Power Tilt Ratio, and [N-16 Leakage Detection System alarms].

The detailed analysis presented above assessed the potential impact of the proposed daily surveillance change on applicable [Plant] safety analyses and NIS Power Range indications, RTS functions, and control system functions. The analysis also assessed the potential impact on the Power Range High Neutron Flux High Setpoint reactor trip function and the associated safety analysis limit when channel adjustments are made during specific operating conditions. The assessments demonstrated that the proposed ISTS changes will not adversely affect the design basis safety analyses, NIS Power Range safety functions, or the subsequent safe operation of the plant.

In accordance with the criteria set forth in 10 CFR 50.92, the Industry has evaluated the proposed Improved Standard Technical Specification changes and determined they do not represent a significant hazards consideration. The following is provided in support of this conclusion.

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

   Response: No

   The proposed surveillance change does not significantly increase the probability or consequences of an accident previously evaluated in the FSAR. This modification does not directly initiate an accident. The consequences of accidents previously evaluated in the FSAR are not adversely affected by this proposed change because the change to the NIS Power Range channel adjustment requirement ensures the conservative response of the channel even at part power levels.

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

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

   Response: No

   The proposed surveillance change does not create the possibility of a new or different kind of accident than any accident already evaluated in the FSAR. No new accident scenarios, failure mechanisms, or limiting single failures are introduced as a result of the proposed change. The proposed Technical Specifications change does not challenge the performance or integrity of any safety-related systems.

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

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

   Response: No

   The proposed surveillance change does not involve a significant reduction in a margin of safety. The proposed change does require a revision to the criterion for implementation of Power Range channel adjustment based on secondary power calorimetric calculation; however, the change does not eliminate any RTS surveillances or alter the frequency of surveillances required by the Technical Specifications. The revision to the criterion for implementation of the daily surveillance will have a conservative effect on the performance of the NIS Power Range channel, particularly at part power after normalization at 100% RTP conditions. The nominal trip setpoints specified by the Technical Specifications and the safety analysis limits assumed in the transient and accident analysis are unchanged. The margin of safety associated with the acceptance criteria for any accident is unchanged.

   Therefore, the proposed change will not significantly reduce the margin of safety as defined in the Technical Specifications.

Based on the preceding information, it has been determined that the proposed change to the NIS Power Range daily surveillance requirement does not involve a significant hazards consideration as defined in 10 CFR 50.92 (c).

## 5.2 Applicable Regulatory Requirements/Criteria

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 approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

## 6.0 Environmental Consideration

A review has determined that the proposed change 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 change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change 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 change.

**7.0 References**

1. Joseph M. Farley License Amendment No. 144 (Unit 1)/135 (Unit 2), dated October 1, 1999.

**BASES INSERTS**

**INSERT 1**

The power range channel output shall be adjusted consistent with the calorimetric heat balance calculation results if the calorimetric calculation exceed the power range channel output by more than + 2% RTP.

**INSERT 2**

If the calorimetric is performed at part power (< [70]% RTP), adjusting the power range channel indication in the increasing power direction will assure a reactor trip below the safety analysis limit (< [118]% RTP). Making no adjustment to the power range channel in the decreasing power direction due to a part power calorimetric assures a reactor trip consistent with the safety analyses.

**INSERT 3**

This allowance does not preclude making indicated power adjustments, if desired, when the calorimetric heat balance calculation is less than the power range channel output. To provide close agreement between indicated power and to preserve operating margin, the power range channels are normally adjusted when operating at or near full power during steady-state conditions. However, discretion must be exercised if the power range channel output is adjusted in the decreasing power direction due to a part power calorimetric (< [70]% RTP). This action may introduce a non-conservative bias at higher power levels which may result in an NIS reactor trip above the safety analysis limit ( > [118]% RTP). The cause of the potential non-conservative bias is the decreased accuracy of the calorimetric at reduced power conditions. The primary error contributor to the instrument uncertainty for a secondary side power calorimetric measurement is the feedwater flow measurement, which is typically a ΔP measurement across a feedwater venturi. While the measurement uncertainty remains constant in ΔP as power decreases, when translated into flow, the uncertainty increases as a square term. Thus a 1% flow error at 100% power can approach a 10% flow error at 30% RTP even though the ΔP error has not changed. An evaluation of extended operation at part power conditions would conclude that it is prudent to administratively adjust the setpoint of the Power Range Neutron Flux - High bistables to ≤ [85]% RTP when: 1) the power range channel output is adjusted in the decreasing power direction due to a part power calorimetric below [70]% RTP; or 2) for a post refueling startup. The evaluation of extended operation at part power conditions would also conclude that the potential need to adjust the indication of the Power Range Neutron Flux in the decreasing power direction is quite small, primarily to address operation in the intermediate range about P-10 (nominally 10% RTP) to allow enabling of the Power Range Neutron Flux - Low setpoint and the Intermediate Range Neutron Flux reactor trips. Before the Power Range Neutron Flux - High bistables are reset to ≤ [109]% RTP, the power range channel calibration must be confirmed based on a calorimetric performed at ≥ [70]% RTP.

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- REVIEWER'S NOTE-

A plant-specific evaluation based on the guidance in Westinghouse Technical Bulletin ESBU-TB-92-14 is required to determine the power level below which power range channel adjustments in a decreasing power direction become a concern. This evaluation must reflect the plant-specific RTS setpoint study. In addition, this evaluation should determine if additional administrative controls are required for Power Range Neutron Flux-High trip setpoint setting changes.

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**INSERT 4**

A power level of 15% RTP is chosen based on plant stability, i.e., automatic rod control capability and turbine generator synchronized to the grid.

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.3.1.2 | - NOTES -<br>1. Adjust NIS channel if absolute difference is > 2%.<br>2. Not required to be performed until [12] hours after THERMAL POWER is ≥ 15% RTP.<br><br>Compare results of calorimetric heat balance calculation to Nuclear Instrumentation System (NIS) channel output.<br>Insert 1 | 24 hours |
| SR 3.3.1.3 | - NOTES -<br>1. Adjust NIS channel if absolute difference is ≥ 3%.<br>2. Not required to be performed until [24] hours after THERMAL POWER is ≥ [15]% RTP.<br><br>Compare results of the incore detector measurements to NIS AFD.<br>Nuclear Instrumentation System (NIS) | 31 effective full power days (EFPD) |
| SR 3.3.1.4 | - NOTE -<br>This Surveillance must be performed on the reactor trip bypass breaker prior to placing the bypass breaker in service.<br><br>Perform TADOT. | 31 days on a STAGGERED TEST BASIS |
| SR 3.3.1.5 | Perform ACTUATION LOGIC TEST. | 31 days on a STAGGERED TEST BASIS |

BASES

SURVEILLANCE REQUIREMENTS (continued)

in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Frequency is based on operating experience that demonstrates channel failure is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the LCO required channels.

SR 3.3.1.2

SR 3.3.1.2 compares the calorimetric heat balance calculation to the NIS channel output every 24 hours. If the calorimetric exceeds the NIS channel output by > 2% RTP, the NIS is not declared inoperable, but must be adjusted. If the NIS channel output cannot be properly adjusted, the channel is declared inoperable.

Two Notes modify SR 3.3.1.2. The first Note indicates that the NIS channel output shall be adjusted consistent with the calorimetric results if the absolute difference between the NIS channel output and the calorimetric is > 2% RTP. The second Note clarifies that this Surveillance is required only if reactor power is ≥ 15% RTP and that 12 hours is allowed for performing the first Surveillance after reaching 15% RTP. At lower power levels, calorimetric data are inaccurate.

The Frequency of every 24 hours is adequate. It is based on unit operating experience, considering instrument reliability and operating history data for instrument drift. Together these factors demonstrate the change in the absolute difference between NIS and heat balance calculated powers rarely exceeds 2% in any 24 hours period.

In addition, control room operators periodically monitor redundant indications and alarms to detect deviations in channel outputs.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.3

SR 3.3.1.3 compares the incore system to the NIS channel output every 31 EFPD. If the absolute difference is ≥ 3%, the NIS channel is still OPERABLE, but must be readjusted.

If the NIS channel cannot be properly readjusted, the channel is declared inoperable. This Surveillance is performed to verify the f(ΔI) input to the overtemperature ΔT Function.

Two Notes modify SR 3.3.1.3. Note 1 indicates that the excore NIS channel shall be adjusted if the absolute difference between the incore and excore AFD is ≥ 3%. Note 2 clarifies that the Surveillance is required only if reactor power is ≥ [15%] RTP and that 24 hours is allowed for performing the first Surveillance after reaching [15%] RTP. A Note

The Frequency of every 31 EFPD is adequate. It is based on unit operating experience, considering instrument reliability and operating history data for instrument drift. Also, the slow changes in neutron flux during the fuel cycle can be detected during this interval.

SR 3.3.1.4

SR 3.3.1.4 is the performance of a TADOT every 31 days on a STAGGERED TEST BASIS. This test shall verify OPERABILITY by actuation of the end devices. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The RTB test shall include separate verification of the undervoltage and shunt trip mechanisms. Independent verification of RTB undervoltage and shunt trip Function is not required for the bypass breakers. No capability is provided for performing such a test at power. The independent test for bypass breakers is included in SR 3.3.1.14. The bypass breaker test shall include a local shunt trip. A Note has been added to indicate that this test must be performed on the bypass breaker prior to placing it in service.