Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

August 18, 2004

TVA-SQN-TS-02-01, Revision 1 10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-327
Tennessee Valley Authority	)	50-328

SEQUOYAH NUCLEAR PLANT (SQN) - UNITS 1 AND 2 - TECHNICAL SPECIFICATION (TS) CHANGE NO. 02-01, REVISION 1 - NOMINAL TRIP SETPOINTS FOR REACTOR PROTECTION SYSTEM (RPS) AND ENGINEERED SAFETY FEATURES (ESF) INSTRUMENTATION

Reference: TVA letter to NRC dated November 15, 2002, "Sequoyah Nuclear Plant (SQN) - Units 1 and 2 - Technical Specification (TS) Change No. 02-01 - Nominal Trip Setpoints for Reactor Protection System (RPS) and Engineered Safety Features (ESF) Instrumentation and Relocation of Loss of Power and Radiation Monitoring Instrumentation Requirements"

In accordance with the provisions of 10 CFR 50.90, TVA is submitting a request for an amendment to SQN's licenses DPR-77 and 79 to change the TSs for Units 1 and 2. The proposed change is a revision to the referenced request that supercedes the original request in its entirety. The proposed change will revise the trip setpoint column of the RPS and ESF instrumentation tables to utilize a nominal setpoint value and revise the associated Bases discussions.

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The column will be relabeled "Nominal Trip Setpoint" with the inequalities removed from applicable values. The term "trip setpoint" has been evaluated throughout the TSs and has been revised to "nominal trip setpoint" as necessary and the use of the term "nominal" has been eliminated as appropriate. This change is being requested in response to NRC concerns regarding the use of inequalities for RPS and ESF nominal trip setpoint values. This concern was identified in NRC Inspection Report Nos. 50-327 and 50-328/95-26. This change is also consistent with NRC proposed and approved Technical Specification Task Force (TSTF) Item TSTF-355. This revised request does not implement the TSTF-355 recommendation for one ESF radiation monitoring instrumentation function.

Revisions are being made to the RPS underfrequency reactor coolant pump (RCP) nominal trip setpoint and allowable value, the RPS undervoltage RCP allowable value, and the fuel storage pool area radiation monitor trip setpoint to correct a non-conformance. The intermediate range neutron flux P-6 nominal trip setpoint and allowable value is being revised to improve the adequacy of this setpoint with respect to the nominal setpoint application. Also included is a reduction in the number of timers required for loss of power instrumentation functions.

TVA has determined that there are no significant hazards considerations associated with the proposed change and that the change is exempt from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). The SQN Plant Operations Review Committee and the SQN Nuclear Safety Review Board have reviewed this proposed change and determined that operation of SQN Units 1 and 2 in accordance with the proposed change will not endanger the health and safety of the public. Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and attachments to the Tennessee State Department of Public Health.

Enclosure 1 to this letter provides the description and evaluation of the proposed change. This includes TVA's determination that the proposed change does not involve a significant hazards consideration, and is exempt from environmental review. Enclosure 2 contains copies of the appropriate TS pages from Units 1 and 2 marked-up to show the proposed change.

There are no new regulatory commitments being made by this submittal. TVA does not have any specific schedule requirements for this request and processing can be pursued as necessary. TVA requests that the revised TS be made effective within 45 days of NRC approval. If you have any questions about this change, please telephone me at (423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

for

Pedro Salas
Licensing and Industry Affairs Manager

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 18th day of August, 2004.

Enclosures
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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 and 2
DOCKET NOS. 327 AND 328

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE 02-01, REVISION 1
DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE

I. DESCRIPTION OF THE PROPOSED CHANGE

The proposed TS change will rename the Trip Setpoint column of TS Tables 2.2-1 and 3.3-4, remove the inequality signs for the trip setpoint values as appropriate, and revise the inequality representation for the allowable values (Avs) as needed. The new title for the Trip Setpoint column will be Nominal Trip Setpoint. Bases discussions clarify operable conditions for the functions and prescribe conditions where the setpoints may be set more conservatively. There is one exception to this nominal trip setpoint implementation. This is the trip setpoint for TS Table 3.3-4, Item 3.c.3, "Containment Purge Air Exhaust Monitor Radioactivity-High," where the inequality will be retained. This revision also includes the revision of other locations in the TSs that currently use the term "trip setpoint" and need to be changed to "nominal trip setpoint" to be consistent with the table title. The term "nominal" will be removed from the average temperature at rated thermal power (T′) definition in Table 2.2-1, Note 1.

The current trip setpoints will now be represented by a nominal value that will not include an inequality sign. This change does not alter the value of the trip setpoint except as noted below. Avs that are currently represented with a numerical value and a tolerance expressed as a plus or minus, are revised to utilize a representation with inequalities that retains the current limits.

Additional changes are proposed to the TS instrumentation tables that involve the revision of three trip setpoints, three Avs, and required minimum channels operable. Specifically, the nominal trip setpoint for the reactor coolant pump (RCP) underfrequency reactor trip in TS Table 2.2-1 has been changed from 56.0 Hertz (Hz) to 57.0 Hz. The Avs for the RCP underfrequency and undervoltage function in TS Table 2.2-1 have been revised. The underfrequency value has been changed from greater than or equal to 55.9 Hz to greater than or equal to 56.3 Hz. The undervoltage Av has been changed from greater than or equal to 4739 volts to greater than or equal to 4952 volts. The intermediate range neutron flux P-6 nominal trip setpoint in TS Table 2.2-1 will be revised from 1×10^{-5} percent of rated thermal power (RTP) to 1×10^{-4} percent RTP. The P-6 allowable value changes from 6×10^{-6} percent RTP to 6×10^{-5} percent RTP. The fuel storage pool area monitor alarm/trip setpoint in TS Table 3.3-6 has been changed from less than or equal to 200 milli roentgen equivalent man (mR) per hour (hr) to less than or equal to 151 mR/hr.

The required minimum channels operable for the auxiliary feedwater (AFW) and emergency diesel generator (EDG) loss of power start timers in TS Table 3.3-3 have been revised from 2 per shutdown board to 1 per shutdown board. This revision also modifies Actions 34 and 35 of TS Table 3.3-3 to accommodate this revision to the required channels.

II. REASON FOR THE PROPOSED CHANGE

This revision of the trip setpoint phrase and column title, the trip setpoint inequality signs, the Av inequality representation, the term "nominal" for limiting values, and the Bases, is being proposed to support a request by NRC that TVA discontinue the use of inequalities for representing nominal trip setpoint values. This request is the result of representing setpoints that are intended to be a nominal value, with margin above and below the value, and implying that they are limits by utilizing inequality signs. This change is similar to TS changes that have been approved for the Vogtle Electric Generating Plant and Millstone Nuclear Power Station, Unit No. 3, and the initial TSs for the Watts Bar Nuclear Plant. In addition, this change is consistent with the NRC approved Technical Specification Task Force (TSTF) Item TSTF-355. The one exception to the elimination of the inequalities for trip setpoints described above is the containment purge air exhaust monitor radioactivity high value in TS Table 3.3-4 and is the result of current SQN TS configuration. Implementation of the nominal setpoint philosophy for this radiation monitor is not being requested to allow TVA to continue to set this function at a more conservative value. TVA is processing an additional TS change request to move this function from the engineered safety features

(ESF) requirements to a new specification consistent with the standard TSs that retains the inequality for these types of setpoints. Therefore, the retention of this inequality is reasonable based on the standard TS requirements and how they apply to radiation monitor functions. Avs that utilize a plus and minus representation are revised to an inequality representation to be consistent with the philosophy that Avs are limits and should utilize inequalities to properly indicate the limits.

The RCP underfrequency setpoint was revised to support the accuracy of currently installed instrumentation. The underfrequency instrumentation setpoint was modified without identifying the need to revise the associated TS requirements because the new setpoint complied with the existing setpoint inequality in the TS. This error has been evaluated in accordance with the SQN Corrective Action Program. The Av was revised in accordance with the setpoint methodology as required for the associated setpoint change. This provides a more appropriate value that supports the safety limit for this function. These changes have been conservatively applied in the plant and are consistent with current TS requirements.

In addition, the Av for the RCP undervoltage function has been revised to incorporate the required method for evaluating this function. The current Av is based on the TVA setpoint methodology. TVA's position is to use the Westinghouse Electric Company setpoint methodology for instrumentation functions that were originally included in the Westinghouse setpoint analysis for SQN. Since this function meets this criteria, TVA is revising the Av to a value consistent with the Westinghouse methodology. TVA evaluated the use of the TVA methodology in accordance with the Corrective Action Program because of procedural requirements that were not met for this protection function. This evaluation identified one other function that did not utilize the appropriate setpoint methodology for a portion of the analysis. The correction of this error did not result in any change to the setpoint or the Av.

The trip setpoint and allowable value for the intermediate range neutron flux P-6 is proposed to be changed to provide a value that supports plant operation and will be consistent with the nominal trip setpoint methodology. SQN replaced the intermediate range channels in 1990 and revised the measurement parameters from amperes to percent

RTP. This change revised the TS requirements through Amendments 136 and 129 for SQN Units 1 and 2, respectively, to indicate the use of percent RTP. The RTP value chosen at that time was the best estimate available; however, following operating experience, it was discovered that it was not the optimum choice. Achieving the P-6 value during start-up allows the trips provided by the source range to be blocked. If this allowance occurs too early in the start-up evolution, the source range could be blocked prior to sensitive criticality events where the source range function is useful. If the source range is not blocked when P-6 is achieved, to allow use during criticality, it would result in a feature that is intended to remind the operators to block a trip function being degraded. This would be a human factors concern that could lead to an unnecessary trip of the unit. Therefore, by increasing the P-6 value to 1×10^{-4}, the reminder to block the source range function will occur after critical start-up activities, but before the source range trip value, which will allow the proper operator actions at the appropriate time. The allowable value change is solely the result of the setpoint change as applied through the methodology.

The revision of the trip setpoint for the fuel storage pool area radiation monitor is proposed to resolve an identified non-conservatism. During reviews of dose calculations for fuel handling accidents it was discovered that errors existed that made the current setpoint values less restrictive than required to maintain the accident analysis. TVA initiated corrective action documents and verified that settings for these monitors were acceptable to accommodate the identified errors. TVA is maintaining these monitors administratively in accordance with the Corrective Action Program until the TSs can be modified. The proposed revision will establish a new setpoint limit that will meet the corrected dose analysis.

The change in minimum channels operable for the AFW and EDG loss of power timers is to provide a more appropriate requirement in consideration of the plant design. This timer function supports the actuation of the loss of power start of the AFW pumps and EDGs and load shed initiation. This function is provided by both trains of power and the voltage sensors for each train are arranged in a two-out-of-three logic scheme. Using redundant timers in each train of this function after the detection of low voltage provides a conservative design but is in excess of the required design for mitigation features. Therefore, these timers should not have to meet single failure requirements in the TSs and only one timer is required to satisfy the loss of power start functions. The associated actions are modified to provide the appropriate wording for this change in required channels.

III. SAFETY ANALYSIS

Revision to Nominal Trip Setpoints

The title change to "Nominal Trip Setpoint" and the removal of the inequality signs, along with the associated Bases changes, is not a change in the current application of the TSs. The SQN setpoint methodology considers the values in the trip setpoint column to be a nominal value and the calibration procedures have implemented the requirements in this manner. This is an administrative change that is intended to resolve a concern associated with using an inequality sign with a nominal value. In addition to the setpoint change, the representation of the Avs has been revised to exclusively use inequalities in place of plus and minus allowances. This change also does not change the application of the TSs. The classification of the overtemperature delta temperature T′ parameter as a nominal value is not accurate with the evolution of the nominal setting philosophy utilized for reactor protection system (RPS) and ESF instrumentation. The T′ is a limiting parameter for TS compliance and should not be described as a nominal value. The description of this value, as a limit with the appropriate inequalities, is the most accurate method for representation.

Bases discussions provide guidance on the proper use of the nominal trip setpoint representation by indicating conditions that maintain the operability of the function and the acceptability to set functions in the conservative direction. This guidance does not alter the current application of the TSs or the intent of the TSs. Therefore, this change to the nominal trip setpoint representation will not impact plant safety because this revision of the TSs does not change the intent or application of the requirements.

Reactor Coolant Pump Underfrequency Trip Setpoint and Allowable Value Revisions

The setpoint revision for the RCP underfrequency function was required to address the accuracy of replacement instrumentation. The underfrequency instrumentation setpoint was modified without identifying the need to revise the associated TS requirements because the new setpoint complied with the existing setpoint inequality in the TS. This failure has been addressed by the TVA Corrective Action Program. TVA Calculation SQN-EEB-MS-TI28-0076, Revision 4, provides the basis for the revised setpoint value. The proposed setpoint was evaluated within the calculation to ensure that erroneous reactor trips resulting from normal frequency fluctuations would not occur and that the lower safety limit of 55.8 Hz would not be impacted. An upper operational limit of 58.5 Hz was chosen primarily because the normal continuous operating frequency is 59.5 to 60.5 Hz.

In accordance with SQN's Westinghouse setpoint methodology, the channel statistical allowance (CSA) for an instrumentation loop is defined by the following equation:

$$\text{CSA} = \text{EA}+\{(\text{PMA})^2+(\text{PEA})^2+(\text{SCA}+\text{SMTE}+\text{SD})^2+(\text{SPE})^2+(\text{STE})^2 + (\text{RCA}+\text{RMTE}+\text{RCSA}+\text{RD})^2+(\text{RTE})^2\}^{1/2}$$

The error terms for the above equation as defined by SQN's Westinghouse setpoint methodology are; environmental allowance (EA), process measurement accuracy (PMA), primary element accuracy (PEA), sensor calibration accuracy (SCA), sensor measurement and test equipment accuracy (SMTE), sensor drift (SD), sensor pressure effects (SPE), sensor temperature effects (STE), rack calibration accuracy (RCA), rack drift (RD), rack temperature effects (RTE), rack measurement and test equipment accuracy (RMTE), and rack calibration setting accuracy (RCSA).

Since this loop only involves the relay, the above terms are evaluated for applicability. The error terms defined in the equation for the primary element and sensor are not applicable since the relay directly monitors the RCP frequency. As documented within the accuracy calculation, the relay is not subjected to harsh environmental parameters of radiation and temperature from a design basis accident. Therefore, the EA term of the equation is not applicable.

From TVA Calculation SQN-EEB-MS-TI28-0076, Revision 4, the resulting rack effects (RE) portion of the CSA equation for the relay is:

$$RE = \pm\{(RCA+RMTE+RD+RCSA)^2+RTE^2\}^{1/2}$$
$$RE = \pm\{(0.008+(0.05+0.05)+0.553+0.05)^2+0.008^2\}^{1/2}$$
$$RE = \pm 0.711 \text{ Hz}$$

Therefore, the error around the setpoint is 57 ± 0.711 Hz or 57.711 Hz to 56.289 Hz. These results do not impact the lower safety limit of 55.8 Hz nor challenge the normal operational frequency of 59.5 to 60.5 Hz. The results of this calculation provide adequate verification that the installed underfrequency instrumentation will actuate within the required accident analysis assumptions to support accident mitigation. Current TVA procedures conservatively utilize the proposed 57 Hz setpoint requirement to properly maintain the associated safety limit.

The Av for this function has been revised to be compatible with the proposed setpoint. This Av is defined by the Westinghouse methodology as:

$$Av = \text{Setpoint} - \text{the lowest of the values } T_1 \text{ or } T_2$$

T_1 and T_2 are referred to as the "trigger values" defined by SQN's Westinghouse setpoint methodology. The T_1 method involves the values used in the statistical calculation as follows:

$$T_1 = (RCA+RMTE+RD+RCSA)$$
$$T_1 = (0.008+0.1+0.553+0.05) \text{ Hz}$$
$$T_1 = 0.771 \text{ Hz}$$

The T_2 method extracts these values from the calculation and compares these numbers statistically against the total allowance as follows:

$$T_2 = TA-(\{A+(S)^2\}^{1/2}+EA)$$

where;

$$A = (PMA)^2+(PEA)^2+(SPE)^2+(STE)^2+(RTE)^2$$
$$S = (SCA+SMTE+SD)$$

TA = Total Allowance = Setpoint - Reactor Trip Safety Limit = 57 Hz-55.8 Hz = 1.2 Hz

Therefore,

$$T_2 = TA-\{(PMA)^2+(PEA)^2+(SCA+SMTE+SD)^2+(SPE)^2+(STE)^2 +(RTE)^2\}^{1/2}-EA$$

As previously stated, this loop only involves a relay. The error terms defined in the equation for the process error and sensor are not applicable since the relay directly monitors the RCP frequency. The relay is located in an auxiliary building area not subjected to harsh environmental parameters of radiation and temperature from a design basis accident. Therefore, the EA term of the equation is not applicable. This only leaves the RTE term in the equation as follows:

$$T_2 = 1.2-\{(0.008)^2\}^{1/2} = 1.192 \text{ Hz}$$

The above value for T_1 was found to be the most restrictive or lowest of the two values and therefore, utilized to determine Av as follows:

$$Av = \text{Setpoint}-T_1$$
$$Av = 57 \text{ Hz}-0.711 \text{ Hz}$$
$$Av = 56.289 \text{ Hz or } 56.3 \text{ Hz conservatively rounded up}$$

Although these calculations use Method 3 from American National Standards Institute (ANSI)/Instrument Society of America (ISA) S67.04, the T_1 and T_2 check calculations above show that the proposed setpoint and allowable value would meet the Method 1 requirements. The revised Av continues to provide assurance that the safety limit for the underfrequency reactor trip function is not impacted. TVA has verified that past calibrations for this function, with the proposed setpoint, have satisfied the new Av.

Reactor Coolant Pump Undervoltage Allowable Value Revision

During the setpoint evaluation for the underfrequency function, TVA identified an inconsistency in the calculation method used for the RCP undervoltage function. This method utilized a formula for calculating the Av in accordance with a methodology developed by TVA instead of the Westinghouse methodology. The TVA methodology allows two methods for calculating the Av with the one that was used for this function being less conservative than the Westinghouse method. The Av has been recalculated using the Westinghouse setpoint methodology since the loop was included in the original Westinghouse analysis. TVA's position is to use the Westinghouse methodology for instrumentation of this type. The use of TVA's methodology for this function has been evaluated by the SQN Corrective Action Program.

TVA evaluated the Av for the RCP undervoltage within TVA Calculation SQN-EEB-27DAT that has been revised to resolve this concern. The error terms for this function are defined by SQN's Westinghouse setpoint methodology in the same manner as described for the underfrequency relay.

These terms are utilized, along with the setpoint that has not changed, to determine the Av which is defined as:

Av = Setpoint - the lowest of the values T_1 or T_2

T_1 and T_2 values were evaluated as previously described for the underfrequency function. The T_1 determination is as follows:

T_1 = (RCA+RMTE+RD+RCSA)
T_1 = (0.5+0.2+0.2+0.5)% of Setpoint
T_1 = 1.4% of Setpoint or 0.014x5022 volts alternating current (VAC) = 70.3 VAC

The T_2 evaluation resulted in a value of 311.76 volts and is less restrictive than the T_1 value. Therefore, the T_1 value was used to determine the Av as follows:

Av = Setpoint-T_1
Av = 5022-70.3 VAC
Av = 4951.7 VAC or 4952 VAC conservatively rounded up

Although these calculations use Method 3 from ANSI/ISA S67.04, the T_1 and T_2 check calculations above show that the proposed setpoint and allowable value would meet the Method 1 requirements. The setpoint value and associated safety limit are not affected by this change of the Av. SQN's calibration procedures have been evaluated and verified to be in compliance with the proposed Av.

Intermediate Range Neutron Flux P-6 Setpoint and Allowable Value Revision

The setpoint revision for the P-6 value is intended to prevent the permissive from occurring too early in the startup sequence and resulting in the operators having to delay the block of the source range reactor trip. The proposed value will ensure the ability to block the trip function at the appropriate time during the start-up evolution while continuing to optimize the availability of the source range count feature to support reactor criticality activities. Normal start-up evolutions have shown that the criticality point is usually in the range of 1×10^{-5} to 1×10^{-4} percent RTP on the intermediate range instrumentation. The source range trip setpoint is 10^5 counts per second (cps) with a channel calibration tolerance that would not allow the "as left" value to be any less than 8.7×10^4 cps. The P-6 actuations during the past four start-ups of both SQN units, when set at 1×10^{-4}

percent RTP, have shown the value to be between 2700 and 5900 cps. These actuation values are well below the source range trip value described above and provide adequate time for the operators to block the trip function. Therefore, the proposed change to a P-6 value of 1 x 10^{-4} percent RTP allows the permissive to occur within or just after the normal reactor criticality range, but well before the source range trip value. The revision of the trip setpoint has been addressed in TVA Calculation SQN-EEB-PS-TI28-0001, Revision 14. This calculation is in accordance with SQN's Westinghouse setpoint methodology as stated above.

The AV change to the P-6 value was only in response to the setpoint change described above. In order to maintain the setpoint methodology, this AV revision was required to be consistent with the proposed setpoint of 1 x 10^{-4} percent RTP.

The resulting rack effects (RE) portion of the CSA equation for the instrument loop is:

$$RE = \pm\{RCA^2 + RMTE^2 + RCSA^2 + RD^2 + RTE^2\}^{1/2}$$
$$RE = \pm\{1.1180^2+0.1414^2+0.2236^2+1.8750^2+1.3332^2\}^{1/2}$$
$$RE = \pm\ 2.572\%$$

Decade error for the rack 2.572% channel error based on 10.3 decades full span = ± 0.265 decades.

Decade value of P-6 setpoint of 10^{-4}% RTP is
Log (10^{-4}) = -4.0

Tech Spec Av = Setpoint + RE

Using the decade values from above for setpoint and rack errors:

Tech Spec Av = -4.0 -0.265 = -4.265 decades.

Converting decades to % RTP: $10^{-4.265} = 5.43 \times 10^{-5}$% RTP.

The allowable value has been rounded up to 6 x 10^{-5}% RTP, which is toward the setpoint value and therefore is conservative.

The Av for this function has been revised to be compatible with the present source range setpoint. Again using the check calculation to determine a conservative allowable value T_1 and T_2 are calculated as:

Av = Setpoint + the lowest of the values T_1 or T_2

T_1 was used in the above calculation in deriving the allowable value. The individual parameters were squared which gives a more conservative allowable value.

The T_2 method extracts these values from the calculation and compares these numbers statistically against the total allowance as follows:

$T_2 = TA-(\{A+(S)^2\}^{1/2}+EA)$
where;
$A = (PMA)^2+(PEA)^2+(SPE)^2+(STE)^2+(RTE)^2$
$S = (SCA+SMTE+SD)$
TA = Total Allowance = Reactor Trip Safety Limit - Setpoint = 1.25×10^{-3}% RTP - 10^{-4}% RTP = 1.15×10^{-3}% RTP

Although there is no safety limit, the source range trip will be used as the Reactor Trip Safety Limit. 1.25×10^{-3}% RTP ~ 105 cps from the source range.

Therefore,
$$T_2 = TA-\{(PMA)^2+(PEA)^2+(SCA+SMTE+SD)^2+(SPE)^2+(STE)^2+(RTE)^2\}^{1/2}-EA$$

As previously stated, this loop only involves the rack instrumentation. The error terms defined in the equation for the process error and sensor are not applicable as both the source range and intermediate range rack instrumentation use the same detector. The instrumentation is located in an auxiliary and control building area not subjected to harsh environmental parameters of radiation and temperature from a design basis accident. Therefore, the EA term of the equation is not applicable. This only leaves the RTE term in the equation as follows:

RTE = ± 1.3332% decade error based on 10.3 decades full span = ± 0.13332 decades.

Decade value of TA = Log (1.15×10^{-3}% RTP) = -2.94

Therefore:
$T_2 = -2.94 - 0.13332 = -3.07332$ decades.

Converting decades to % RTP: $10^{-3.07332} = 8.4 \times 10^{-4}$% RTP.

The above value for T_1 was found to be the most restrictive or lowest of the two values and therefore, utilized to determine Av.

Although these calculations use Method 3 from American National Standards Institute (ANSI)/Instrument Society of America (ISA) S67.04, the T_1 and T_2 check calculations above show that the proposed setpoint and allowable value would meet the Method 1 requirements. The revised Av continues to provide assurance that the permissive will be given before the source range trip occurs. TVA has verified that past calibrations for this function, with the proposed setpoint, have satisfied the new Av.

<u>Fuel Storage Pool Area Radiation Monitor Setpoint Revision</u>

The setpoint revision for the fuel storage pool area radiation monitor function was required to address identified errors in the dose calculations for a fuel handling event. The identified errors in the dose calculation have been addressed by the TVA Corrective Action Program. TVA Calculation 0-RE-90-102/103, Revision 1, provides the basis for the revised setpoint value. The proposed setpoint was evaluated within the calculation to ensure that sufficient margin exists to prevent impact to the safety limit.

TVA used a setpoint methodology in this calculation that was developed by TVA for instrumentation that was not included in the original Westinghouse setpoint analysis. The TVA setpoint methodology includes two methods for determining an acceptable Av similar to the T_1 and T_2 evaluations in the SQN's Westinghouse methodology. The TVA calculations representing the two methods are:

Av(max) = Safety Limit - (LAn - LAnf)

Av(min) = Setpoint + LAnf

Where LAnf is defined as the Loop Normal Measurable Accuracy and includes the errors that may be detected during a calibration. These error terms include Drift, Component Accuracy, Calibration Accuracy, and Calibration Uncertainties.

Whereas the LAn term also incorporates these terms in addition to terms that are not detectable during a calibration such as Process Measurement Errors.

TVA's methodology allows the use of either result or a value between the limiting Avs. For the Fuel Storage Pool Area Radiation Monitor function, a value between the limiting Avs was used. TVA has chosen to use an intermediate value based on the past history of the function.

From TVA Calculation 0-RE-90-102/103, Revision 1, the Fuel Storage Pool Area Radiation Monitor Safety Limit is 375.49 mR/hr. Converting the Safety Limit to volts;

$$\text{Safety Limit (volts)} = \frac{Log[Input(mR/hr)] - StartingDecade}{\left[\frac{\#of\,Decades}{VoltageSpan}\right]}$$

Safety Limit (volts) = 2 x [log(375.49)+1]

Safety Limit (volts) = 7.149 volts

$+Av = \text{Safety Limit} - (LAn_{BS} - LAnf_{BS+} + \text{Margin});$

Where Margin is defined as 0.158 volts or ≅ 25% of LAn_{BS+} for conservatism.

+Av = 7.149 - (0.632 -0.618 + 0.158) volts

+Av = 6.977 volts

Converting to mR/hr:

$$+Av\ (mR/hr) = 10^{\left[\frac{Output(volts)\,X\,\#of\,Decades}{VoltageSpan} + StartingDecade\right]}$$

$$+Av\ (mR/hr) = 10^{[(6.977 \times 5)/10]-1}$$

+Av (mR/hr) = 307 mR/hr (rounded down for conservatism)

The new setpoint was then determined by subtracting LAnf from this allowable value:

Setpoint = +Av - Lanf

Setpoint = 6.977 - 0.618 volts

Setpoint = 6.359 volts

Converting to mR/hr:

$$\text{Setpoint}\ (mR/hr) = 10^{\left[\frac{Output(volts)\,X\,\#of\,Decades}{VoltageSpan} + StartingDecade\right]}$$

Setpoint (mR/hr) = $10^{[(6.359 \times 5)/10]-1}$

Setpoint (mR/hr) = 151 mR/hr (rounded down for conservatism)

Although these calculations are utilizing Method 3 calculations from ANSI/ISA S67.04, Method 1 calculations could have also been used and the proposed setpoint would have still been conservative because of the margin added for the setpoint and allowable value. The results of this calculation provide adequate verification that the fuel storage pool area radiation monitor will actuate within the required accident analysis assumptions to support accident mitigation. Current TVA procedures conservatively utilize a 50 mR/hr setpoint requirement to properly maintain the associated safety limit.

Auxiliary Feedwater and Emergency Diesel Generator Loss of Power Timers

The minimum channels operable requirement change for the AFW and 6.9-killovolt shutdown board loss of power timers is to provide a more appropriate requirement in consideration of the plant design. These timers function to support the actuation of the loss of power start of the AFW pumps and the EDGs. This function is provided by both trains of shutdown power and the voltage sensors for each train are arranged in a two-out-of-three logic scheme. Using redundant timers in each redundant train of this function, after the detection of low voltage, provides a conservative design but is in excess of the requirements for mitigation features. Therefore, multiple timers in each train should not have to meet single failure requirements in the TSs and only one timer is required to satisfy the loss of power start functions. Single failure criteria is satisfied by having actuation capability from either redundant train in the event of a loss of power condition. The associated actions for the AFW and diesel generator start and load shed on loss of power are modified to provide the appropriate wording for this change in required channels. While these changes reduce the current redundancy capability, the remaining provisions for the loss of power timers continue to fully satisfy all accident mitigation requirements associated with AFW and EDG starts and maintain single failure requirements. This change is also consistent with NUREG-1431 recommendations because multiple timers are not addressed for either of these functions.

Bases Additions to Address Operability and Limiting Safety System Settings

The SQN TSs have not been converted to the latest version of the standard TSs (NUREG-1431, Revision 2) and therefore, does not contain the expanded Bases found in the NUREG. For this reason, all Bases additions found in NRC approved TSTF-355, Revision 1, were not applicable for this effort. TVA has determined those that are essential to the implementation of TSTF-355 and has incorporated those into the SQN Bases. Three Bases inserts are included in this proposed TS change package that are applicable to Westinghouse design plants. The first insert provides detailed discussions associated with the application of a limiting safety system setting (LSSS) for the RPS. This insert is taken from TSTF-355 and has only been modified to include the references within the discussions as opposed to a reference section that does not exist in the current SQN TSs.

The second insert includes details on the operability requirements for RPS functions using the nominal trip setpoint representation. This section is identical to the TSTF-355 discussions for this information. One sentence has been added to this insert that clarifies the conservative direction for a setpoint is in the direction of the inequality applied to the allowable value. This is consistent with the discussions included in TSTF-355 and only helps clarify the direction that would be acceptable. This will prevent any confusion in application by operating personnel. The third insert provides the same discussions as the second insert discussed above but for the ESF section of the SQN TSs. This insert also includes inserts from TSTF-355 that provide discussions associated with the use of trip setpoints and allowable values for the ESF requirements. These inserts are the equivalent of the discussions included in the second insert for the RPS functions as they would apply to ESF functions. These inserts to the SQN Bases are essential to ensuring the proper application of the nominal trip setpoint representation and the implementation of the NRC approved TSTF-355.

Conclusion

The proposed changes provide acceptable limits to ensure all accident mitigation and safety functions are available and capable of performing their intended function. In many cases the proposed changes implement more conservative requirements in response to identified non-conservative TS requirements. Changes that relax current licensing basis requirements and are consistent with those in NUREG-1431 are acceptable based on the discussions provided. Overall, the proposed changes are acceptable and adequately maintain required safety functions.

IV. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

TVA has concluded that operation of Sequoyah Nuclear Plant (SQN) Units 1 and 2, in accordance with the proposed change to the technical specifications (TSs), does not involve a significant hazards consideration. TVA's conclusion is based on its evaluation, in accordance with 10 CFR 50.91(a)(1), of the three standards set forth in 10 CFR 50.92(c).

The proposed TS change will rename the "Trip Setpoint" column of reactor protection and engineered safety feature (ESF) TS tables to be "Nominal Trip Setpoint", remove the inequality signs for the trip setpoint values as appropriate, and revise the inequality representation for the allowable values (Avs) as needed. Bases discussions clarify operable conditions for the functions and prescribe conditions where the setpoints may be set more conservatively. This revision also includes the revision of other TSs that currently use the term "trip setpoint" or "nominal" that needs to be changed to be consistent with the table title. Additional changes are proposed to the TS instrumentation tables that involve the revision of three trip setpoints, three Avs, and required minimum channels operable.

A. The proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed revisions for the nominal trip setpoint representation are administrative changes that will not impact the application of the reactor trip or ESF actuation system instrumentation requirements. This is based on the setpoint requirements being applied without change, as well as the Avs, in accordance with the current setpoint methodology. The removal of the inequalities associated with the trip setpoint values will be more appropriate for the use of nominal setpoint values but will not differ in application from the setpoint methodology utilized by

TVA. Deletion of the nominal terminology associated with overtemperature delta temperature average temperature at rated thermal power (T') provides a better representation of the limit associated with this value. In addition, this change will not alter plant equipment or operating practices. Therefore, the implementation of these changes will not increase the probability or consequences of an accident.

The revision of the reactor coolant pump (RCP) underfrequency, intermediate range neutron flux P-6, and fuel storage pool area radiation monitor trip setpoints and the Avs for the RCP underfrequeny, intermediate range neutron flux P-6, and undervoltage has been evaluated and the results are documented in approved calculations. These calculations verify that the revised values are acceptable in accordance with appropriate calculation methodologies and that they will continue to support the accident analysis. These revisions will not require changes to the instrumentation settings currently being used or the methods for maintaining them. The offsite dose potential will be reduced because the proposed TS values are more conservative and will ensure the adequacy of designed safety functions to limit the release of radioactivity. Therefore, the proposed revision of these values will not significantly increase the probability or consequences of an accident.

B. **The proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The revision of the nominal trip setpoint representation and elimination of the nominal nomenclature, as well as the revised setpoint values and Avs will not alter the plant configuration or functions. The revised setpoints and the proposed operability limits will continue to provide acceptable initiation of safety functions for the mitigation of postulated accidents as required by the design basis. The primary function of the reactor protection system, the ESF actuation system, and the radiation monitoring function is to initiate accident mitigation functions. These functions are not considered to be initiators of postulated accidents. The proposed changes do not create the possibility of a new or different kind of accident because the design functions are not altered and the proposed values meet the accident analysis requirements for accident mitigation.

C. **The proposed amendment does not involve a significant reduction in a margin of safety.**

The setpoint and Av revisions proposed in this request were evaluated and found to be acceptable without impact to the safety limits required for the associated functions. The nominal trip setpoint representation change and the elimination of inappropriate nominal indications do not alter the TS functions or their application and will not require changes to design settings. Plant systems will continue to be actuated for those plant conditions that require the initiation of accident mitigation functions. The margin of safety is not reduced because the proposed conservative changes to the Av and setpoint representations will not change design functions and the initiation of accident mitigation functions for appropriate plant conditions is ensured.

V. ENVIRONMENTAL IMPACT CONSIDERATION

The proposed change does not involve a significant hazards consideration, a significant change in the types of or significant increase in the amounts of any effluents that may be released offsite, or a significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
SEQUOYAH PLANT (SQN)
UNITS 1 and 2

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE 02-01, REVISION 1
MARKED PAGES

I. AFFECTED PAGE LIST

Unit 1	Unit 2
2-4	2-4
2-5	2-5
2-6	2-6
2-6a	2-7
2-7	2-8
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2-9	2-10
2-10	2-11
	2-12
B 2-2	B 2-2
3/4 3-14	3/4 3-14
3/4 3-20	3/4 3-20
3/4 3-21	3/4 3-21
3/4 3-23	3/4 3-23
3/4 3-23a	3/4 3-23a
3/4 3-24	3/4 3-24
3/4 3-25	3/4 3-25
3/4 3-26	3/4 3-26
3/4 3-27	3/4 3-27
3/4 3-27a	3/4 3-27a
3/4 3-27b	3/4 3-27b
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B 3/4 3-1	B 3/4 3-1

II. MARKED PAGES

See attached.

INSERT 1

Technical specifications are required by 10 CFR 50.36 to contain Limiting Safety System Settings (LSSS) defined by the regulation as ". . . settings for automatic protective devices . . . so chosen that automatic protective action will correct the abnormal situation before a Safety Limit (SL) is exceeded." The analytic limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the analytic limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective devices must be chosen to be more conservative than the analytic limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The Nominal Trip Setpoint is a predetermined setting for a protective device chosen to ensure automatic actuation prior to the process variable reaching the analytic limit and thus ensuring that the SL would not be exceeded. As such, the Nominal Trip Setpoint accounts for uncertainties in setting the device (e.g., calibration), uncertainties in how the device might actually perform (e.g., repeatability), changes in the point of action of the device over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the Nominal Trip Setpoint plays an important role in ensuring that SLs are not exceeded. As such, the Nominal Trip Setpoint meets the definition of an LSSS in accordance with Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," and could be used to meet the requirements that they be contained in the technical specifications.

Technical specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in the technical specifications as ". . . being capable of performing its safety function(s)." For automatic protective devices, the required safety function is to ensure that a SL is not exceeded and therefore the LSSS as defined by 10 CFR 50.36 is the same as the OPERABILITY limit for these devices. However, use of the Nominal Trip Setpoint to define OPERABILITY in technical specifications and its corresponding designation as the LSSS required by 10 CFR 50.36 would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protective device setting during a surveillance. This would result in technical specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protective device with a setting that has been found to be different from the Nominal Trip Setpoint due to some drift of the setting may still be OPERABLE since drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the Nominal Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to reset the device to the Nominal Trip Setpoint to account for further drift during the next surveillance interval.

Use of the Nominal Trip Setpoint to define "as found" OPERABILITY and its designation as the LSSS under the expected circumstances described above would result in actions required by both the rule and technical specifications that are clearly not warranted. However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the technical specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value, which as stated above, is the same as the LSSS.

The Allowable Value specified in Table 2.2-1 serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). As such, the Allowable Value differs from the Nominal Trip Setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a Safety Limit is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval. Note that, although the channel is "OPERABLE" under these circumstances, the trip setpoint should be left adjusted to a value within the established trip setpoint calibration tolerance band, in accordance with uncertainty assumptions stated in the setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned. If the actual setting of the device is found to have exceeded the Allowable Value, the device would be considered inoperable from a technical specification perspective. This requires corrective action including those actions required by 10 CFR 50.36 when automatic protective devices do not function as required.

INSERT 2

A channel is OPERABLE with a trip setpoint value outside its calibration tolerance band provided the trip setpoint "as-found" value does not exceed its associated Allowable Value and provided the trip setpoint "as-left" value is adjusted to a value within the "as-left" calibration tolerance band of the Nominal Trip Setpoint. A trip setpoint may be set more conservative than the Nominal Trip Setpoint as necessary in response to plant conditions. The conservative direction is established by the direction of the inequality applied to the Allowable Value.

A detailed description of the methodology used to calculate the Allowable Value and trip setpoints, including their explicit uncertainties, is provided in the Westinghouse Electric Company setpoint methodology study which incorporates all of the known uncertainties applicable to each channel. The magnitudes of these uncertainties are factored into the determination of each trip setpoint and corresponding Allowable Value. The trip setpoint entered into the channel is more conservative than that specified by the Allowable Value (LSSS) to account for measurement errors detectable by the CFT. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CFT. One example of such a change in measurement error is drift during the surveillance interval. If the measured setpoint does not exceed the Allowable Value, the channel is considered OPERABLE.

The trip setpoint is the value at which the channels are set and is the expected value to be achieved during calibration. The trip setpoint value ensures the LSSS and safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on the stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" setpoint value is within the band for CHANNEL CALIBRATION uncertainty allowance (i.e. ± rack calibration + comparator setting uncertainties). The trip setpoint value is therefore, considered a "nominal" value (i.e., expressed as a value without inequalities) for the purposes of the CFT and CHANNEL CALIBRATION.

INSERT 3

A channel is OPERABLE with a trip setpoint value outside its calibration tolerance band provided the trip setpoint "as-found" value does not exceed its associated Allowable Value and provided the trip setpoint "as-left" value is adjusted to a value within the "as-left" calibration tolerance band of the Nominal Trip Setpoint. A trip setpoint may be set more conservative than the Nominal Trip Setpoint as necessary in response to plant conditions. The conservative direction is established by the direction of the inequality applied to the Allowable Value.

The Allowable Value, in conjunction with the trip setpoint and LCO, establishes the threshold for ESF action to prevent exceeding acceptable limits such that the consequences of design bases accidents will be acceptable. The Allowable Value is considered a limiting value such that a channel is OPERABLE if the setpoint is found not to exceed the Allowable Value during the CHANNEL FUNCTIONAL TEST (CFT). Note that, although a channel is "OPERABLE" under these circumstances, the ESF setpoint must be left adjusted to within the established calibration tolerance band of the ESF setpoint in accordance with the uncertainty assumptions stated in the setpoint methodology, (as-left criteria) and confirmed to be operating within the statistical allowances of the uncertainty terms assigned.

A detailed description of the methodology used to calculate the Allowable Value and ESF setpoints including their explicit uncertainties, is provided in the Westinghouse Electric Company or TVA setpoint methodology study which incorporates all of the known uncertainties applicable to each channel. The magnitudes of these uncertainties are factored into the determination of each ESF setpoint and corresponding Allowable Value. The nominal ESF setpoint entered into the channel is more conservative than that specified by the Allowable Value to account for measurement errors detectable by the CFT. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CFT. One example of such a change in measurement error is drift during the surveillance interval. If the measured setpoint does not exceed the Allowable Value, the channel is considered OPERABLE.

The ESF setpoints are the values at which the channels are set and is the expected value to be achieved during calibration. The ESF setpoint value ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on the stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" setpoint value is within the band for CHANNEL CALIBRATION uncertainty allowance (i.e., calibration tolerance uncertainties). The ESF setpoint value is therefore considered a "nominal" value (i.e., expressed as a value without inequalities) for the purposes of the CFT and CHANNEL CALIBRATION.

2.2 LIMITING SAFETY SYSTEM SETTINGS

REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS

2.2.1 The reactor trip system instrumentation and interlocks setpoints shall be set consistent with the ~~Trip Setpoint~~ values shown in Table 2.2-1.
Nominal

APPLICABILITY: As shown for each channel in Table 3.3-1.

ACTION:

With a reactor trip system instrumentation or interlock setpoint less conservative than the value shown in the Allowable Values column of Table 2.2-1, declare the channel inoperable and apply the applicable ACTION statement requirement of Specification 3.3.1 until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with ~~the Trip Setpoint value~~.
Nominal

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	NOMINAL TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Power Range Neutron Flux	Low Setpoint $\leq$ 25% of RATED THERMAL POWER High Setpoint $\leq$ 109% of RATED THERMAL POWER	Low Setpoint - $\leq$ 27.4% of RATED THERMAL POWER High Setpoint - $\leq$ 111.4% of RATED THERMAL POWER
3. Power Range Neutron Flux High Positive Rate	$\leq$ 5% of RATED THERMAL POWER with a time constant $\geq$ 2 second	$\leq$ 6.3% of RATED THERMAL POWER with a time constant $\geq$ 2 second
4. Power Range Neutron Flux, High Negative Rate	$\leq$ 5% of RATED THERMAL POWER with a time constant $\geq$ 2 second	$\leq$ 6.3% of RATED THERMAL POWER with a time constant $\geq$ 2 second
5. Intermediate Range, Neutron Flux	$\leq$ 25% of RATED THERMAL POWER	$\leq$ 45.20% of RATED THERMAL POWER
6. Source Range Neutron Flux	$\leq 10^5$ counts per second	$\leq 1.45 \times 10^5$ counts per second
7. Overtemperature ΔT	See Note 1	See Note 3
8. Overpower ΔT	See Note 2	See Note 4
9. Pressurizer Pressure–Low	$\geq$ 1970 psig	$\geq$ 1964.8 psig
10. Pressurizer Pressure–High	$\leq$ 2385 psig	$\leq$ 2390.2 psig
11. Pressurizer Water Level–High	$\leq$ 92% of instrument span	$\leq$ 92.7% of instrument span
12. Loss of Flow	$\geq$ 90% of design flow per loop*	$\geq$ 89.6% of design flow per loop*

*Design flow is 90,045 (87,000 X 1.035) gpm per loop.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓NOMINAL TRIP SETPOINT	ALLOWABLE VALUES
13. Steam Generator Water Level--Low-Low		
a. RCS Loops ΔT Equivalent to Power ≤ 50% RTP	RCS Loop ΔT variable input ≤ 50% RTP	RCS Loop ΔT variable input ≤ trip setpoint + 2.5% RTP ⇑ *nominal*
Coincident with		
Steam Generator Water Level -- Low-Low (Adverse) and	≥ 15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
Containment Pressure - EAM or	≤ 0.5 psig	≤ 0.6 psig
Steam Generator Water Level -- Low-Low (EAM) with	≥ 10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument span
A time delay (T_S) if one Steam Generator is affected or	≤ T_S (Note 5)	≤ (1.01) T_S (Note 5)
A time delay (T_M) if two or more Steam Generators are affected	≤ T_M (Note 5)	≤ (1.01) T_M (Note 5)
b. RCS Loop ΔT Equivalent to Power > 50% RTP		
Coincident with		
Steam Generator Water Level -- Low-Low (Adverse) and	≥ 15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
Containment Pressure (EAM) or	≤ 0.5 psig	≤ 0.6 psig
Steam Generator Water Level -- Low-Low (EAM)	≥ 10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
14. Deleted		
15. Undervoltage-Reactor Coolant Pumps	~~≥~~ 5022 volts-each bus	*4952* ≥ ~~4739~~ volts-each bus
16. Underfrequency-Reactor Coolant Pumps	*57.0* ~~≥ 56.0~~ Hz - each bus	*56.3* ≥ ~~55.9~~ Hz - each bus
17. Turbine Trip		
A. Low Trip System Pressure	~~≥~~ 45 psig	≥ 43 psig
B. Turbine Stop Valve Closure	~~≥~~ 1% open	≥ 1% open
18. Safety Injection Input from ESF	Not Applicable	Not Applicable
19. Intermediate Range Neutron Flux - (P-6) Enable Block Source Range Reactor Trip	≥ 1 x ~~10-5~~ *10^{-4}* % of RATED THERMAL POWER	≥ 6 x ~~10-6~~ *10^{-5}* % of RATED THERMAL POWER
20. Power Range Neutron Flux (not P-10) Input to Low Power Reactor Trips Block P-7	~~≤~~ 10% of RATED THERMAL POWER	≤ 12.4% of RATED THERMAL POWER

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
21. Turbine Impulse Chamber Pressure - (P-13) Input to Low Power Reactor Trips Block P-7	≤ 10% Turbine Impulse Pressure Equivalent	≤ 12.4% Turbine Impulse Pressure Equivalent
22. Power Range Neutron Flux - (P-8) Low Reactor Coolant Loop Flow, and Reactor Trip	≤ 35% of RATED THERMAL POWER	≤ 37.4% of RATED THERMAL POWER
23. Power Range Neutron Flux - (P-10) - Enable Block of Source, Intermediate, and Power Range (low setpoint) Reactor Trips	≥ 10% of RATED THERMAL POWER	≥ 7.6% of RATED THERMAL POWER
24. Reactor Trip P-4	Not Applicable	Not Applicable
25. Power Range Neutron Flux - (P-9) - Blocks Reactor Trip for Turbine Trip Below 50% Rated Power	≤ 50% of RATED THERMAL POWER	≤ 52.4% of RATED THERMAL POWER

NOTATION

NOTE 1:

$$\text{Overtemperature } \Delta T \left(\frac{1 + \tau_4 S}{1 + \tau_5 S}\right) \leq \Delta T_0 \left\{K_1 - K_2 \left(\frac{1 + \tau_1 S}{1 + \tau_2 S}\right)[T - T'] + K_3 (P - P') - f_1(\Delta I)\right\}$$

Where:

$\frac{1 + \tau_4 S}{1 + \tau_5 S}$	=	Lead-lag compensator on measured ΔT
τ_4, τ_5	=	Time constants utilized in the lead-lag controller for ΔT, $\tau_4 \geq 5$ secs, $\tau_5 \leq 3$ sec.
ΔT_0	=	Indicated ΔT at RATED THERMAL POWER
K_1	≤	1.15
K_2	≥	0.011

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS
NOTATION (Continued)

NOTE 1: (Continued)

$\frac{1 + \tau_1 S}{1 + \tau_2 S}$	=	The function generated by the lead-lag controller for T_{avg} dynamic compensation
τ_1, & τ_2	=	Time constants utilized in the lead-lag controller for T_{avg}, $\tau_1 \geq 33$ secs., $\tau_2 \leq 4$ secs.
T	=	Average temperature °F
T'	≤	578.2°F (~~Nominal~~ T_{avg} at RATED THERMAL POWER)
K_3	=	0.00055
P	=	Pressurizer pressure, psig
P'	=	2235 psig (Nominal RCS operating pressure)
S	=	Laplace transform operator (sec^{-1})

and f_1 (ΔI) is a function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that:

(i) for $q_t - q_b$ between QTNL* and QTPL* $f_1(\Delta I) = 0$ (where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER).

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS
NOTATION (Continued)

NOTE 1: (Continued)

(ii) for each percent that the magnitude of $(q_t - q_b)$ exceeds QTNL*, ~~the ΔT trip set point~~ ⇓ *nominal* shall be automatically reduced by QTNS* of its value at RATED THERMAL POWER.

(iii) for each percent that the magnitude of $(q_t - q_b)$ exceeds QTPL*, ~~the ΔT trip set-point~~ ⇓ *nominal* shall be automatically reduced by QTPS* of its value at RATED THERMAL POWER.

NOTE 2: Overpower $\Delta T\left(\frac{1+\tau_4 S}{1+\tau_5 S}\right) \leq \Delta T_0 \left\{K_4 - K_5\left(\frac{\tau_3 S}{1+\tau_3 S}\right) T - K_6 \left(T - T''\right) - f_2 \left(\Delta I\right)\right\}$

Where:

$\frac{1+\tau_4 S}{1+\tau_5 S}$	=	as defined in Note 1
τ_4, τ_5	=	as defined in Note 1
ΔT_0	=	as defined in Note 1
K_4	≤	1.087
K_5	≥	0.02/°F for increasing average temperature and 0 for decreasing average temperature
$\frac{\tau_3 S}{1+\tau_3 S}$	=	The function generated by the rate-lag controller for T_{avg} dynamic compensation

* QTNL, QTPL, QTNS, and QTPS are specified in the COLR per Specification 6.9.1.14.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS
NOTATION (Continued)

NOTE 2: (Continued)

τ_3 = Time constant utilized in the rate-lag controller for T_{avg}, $\tau_3 \geq 10$ secs.

K_6 ≥ 0.0011 for $T > T''$ and $K_6 \geq 0$ for $T \leq T''$

T = as defined in Note 1

T" = Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 578.2°F)

S = as defined in Note 1

and $f_2(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that:

(i) for $q_t - q_b$ between QPNL* and QPPL* $f_2(\Delta I) = 0$ (where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER).

(ii)
⇓ *nominal*
for each percent that the magnitude of $(q_t - q_b)$ exceeds QPNL* the ΔT trip setpoint shall be automatically reduced by QPNS* of its value at RATED THERMAL POWER.

(iii)
⇓ *nominal*
for each percent that the magnitude of $(q_t - q_b)$ exceeds QPPL* the ΔT trip setpoint shall be automatically reduced by QPPS* of its value at RATED THERMAL POWER.

nominal ⇓ ⇓ *set*
NOTE 3: The channel's maximum trip setpoint shall not exceed its computed trip point by more than 1.9 percent ΔT span.

nominal ⇓ ⇓ *set*
NOTE 4: The channel's maximum trip setpoint shall not exceed its computed trip point by more than 1.7 percent ΔT span.

*QPNL, QPPL, QPNS, and QPPS are specified in the COLR per Specification 6.9.1.14.

These limiting heat flux conditions are higher than those calculated for the range of all control rods fully withdrawn to the maximum allowable control rod insertion assuming the axial power imbalance is within the limits of the f_1 (Delta I) function of the Overtemperature Delta T trip. When the axial power imbalance is not within the tolerance, the axial power imbalance effect on the Overtemperature Delta T trips will reduce the setpoints to provide protection consistent with core safety limits.

2.1.2 REACTOR COOLANT SYSTEM PRESSURE

The restriction of this Safety Limit protects the integrity of the Reactor Coolant System from overpressurization and thereby prevents the release of radionuclides contained in the reactor coolant from reaching the containment atmosphere.

The reactor pressure vessel and pressurizer are designed to Section III of the ASME Code for Nuclear Power Plant which permits a maximum transient pressure of 110% (2735 psig) of design pressure. The Reactor Coolant System piping, valves and fittings, are designed to ANSI B 31.1 1967 Edition, which permits a maximum transient pressure of 120% (2985 psig) of component design pressure. The Safety Limit of 2735 psig is therefore consistent with the design criteria and associated code requirements.

The entire Reactor Coolant System is hydrotested at 3107 psig, 125% of design pressure, to demonstrate integrity prior to initial operation.

2.2.1 REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS

⇓ Nominal

The Reactor Trip Setpoint Limits specified in Table 2.2-1 are the values at which the Reactor Trips

⇓ Nominal

are set for each functional unit. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their safety limits during normal operation and design basis anticipated operational occurrences and to assist the Engineered Safety Features Actuation System in

⇓ Nominal

mitigating the consequences of accidents. Operation with a trip set less conservative than its Trip Setpoint

Nominal ⇓

but within its specified Allowable Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is equal to or less than the ~~drift~~ allowance assumed for each trip in the

⇑ rack

safety analyses.

Add Insert 1

Add Insert 2

3/4.3.2 ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.2.1 The Engineered Safety Feature Actuation System (ESFAS) instrumentation channels and interlocks shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in ~~the Trip Setpoint~~ column of Table 3.3-4.

⇑ *Nominal*

APPLICABILITY: As shown in Table 3.3-3.

ACTION:

a. With an ESFAS instrumentation channel or interlock trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3-4, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.3-3 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with ~~the Trip Setpoint~~ value.

⇑ *Nominal*

b. With an ESFAS instrumentation channel or interlock inoperable, ~~take the ACTION~~ shown in Table 3.3-3.

SURVEILLANCE REQUIREMENTS

4.3.2.1.1 Each ESFAS instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations for the MODES and at the frequencies shown in Table 4.3-2.

4.3.2.1.2 The logic for the interlocks shall be demonstrated OPERABLE during the automatic actuation logic test. The total interlock function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each channel affected by interlock operation.

4.3.2.1.3 The ENGINEERED SAFETY FEATURES RESPONSE TIME of each ESFAS function shall be verified to be within the limit at least once per 18 months. Each verification shall include at least one train such that both trains are verified at least once per 36 months and one channel per function such that all channels are verified at least once per N times 18 months where N is the total number of redundant channels in a specific ESFAS function as shown in the "Total No. of Channels" Column of Table 3.3-3.

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
e. Loss of Power Start					
1. Voltage Sensors	3/shutdown board**	2/shutdown board**	3/shutdown board**	1, 2, 3	35
2. Load Shed Timer	2/shutdown board**	1/shutdown board**	⇓ 1 ~~2~~/shutdown board**	1, 2, 3	35
f. Trip of Main Feedwater Pumps Start Motor-Driven Pumps and Turbine Driven Pump	1/pump	1/pump	1/pump	1, 2	20*
g. Auxiliary Feedwater Suction Pressure- Low	3/pump	2/pump	3/pump	1, 2, 3	21*
h. Auxiliary Feedwater Suction Transfer Time Delays					
1. Motor-Driven Pump	1/pump	1/pump	1/pump	1, 2, 3	21*
2. Turbine-Driven Pump	2/pump	1/pump	2/pump	1, 2, 3	21*

**Unit 1 shutdown boards only

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
7. LOSS OF POWER					
a. 6.9 kv Shutdown Board -- Loss of Voltage					
1. Voltage Sensors	3/shutdown board	2/shutdown board	3/shutdown board	1, 2, 3, 4 $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
2. Diesel Generator Start and Load Shed Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4 $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
b. 6.9 kv Shutdown Board Degraded Voltage					
1. Voltage Sensors	3/shutdown board	2/shutdown board	3/shutdown board	1, 2, 3, 4 $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
2. Diesel Generator Start and Load Shed Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4 $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
3. SI/Degraded Voltage Logic Enable Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4	34
8. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS					
a. Pressurizer Pressure-P-11/Not P-11	3	2	2	1, 2, 3	22a
b. Deleted					
c. Steam Generator Level P-14	3/loop	2/loop any loop	3/loop	1, 2	22c

TABLE 3.3-3 (Continued)

ACTION 21 - With less than the Minimum Number of Channels OPERABLE, declare the associated auxiliary feedwater pump inoperable, and comply with the ACTION requirements of Specification 3.7.1.2.

ACTION 22 - With less than the Minimum Number of Channels OPERABLE, declare the interlock inoperable and verify that all affected channels of the functions listed below are OPERABLE or apply the appropriate ACTION statement(s) for those functions. Functions to be evaluated are:

a. Safety Injection
   Pressurizer Pressure
   Steam Line Pressure
   Negative Steam Line Pressure Rate

b. Deleted

c. Turbine Trip
   Steam Generator Level High-High
   Feedwater Isolation
   Steam Generator Level High-High

ACTION 23 - With the number of OPERABLE channels one less than the Total Number of Channels, be in at least HOT STANDBY within 6 hours and in at least HOT SHUTDOWN within the following 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1.1.

ACTION 24 - With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within 6 hours and in at least HOT SHUTDOWN within the following 6 hours.

ACTION 25 - With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or declare the associated valve inoperable and take the ACTION required by Specification 3.7.1.5.

ACTION 34 -

a. With the number of OPERABLE channels one less than the Total Number of
⇓ for voltage sensors
Channels, restore the inoperable channel to OPERABLE status within 6 hours or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated diesel generator set made inoperable by the channel.

b. With the number of OPERABLE channels less than the Total Number of
⇓ for voltage sensors or timers
Channels by more than one, restore all but one channel to OPERABLE status within 1 hour or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated diesel generator set made inoperable by the channels.

TABLE 3.3-3 (Continued)

ACTION 35 -

a. With the number of OPERABLE channels one less than the Total
⇓ for voltage sensors
Number of Channels, restore the inoperable channel to OPERABLE status within 6 hours or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated auxiliary feedwater pump made inoperable by the channel.

b. With the number of OPERABLE channels less than the Total Number
⇓ for voltage sensors or timers
of Channels by more than one, restore all but one channel to OPERABLE status within 1 hour or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated auxiliary feedwater pump made inoperable by the channels.

ACTION 36 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours.

b. For the affected protection set, the Trip Time Delay for one affected steam generator (T_S) is adjusted to match the Trip Time Delay for multiple affected steam generators (T_M) within 4 hours.

c. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.2.1.1.

ACTION 37 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided that within 6 hours, for the affected protection set, the Trip Time Delays (T_S and T_M) threshold power level for zero seconds time delay is adjusted to 0% RTP.

ACTION 38 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided that within 6 hours, for the affected protection set, the Steam Generator Water Level - Low-Low (EAM) channels trip setpoint is adjusted to the same value as Steam Generator Water Level - Low-Low (Adverse).

TABLE 3.3-4

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
1. SAFETY INJECTION, TURBINE TRIP AND FEEDWATER ISOLATION		
a. Manual Initiation	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure—High	≤ 1.54 psig	≤ 1.6 psig
d. Pressurizer Pressure--Low	≥ 1870 psig	≥ 1864.8 psig
e. Deleted		
f. Steam Line Pressure—Low	≥ 600 psig steam line pressure (Note 1)	≥ 592.2 psig steam line pressure (Note 1)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
2. CONTAINMENT SPRAY		
a. Manual Initiation	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure--High-High	~~≤~~2.81 psig	≤ 2.9 psig
3. CONTAINMENT ISOLATION		
a. Phase "A" Isolation		
1. Manual	Not Applicable	Not Applicable
2. From Safety Injection Automatic Actuation logic	Not Applicable	Not Applicable
b. Phase "B" Isolation		
1. Manual	Not Applicable	Not Applicable
2. Automatic Actuation Logic	Not Applicable	Not Applicable
3. Containment Pressure--High-High	~~≤~~2.81 psig	≤ 2.9 psig
c. Containment Ventilation Isolation		
1. Manual	Not Applicable	Not Applicable
2. Automatic Isolation Logic	Not Applicable	Not Applicable

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
3. Containment Purge Air Exhaust Monitor Radioactivity-High	$\leq 8.5 \times 10^{-3}$ μCi/cc	$\leq 8.5 \times 10^{-3}$ μCi/cc
4. STEAM LINE ISOLATION		
a. Manual	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure--High-High	≤ 2.81 psig	≤ 2.9 psig
d. Steam Line Pressure--Low	≥ 600 psig steam line pressure (Note 1)	≥ 592.2 psig steam line pressure (Note 1)
e. Negative Steam Line Pressure Rate—High	≤ 100.0 psi (Note 2)	≤ 107.8 psi (Note 2)
5. TURBINE TRIP AND FEEDWATER ISOLATION		
a. Steam Generator Water level– High-High	≤ 81% of narrow range instrument span each steam generator	≤ 81.7% of narrow range instrument span each steam generator
b. Automatic Actuation Logic	N.A.	N.A.

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
6. AUXILIARY FEEDWATER		
a. Manual	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Main Steam Generator Water Level--Low-Low		
i. RCS Loop ΔT Equivalent to Power ≤ 50% RTP	RCS Loop ΔT variable input ≤ 50% RTP	RCS Loop ΔT *nominal* ⇓ ~~variable input~~ ≤ trip setpoint +2.5% RTP
Coincident with Steam Generator Water Level-- Low-Low (Adverse) and	≥ 15.0% of narrow range instrument span	≥14.4% of narrow range instrument span
Containment Pressure-EAM or	≤ 0.5 psig	≤ 0.6 psig
Steam Generator Water Level--Low-Low (EAM) with	≥ 10.7% of narrow range instrument span	≥ 10.1% of narrow instrument span
A time delay (T_S) if one Steam Generator is affected or	≤ T_S (Note 5, Table 2.2-1)	≤ (1.01) T_S (Note 5, Table 2.2-1)
A time delay (T_m) if two or more Steam Generators are affected	≤ T_m (Note 5, Table 2.2-1)	≤ (1.01) T_m (Note 5, Table 2.2-1)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
ii. RCS Loop ΔT Equivalent to Power > 50% RTP		
Coincident with Steam Generator Water Level-- Low-Low (Adverse) and	≥ 15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
Containment Pressure (EAM) or	≤ 0.5 psig	≤ 0.6 psig
Steam Generator Water Level-- Low-Low (EAM)	≥ 10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument span
d. S.I.	See 1 above (all SI Setpoints)	
e. Loss of Power Start		
1. Voltage Sensors	≥ 5520 volts	≥ 5331 volts
2. Load Shed Timer	1.25 seconds	⇓ ***≥ 1.00 second and ≤ 1.50*** ~~1.25 ±0.25~~ seconds
f. Trip of Main Feedwater Pumps	N.A.	N.A.
g. Auxiliary Feedwater Suction Pressure-Low	≥ 3.21 psig (motor driven pump) ≥ 13.9 psig (turbine driven (pump)	≥ 2.44 psig (motor driven pump) ≥ 12 psig (turbine driven pump)
h. Auxiliary Feedwater Suction Transfer Time Delays	4 seconds (motor driven pump)	***≤ 4.4 seconds*** ***≥ 3.6 seconds*** ~~4 seconds +0.4~~ (motor driven pump) ~~seconds~~
	5.5 seconds (turbine driven pump)	***≤ 6.05 seconds*** ***≥ 4.95 seconds*** ~~5.5 seconds +0.55 seconds~~(turbine driven pump)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
7. LOSS OF POWER		
a. 6.9 kv Shutdown Board Undervoltage		
Loss of Voltage		
1. Voltage Sensors	~~≥~~5520 volts	≥ 5331 volts
2. Diesel Generator Start and Load Shed Timer	1.25 seconds	⇓ ***≥ 1.00 seconds and ≤1.50*** ~~1.25 ± 0.25~~ seconds
b. 6.9 kv Shutdown Board-Degraded Voltage		
1. Voltage Sensors	6456 volts	≥ 6403.5 volts (dropout) ≤ 6595.5 volts (reset)
2. Diesel Generator Start and Load Shed Timer	~~≤~~300 seconds	≤ 370 seconds
3. SI/Degraded Voltage Logic Enable Timer	9.5 seconds	⇓ ***≥ 7.5 seconds and ≤ 11.5*** ~~9.5 ± 2.0~~ seconds
8. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS		
a. Pressurizer Pressure		
1. Not P-11, Automatic Unblock of Safety Injection on Increasing Pressure	~~≤~~1970 psig	≤ 1975.2 psig
2. P-11, Enable Manual Block of Safety Injection on Decreasing Pressure	~~≥~~1962 psig	≥ 1956.8 psig

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
8. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS (Continued)		
b. Deleted		
c. Deleted		
d. Steam Generator Level Turbine Trip, Feedwater Isolation P-14	(See 5. above)	
9. AUTOMATIC SWITCHOVER TO CONTAINMENT SUMP		
a. RWST Level - Low	130" from tank base	***≤132.71" from tank base*** ⇓ ***≥127.29"*** ~~130" ± 2.71"~~ from tank base
COINCIDENT WITH Containment Sump Level - High	30" above elev. 680'	***≤31.68" above elev. 680'*** ⇓ ***≥28.32"*** ~~30" ± 1.68"~~ above elev. 680'
AND Safety Injection	(See 1 above for all Safety Injection Setpoints/Allowable Values)	
b. Automatic Actuation Logic	N.A.	N.A.

Note 1: Time constants utilized in the lead-lag controller for Steam Pressure - Low are $\tau_1 \geq 50$ seconds and $\tau_2 \leq 5$ seconds.

Note 2: Time constant utilized in the rate-lag controller for Negative Steam Line Pressure Rate - High is $\tau \geq 50$ seconds.

TABLE 3.3-6

RADIATION MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	MEASUREMENT RANGE	ACTION
1. AREA MONITOR					
a. Fuel Storage Pool Area	1	*	⇓ 151 $\leq$ ~~200~~ mR/hr	10^{-1} - 10^{4} mR/hr	26
2. PROCESS MONITORS					
a. Containment Purge Air	1	1, 2, 3, 4 & 6	$\leq 8.5 \times 10^{-3}$ µCi/cc	10 - 10^{7} cpm	28
b. Containment					
i. Gaseous Activity					
RCS Leakage Detection	1	1, 2, 3 & 4	N/A	10 - 10^{7} cpm	27
ii. Particulate Activity					
RCS Leakage Detection	1	1, 2, 3 & 4	N/A	10 - 10^{7} cpm	27
c. Control Room Isolation	2	ALL MODES and during movement of irradiated fuel assemblies	$\leq$ 400 cpm**	10 - 10^{7} cpm	29

* With fuel in the storage pool or building

** Equivalent to 1.0×10^{-5} µCi/cc.

3/4.3 INSTRUMENTATION

BASES

3/4.3.1 and 3/4.3.2 PROTECTIVE AND ENGINEERED SAFETY FEATURES (ESF) INSTRUMENTATION

The OPERABILITY of the protective and ESF instrumentation systems and interlocks ensure that 1) the associated ESF action and/or reactor trip will be initiated when the parameter monitored by each channel or combination thereof reaches its ⇓ *nominal trip* setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available for protective and ESF purposes from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundancy and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the accident analyses.

Add Insert 3

The Engineered Safety Features System interlocks perform the functions indicated below on increasing the required parameter, consistent with ~~the setpoints listed~~ ⇑ *nominal trip* in Table 3.3-4:

P-11 Defeats the manual block of safety injection actuation on low pressurizer pressure.

P-14 Trip of all feedwater pumps, turbine trip, closure of feedwater isolation valves and inhibits feedwater control valve modulation.

On decreasing the required parameter the opposite function is performed at reset setpoints.

The surveillance requirements specified for these systems ensure that the overall system functional capability is maintained comparable to the original design standards. The periodic surveillance tests performed at the minimum frequencies are sufficient to demonstrate this capability.

The surveillance for the comparison of the incore to the excore Axial Flux Difference is required only when reactor power is ≥ 15 percent. The 96 hour delay in the first performance of the surveillance after reaching 15 percent reactor thermal power (RTP), following a refueling outage, is to achieve a higher power level and approach Xenon stability. The surveillance is typically performed when the RTP is ≥ 30 percent to ensure the results of the evaluation are more accurate and the adjustments more reliable. The frequency of 31 EFPD is to allow slow changes in neutron flux to be better detected during the fuel cycle.

2.2 LIMITING SAFETY SYSTEM SETTINGS

REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS

2.2.1 The reactor trip system instrumentation and interlocks setpoints shall be set consistent with the Trip Setpoint values shown in Table 2.2-1.
⇑ *Nominal*

APPLICABILITY: As shown for each channel in Table 3.3-1.

ACTION:

With a reactor trip system instrumentation or interlock setpoint less conservative than the value shown in the Allowable Values column of Table 2.2-1, declare the channel inoperable and apply the applicable ACTION statement requirement of Specification 3.3.1 until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with the Trip Setpoint value.
⇑ *Nominal*

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓NOMINAL TRIP SETPOINT	ALLOWABLE VALUES
1. Manual Reactor Trip	Not Applicable	Not Applicable
2. Power Range Neutron Flux	Low Setpoint ≤ 25% of RATED THERMAL POWER High Setpoint ≤ 109% of RATED THERMAL POWER	Low Setpoint - ≤ 27.4% of RATED THERMAL POWER High Setpoint - ≤ 111.4% of RATED THERMAL POWER
3. Power Range Neutron Flux High Positive Rate	≤ 5% of RATED THERMAL POWER with a time constant ≥ 2 second	≤ 6.3% of RATED THERMAL POWER with a time constant ≥ 2 second
4. Power Range Neutron Flux, High Negative Rate	≤ 5% of RATED THERMAL POWER with a time constant ≥ 2 second	≤ 6.3% of RATED THERMAL POWER with a time constant ≥ 2 second
5. Intermediate Range, Neutron Flux	≤ 25% of RATED THERMAL POWER	≤ 45.20% of RATED THERMAL POWER
6. Source Range Neutron Flux	≤ 10^5 counts per second	≤ 1.45×10^5 counts per second
7. Overtemperature ΔT	See Note 1	See Note 3
8. Overpower ΔT	See Note 2	See Note 4
9. Pressurizer Pressure--Low	≥ 1970 psig	≥ 1964.8 psig
10. Pressurizer Pressure--High	≤ 2385 psig	≤ 2390.2 psig
11. Pressurizer Water Level--High	≤ 92% of instrument span	≤ 92.7% of instrument span
12. Loss of Flow	≥ 90% of design flow per loop*	≥ 89.6% of design flow per loop*

*Design flow is 90,045 (87,000 X 1.035) gpm per loop.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓NOMINAL TRIP SETPOINT	ALLOWABLE VALUES
13. Steam Generator Water Level--Low-Low		
a. RCS Loop ΔT Equivalent to Power ≤ 50% RTP	RCS Loop ΔT variable ~~input ≤~~ 50% RTP	~~RCS Loop ΔT variable input~~ ≤ trip setpoint ~~+~~2.5% RTP ⇑ nominal
Coincident with Steam Generator Water Level--Low-Low (Adverse)	~~≥~~15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
and Containment Pressure (EAM)	~~≤~~0.5 psig	≤ 0.6 psig
or Steam Generator Water Level--Low-Low (EAM)	~~≥~~10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument span
With A time delay (T_S) if one Steam Generator is affected	~~≤~~T_S (Note 5)	≤ (1.01) T_S (Note 5)
or A time delay (T_m) if two or more Steam Generators are affected	~~≤~~T_M Note 5)	≤ (1.01)T_M (Note 5)

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	NOMINAL TRIP SETPOINT	ALLOWABLE VALUES
b. RCS Loop ΔT Equivalent to Power > 50% RTP		
Coincident with Steam Generator Water Level--Low-Low(Adverse) and	~~≥~~15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
Containment Pressure (EAM)	~~≤~~0.5 psig	≤ 0.6 psig
or		
Steam Generator Water Level--Low-Low (EAM)	~~≥~~10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument span
14. Deleted		
15. Undervoltage-Reactor Coolant Pumps	~~≥~~5022 volts-each bus	≥ ~~4739~~ 4952 volts - each bus
16. Underfrequency-Reactor Coolant Pumps	~~≥ 56~~ 57.0 Hz - each bus	≥ ~~55.9~~ 56.3 Hz - each bus
17. Turbine Trip		
A. Low Trip System Pressure	~~≥~~45 psig	≥ 43 psig
B. Turbine Stop Valve Closure	~~≥~~1% open	> 1% open
18. Safety Injection Input from ESF	Not Applicable	Not Applicable

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	*NOMINAL* TRIP SETPOINT	~~ALLOWABLE~~ VALUES
19. Intermediate Range Neutron Flux, P-6, Enable Block Source Range Reactor Trip	≥ 1 x ~~10^{-5}~~ 10^{-4} % of RATED THERMAL POWER	≥ 6 x ~~10^{-6}~~ 10^{-5} % of RATED THERMAL POWER
20. Power Range Neutron Flux (not P-10) Input to Low Power Reactor Trips Block P-7	≤ 10% of RATED THERMAL POWER	≤ 12.4% of RATED THERMAL POWER
21. Turbine Impulse Chamber Pressure -(P-13) Input to Low Power Reactor Trips Block P-7	≤ 10% Turbine Impulse Pressure Equivalent	≤ 12.4% Turbine Impulse Pressure Equivalent
22. Power Range Neutron Flux - (P-8) Low Reactor Coolant Loop Flow, and Reactor Trip	≤ 35% of RATED THERMAL POWER	≤ 37.4% of RATED THERMAL POWER
23. Power Range Neutron Flux - (P-10) - Enable block of Source, Intermediate, and Power Range (low setpoint) Reactor Trips	≥ 10% of RATED THERMAL POWER	≥ 7.6% of RATED THERMAL POWER
24. Reactor Trip P-4	Not Applicable	Not Applicable
25. Power Range Neutron Flux - (P-9) Blocks Reactor Trip for Turbine - Trip Below 50% Rated Power	≤ 50% of RATED THERMAL POWER	≤ 52.4% of RATED THERMAL POWER

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION

NOTE 1:

$$\text{Overtemperature } \Delta T \left(\frac{1+\tau_4 S}{1+\tau_5 S}\right) \leq \Delta T_0 \left\{K_1 - K_2\left(\frac{1+\tau_1 S}{1+\tau_2 S}\right)[T - T'] + K_3(P - P') - f_1(\Delta I)\right\}$$

Where:

$\frac{1+\tau_4 S}{1+\tau_5 S}$	=	Lead-lag compensator on measured ΔT
τ_4, τ_5	=	Time constants utilized in the lead-lag controller for ΔT, $\tau_4 \geq 5$ secs, $\tau_5 \leq 3$ sec.
ΔT_0	=	Indicated ΔT at RATED THERMAL POWER
K_1	$\leq$	1.15
K_2	$\geq$	0.011
$\frac{1+\tau_1 S}{1+\tau_2 S}$	=	The function generated by the lead-lag controller for T_{avg} dynamic compensation
τ_1, & τ_2	=	Time constants utilized in the lead-lag controller for T_{avg}, $\tau_1 \geq 33$ secs., $\tau_2 \leq 4$ secs.
T	=	Average temperature °F
T'	$\leq$	578.2°F (~~Nominal~~ T_{avg} at RATED THERMAL POWER)
K_3	=	0.00055
P	=	Pressurizer pressure, psig
P'	=	2235 psig (Nominal RCS operating pressure)

TABLE 2.2-1 (Continued)
REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

NOTE 1: (Continued)

S = Laplace transform operator (sec^{-1})

and f_1 (ΔI) is a function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that:

(i) for q_t - q_b between QTNL* and QTPL* f_1 (ΔI) = 0 (where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and q_t + q_b is total THERMAL POWER in percent of RATED THERMAL POWER).

(ii) ⇓ *nominal*
for each percent that the magnitude of (q_t - q_b) exceeds QTNL*, the ΔT trip set point shall be automatically reduced by QTNS* of its value at RATED THERMAL POWER.

(iii) ⇓ *nominal*
for each percent that the magnitude of (q_t - q_b) exceeds QTPL*, the ΔT trip set-point shall be automatically reduced by QTPS* of its value at RATED THERMAL POWER.

NOTE 2:

Overpower $$\Delta T\left(\frac{1+\tau_4 S}{1+\tau_5 S}\right) \leq \Delta T_0 \left\{K_4 - K_5\left(\frac{\tau_3 S}{1+\tau_3 S}\right) T - K_6\ (T - T'') - f_2\ (\Delta I)\right\}$$

Where: $\frac{1+\tau_4 S}{1+\tau_5 S}$ = as defined in Note 1

* QTNL, QTPL, QTNS, and QTPS are specified in the COLR per Specification 6.9.1.14.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS
NOTATION (Continued)

NOTE 2: (Continued)

τ_4, τ_5	=	as defined in Note 1
ΔT_0	=	as defined in Note 1
K_4	≤	1.087
K_5	≥	0.02/°F for increasing average temperature and 0 for decreasing average temperature
$\frac{\tau_3 S}{1 + \tau_3 S}$	=	The function generated by the rate-lag controller for T_{avg} dynamic compensation
τ_3	=	Time constant utilized in the rate-lag controller for T_{avg}, $\tau_3 \geq$ 10 secs.
K_6	≥	0.0011 for $T > T''$ and $K_6 \geq 0$ for $T \leq T''$
T	=	as defined in Note 1
T"	=	Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 578.2°F)
S	=	as defined in Note 1

and $f_2(\Delta I)$ is a function of the indicated difference between top and bottom detectors of the power-range nuclear ion chambers; with gains to be selected based on measured instrument response during plant startup tests such that:

(i) for $q_t - q_b$ between QPNL* and QPPL* $f_2(\Delta I) = 0$ (where q_t and q_b are percent RATED THERMAL POWER in the top and bottom halves of the core respectively, and $q_t + q_b$ is total THERMAL POWER in percent of RATED THERMAL POWER).

(ii) for each percent that the magnitude of $(q_t - q_b)$ exceeds QPNL* the $\Downarrow$ *nominal* ΔT trip setpoint shall be automatically reduced by QPNS* of its value at RATED THERMAL POWER.

(iii) for each percent that the magnitude of $(q_t - q_b)$ exceeds QPPL* the $\Downarrow$ *nominal* ΔT trip setpoint shall be automatically reduced by QPPS* of its value at RATED THERMAL POWER.

*QPNL, QPPL, QPNS, and QPPS are specified in the COLR per Specification 6.9.1.14.

TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

NOTATION (Continued)

nominal ⇓ ⇓ *set*

NOTE 3: The channel's maximum trip setpoint shall not exceed its computed trip point by more than 1.9 percent ΔT span.

nominal ⇓

NOTE 4: The channel's maximum trip setpoint shall not exceed its computed trip setpoint by more than 1.7 percent ΔT span.

NOTE 5: Trip Time Delay - Steam Generator Water Level--Low-Low

$T_s = \{(-0.00583)(P)^3 + (0.735)(P)^2 - (33.560)(P) + 649.5\}\{0.99\}$ secs.

$T_m = \{(-0.00532)(P)^3 + (0.678)(P)^2 - (31.340)(P) + 589.5\}\{0.99\}$ secs.

Where:

P = RCS Loop ΔT Equivalent to Power (% RTP), $P \leq 50\%$ RTP

T_s = Time delay for Steam Generator Water Level--Low-Low Reactor Trip, one Steam Generator affected (secs).

T_m = Time delay for Steam Generator Water Level--Low-Low Reactor Trip, two or more Steam Generators affected (secs).

SAFETY LIMITS

BASES

2.1.1 REACTOR CORE (Continued)

These limiting heat flux conditions are higher than those calculated for the range of all control rods fully withdrawn to the maximum allowable control rod insertion assuming the axial power imbalance is within the limits of the f_1(delta I) function of the Overtemperature Delta T trip. When the axial power imbalance is not within the tolerance, the axial power imbalance effect on the Overtemperature delta T trips will reduce the setpoints to provide protection consistent with core safety limits.

2.1.2 REACTOR COOLANT SYSTEM PRESSURE

The restriction of this Safety Limit protects the integrity of the Reactor Coolant System from overpressurization and thereby prevents the release of radionuclides contained in the reactor coolant from reaching the containment atmosphere.

The reactor pressure vessel and pressurizer are designed to Section III of the ASME Code for Nuclear Power Plant which permits a maximum transient pressure of 110% (2735 psig) of design pressure. The Reactor Coolant System piping, valves and fittings, are designed to ANSI B 31.1 1967 Edition, which permits a maximum transient pressure of 120% (2985 psig) of component design pressure. The Safety Limit of 2735 psig is therefore consistent with the design criteria and associated code requirements.

The entire Reactor Coolant System is hydrotested at 3107 psig, 125% of design pressure, to demonstrate integrity prior to initial operation.

2.2.1 REACTOR TRIP SYSTEM INSTRUMENTATION SETPOINTS

⇓ Nominal

The Reactor Trip Setpoint Limits specified in Table 2.2-1 are the values at which the

⇓ Nominal

Reactor Trips are set for each functional unit. The Trip Setpoints have been selected to ensure that the reactor core and reactor coolant system are prevented from exceeding their safety limits during normal operation and design basis anticipated operational occurrences and to assist the Engineered Safety Features Actuation System in mitigating the consequences of accidents.

⇓ Nominal

Operation with a trip set less conservative than its Trip Setpoint but within its specified Allowable

Nominal ⇓

Value is acceptable on the basis that the difference between each Trip Setpoint and the Allowable Value is equal to or less than the ~~drift~~ allowance assumed for each trip in the safety analyses.

⇑ rack

Add Insert 1

Add Insert 2

INSTRUMENTATION

3/4.3.2 ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.2 The Engineered Safety Feature Actuation System (ESFAS) instrumentation channels and interlocks shown in Table 3.3-3 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4.
⇑ *Nominal*

APPLICABILITY: As shown in Table 3.3-3.

ACTION:

a. With an ESFAS instrumentation channel or interlock trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3-4, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.3-3 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with the Trip Setpoint value.
⇑ *Nominal*

b. With an ESFAS instrumentation channel or interlock inoperable, take the ACTION shown in Table 3.3-3.

SURVEILLANCE REQUIREMENTS

4.3.2.1.1 Each ESFAS instrumentation channel and interlock shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations for the MODES and at the frequencies shown in Table 4.3-2.

4.3.2.1.2 The logic for the interlocks shall be demonstrated OPERABLE during the automatic actuation logic test. The total interlock function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each channel affected by interlock operation.

4.3.2.1.3 The ENGINEERED SAFETY FEATURES RESPONSE TIME of each ESFAS function shall be verified to be within the limit at least once per 18 months. Each verification shall include at least one train such that both trains are verified at least once per 36 months and one channel per function such that all channels are verified at least once per N times 18 months where N is the total number of redundant channels in a specific ESFAS function as shown in the "Total No. of Channels" Column of Table 3.3-3.

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
e. Loss of Power Start					
1. Voltage Sensors	3/shutdown board**	2/shutdown board**	3/shutdown board**	1, 2, 3	35
2. Load Shed Timer	2/shutdown board**	1/shutdown board**	⇓ 1 ~~2~~/shutdown board**	1, 2, 3	35
f. Trip of Main Feedwater Pumps Start Motor-Driven Pumps and Turbine Driven Pump	1/pump	1/pump	1/pump	1, 2	20*
g. Auxiliary Feedwater Suction Pressure-Low	3/pump	2/pump	3/pump	1, 2, 3	21*
h. Auxiliary Feedwater Suction Transfer Time Delays					
1. Motor-Driven Pump	1/pump	1/pump	1/pump	1, 2, 3	21*
2. Turbine-Driven Pump	2/pump	1/pump	2/pump	1, 2, 3	21*

** Unit 2 Shutdown Boards Only

TABLE 3.3-3 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	TOTAL NO. OF CHANNELS	CHANNELS TO TRIP	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ACTION
7. LOSS OF POWER					
a. 6.9 kv Shutdown Board --Loss of Voltage					
1. Voltage Sensors	3/shutdown board	2/shutdown board	3/shutdown board	1, 2, 3, 4, $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
2. Diesel Generator Start and Load Shed Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4, $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
b. 6.9 kv Shutdown Board Degraded Voltage					
1. Voltage Sensors	3/shutdown board	2/shutdown board	3/shutdown board	1, 2, 3, 4, $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
2. Diesel Generator Start and Load Shed Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4, $5^{\#\#\#\#}$, $6^{\#\#\#\#}$	34
3. SI/Degraded Voltage Logic Enable Timer	2/shutdown board	1/shutdown board	⇓ 1 ~~2~~/shutdown board	1, 2, 3, 4	34

ACTION 21 - With less than the Minimum Number of Channels OPERABLE, declare the associated auxiliary feedwater pump inoperable, and comply with the ACTION requirements of Specification 3.7.1.2.

ACTION 22- With less than the Minimum Number of Channels OPERABLE, declare the interlock inoperable and verify that all affected channels of the functions listed below are OPERABLE or apply the appropriate ACTION statement(s) for those functions. Functions to be evaluated are:

a. Safety Injection
   Pressurizer Pressure
   Steam Line Pressure
   Negative Steam Line Pressure Rate

b. Deleted

c. Turbine Trip
   Steam Generator Level High-High
   Feedwater Isolation
   Steam Generator Level High-High

ACTION 23 - With the number of OPERABLE channels one less than the Total Number of Channels, be in at least HOT STANDBY within 6 hours and in at least HOT SHUTDOWN within the following 6 hours; however, one channel may be bypassed for up to 2 hours for surveillance testing per Specification 4.3.2.1.1.

ACTION 24 - With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within 6 hours and in at least HOT SHUTDOWN within the following 6 hours.

ACTION 25- With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or declare the associated valve inoperable and take the ACTION required by Specification 3.7.1.5.

ACTION 34 - a. With the number of OPERABLE channels one less than the Total Number of
⇓ for voltage sensors
Channels, restore the inoperable channel to OPERABLE status within 6 hours or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated diesel generator set made inoperable by the channel.

b. With the number of OPERABLE channels less than the Total Number of Channels by
⇓ for voltage sensors or timers
more than one, restore all but one channel to OPERABLE status within 1 hour or enter applicable Limiting Condition(s) For Operation and Action(s) for the associated diesel generator set made inoperable by the channels.

TABLE 3.3-3 (Continued)

ACTION 35 - a. With the ~~number of OPERABLE~~ channels one less than the Total Number of ⇓ *for voltage sensors* Channels, restore the inoperable channel to OPERABLE status within 6 hours or enter applica~~ble Limiting Condi~~tion(s) For Operation and Action(s) for the associated auxiliary feedwater pump made inoperable by the channel.

b. With the number of OPERABLE ~~channels less than the Total Number of~~ ⇓ *for voltage sensors or timers* Channels by more than one, restore all but one channel to OPERABLE status within 1 hour or enter applicable ~~Limiting Condition(s) For Operation and~~ Action(s) for the associated auxiliary feedwater pump made inoperable by the channels.

ACTION 36 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied:

a. The inoperable channel is placed in the tripped condition within 6 hours.

b. For the affected protection set, the Trip Time Delay for one affected steam generator (T_S) is adjusted to match the Trip Time Delay for multiple affected steam generators (T_M) within 4 hours.

c. The Minimum Channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to 4 hours for surveillance testing of other channels per Specification 4.3.2.1.1.

ACTION 37 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided that within 6 hours, for the affected protection set, the Trip Time Delays (T_S and T_M) threshold power level for zero seconds time delay is adjusted to 0% RTP.

ACTION 38 - With the number of OPERABLE channels one less than the Total Number of Channels, STARTUP and/or POWER OPERATION may proceed provided that within 6 hours, for the affected protection set, the Steam Generator Water Level - Low-Low (EAM) channels trip setpoint is adjusted to the same value as Steam Generator Water Level - Low-Low (Adverse).

TABLE 3.3-4

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
1. SAFETY INJECTION, TURBINE TRIP AND FEEDWATER ISOLATION		
a. Manual Initiation	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure--High	~~≤~~1.54 psig	≤1.6 psig
d. Pressurizer Pressure--Low	~~≥~~1870 psig	≥1864.8 psig
e. Deleted		
f. Steam Line Pressure--Low	~~≥~~600 psig steam line pressure (Note 1)	≥592.2 psig steam line pressure (Note 1)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
2. CONTAINMENT SPRAY		
a. Manual Initiation	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure--High-High	~~≤~~2.81 psig	≤2.9 psig
3. CONTAINMENT ISOLATION		
a. Phase "A" Isolation		
1. Manual	Not Applicable	Not Applicable
2. From Safety Injection Automatic Actuation logic	Not Applicable	Not Applicable
b. Phase "B" Isolation		
1. Manual	Not Applicable	Not Applicable
2. Automatic Actuation Logic	Not Applicable	Not Applicable
3. Containment Pressure--High-High	~~≤~~2.81 psig	≤2.9 psig
c. Containment Ventilation Isolation		
1. Manual	Not Applicable	Not Applicable
2. Automatic Isolation Logic	Not Applicable	Not Applicable

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
3. Containment Purge Air Exhaust Monitor Radioactivity - High	$\leq 8.5 \times 10^{-3}$ μCi/cc	$\leq 8.5 \times 10^{-3}$ μCi/cc
4. STEAM LINE ISOLATION		
a. Manual	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Containment Pressure--High-High	≤2.81 psig	≤2.9 psig
d. Steam Line Pressure--Low	≥600 psig steam line pressure (Note 1)	≥592.2 psig steam line pressure (Note 1)
e. Negative Steam Line Pressure Rate--High	≤100.0 psi (Note 2)	≤107.8 psi (Note 2)
5. TURBINE TRIP AND FEEDWATER ISOLATION		
a. Steam Generator Water level -- High-High	≤81% of narrow range instrument span each steam generator	≤81.7% of narrow range instrument span each steam generator
b. Automatic Actuation Logic	N.A.	N.A.

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
6. AUXILIARY FEEDWATER		
a. Manual	Not Applicable	Not Applicable
b. Automatic Actuation Logic	Not Applicable	Not Applicable
c. Main Steam Generator Water Level--Low-Low		
i. RCS Loop ΔT Equivalent to Power ≤50% RTP	RCS Loop ΔT variable input ≤ 50% RTP	RCS Loop ΔT variable ⇓ ***nominal*** input ≤ trip setpoint ~~+2.5% RTP~~
Coincident with Steam Generator Water Level--Low-Low (Adverse) and	~~≥~~15.0% of narrow range instrument span	≥14.4% of narrow range instrument span
Containment Pressure-EAM	~~≤~~0.5 psig	≤0.6 psig
or		
Steam Generator Water Level--Low-Low (EAM)	~~≥~~10.7% of narrow range instrument span	≥10.1% of narrow instrument span
with		
A time delay (T_S) if one Steam Generator is affected	~~≤~~T_S (Note 5, Table 2.2-1)	≤ (1.01) T_S (Note 5, Table 2.2-1)
or		
A time delay (T_M) if two or more Steam Generators are affected	~~≤~~T_M (Note 5, Table 2.2-1)	≤ (1.01) T_M (Note 5, Table 2.2-1)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
ii. RCS Loop ΔT Equivalent to Power > 50% RTP		
Coincident with Steam Generator Water Level--Low-Low (Adverse)	~~≥~~15.0% of narrow range instrument span	≥14.4% of narrow range instrument span
and		
Containment Pressure (EAM)	~~≤~~0.5 psig	≤0.6 psig
or		
Steam Generator Water Level--Low-Low (EAM)	~~≥~~10.7% of narrow range instrument span	≥10.1% of narrow range instrument span
d. S.I.	See 1 above (all SI Setpoints)	
e. Loss of Power Start		
1. Voltage Sensors	~~≥~~5520 volts	≥ 5331 volts
2. Load Shed Timer	1.25 seconds	⇓***≥1.00 second and ≤1.50*** ~~1.25 ±0.25~~ seconds
f. Trip of Main Feedwater Pumps	N.A.	N.A.
g. Auxiliary Feedwater Suction Pressure-Low	~~≥~~3.21 psig (motor driven pump) ~~≥~~13.9 psig (turbine driven pump)	≥ 2.44 psig (motor driven pump) ≥ 12 psig (turbine driven pump)
h. Auxiliary Feedwater Suction Transfer Time Delays	4 seconds (motor driven pump)	***≤4.4 seconds*** ***≥3.6 seconds*** ~~4 seconds +0.4~~ (motor driven pump) ~~seconds~~
	5.5 seconds (turbine driven pump)	***≤6.05 seconds*** ***≥4.95 seconds*** ~~5.5 seconds +0.55 seconds~~(turbine driven pump)

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓***NOMINAL*** TRIP SETPOINT	ALLOWABLE VALUES
7. LOSS OF POWER		
a. 6.9 kv Shutdown Board Undervoltage Loss of Voltage		
1. Voltage Sensors	~~≥~~5520 volts	≥ 5331 volts
2. Diesel Generator Start and Load Shed Timer	1.25 seconds	⇓ ***≥ 1.00 seconds and ≤ 1.50*** ~~1.25 ± 0.25~~ seconds
b. 6.9 kv Shutdown Board-Degraded Voltage		
1. Voltage Sensors	6456 volts	≥ 6403.5 volts (dropout) ≤ 6595.5 volts (reset)
2. Diesel Generator Start and Load Shed Timer	~~≤~~300 seconds	≤ 370 seconds
3. SI/Degraded Voltage Logic Enable Timer	9.5 seconds	⇓ ***≥ 7.5 seconds and ≤ 11.5*** ~~9.5 ± 2.0~~ seconds
8. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS		
a. Pressurizer Pressure		
1. Not P-11, Automatic Unblock of Safety Injection on Increasing Pressure	~~≤~~1970 psig	≤1975.2 psig
2. P-11, Enable Manual Block of Safety Injection on Decreasing Pressure	~~≥~~1962 psig	≥1956.8 psig

TABLE 3.3-4 (Continued)

ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	⇓*NOMINAL* TRIP SETPOINT	ALLOWABLE VALUES
8. ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INTERLOCKS (Continued)		
b. Deleted		
c. Deleted		
d. Steam Generator Level Turbine Trip, Feedwater Isolation P-14	(See 5. above)	
9. AUTOMATIC SWITCHOVER TO CONTAINMENT SUMP		
a. RWST Level - Low COINCIDENT WITH	130" from tank base	***≤132.71" from tank base*** ⇓ ***≥127.29"*** ~~130" ± 2.71"~~ from tank base
Containment Sump Level - High	30" above elev. 680'	***≤31.68" above elev. 680'*** ⇓ ***≥28.32"*** ~~30" ± 1.68"~~ above elev. 680'
AND Safety Injection	(See 1 above for all Safety Injection Setpoints/Allowable Valves)	
b. Automatic Actuation Logic	N.A.	N.A.

Note 1: Time constants utilized in the lead-lag controller for Steam Pressure-Low are $\tau_1 \geq 50$ seconds and $\tau_2 \leq 5$ seconds.

Note 2: Time constant utilized in the rate-lag controller for Negative Steam Line Pressure Rate-High is $\tau_1 \geq 50$ seconds.

TABLE 3.3-6
RADIATION MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABLE MODES	ALARM/TRIP SETPOINT	MEASUREMENT RANGE	ACTION
1. AREA MONITOR					
a. Fuel Storage Pool Area	1	*	⇓ 151 ≤~~200~~ mR/hr	10^{-1} - 10^{4} mR/hr	26
2. PROCESS MONITORS					
a. Containment Purge Air	1	1, 2, 3, 4 & 6	≤8.5×10^{-3} μCi/cc	10 - 10^{7} cpm	28
b. Containment					
i. Gaseous Activity					
RCS Leakage Detection	1	1, 2, 3 & 4	N/A	10 - 10^{7} cpm	27
ii. Particulate Activity					
RCS Leakage Detection	1	1, 2, 3 & 4	N/A	10 - 10^{7} cpm	27
c. Control Room Isolation	2	ALL MODES and during movement of irradiated fuel assemblies	≤ 400 cpm**	10 - 10^{7} cpm	29

* With fuel in the storage pool or building

** Equivalent to 1.0×10^{-5} μCi/cc.

3/4.3.1 and 3/4.3.2 REACTOR TRIP AND ENGINEERED SAFETY FEATURE ACTUATION SYSTEM INSTRUMENTATION

The OPERABILITY of the Reactor Trip and Engineered Safety Features Actuation Systems instrumentation and interlocks ensure that 1) the associated action and/or reactor ~~trip~~ will

nominal trip ⇓

be initiated when the parameter monitored by each channel or combination thereof reaches its setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained ~~to permit a~~ channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available from diverse parameters.

The OPERABILITY of these systems is required to provide the overall reliability, redundancy and diversity assumed available in the facility design for the protection and mitigation of accident and transient conditions. The integrated operation of each of these systems is consistent with the assumptions used in the accident analyses. The surveillance requirements specified for these systems ensure that the overall system functional capability is maintained comparable to the original design standards. The periodic surveillance tests performed at the minimum frequencies are sufficient to demonstrate this capability.

Add Insert 3

The Engineered Safety Feature Actuation System interlocks ~~perform the~~ functions indicated below on increasing the required parameter, consistent ~~with the~~ setpoints listed in Table 3.3-4:

⇑ *nominal trip*

P-11 Defeats the manual block of safety injection actuation on low pressurizer pressure.

P-14 Trip of all feedwater pumps, turbine trip, closure of feedwater isolation valves and inhibits feedwater control valve modulation.

On decreasing the required parameter the opposite function is performed at reset setpoints.

The surveillance for the comparison of the incore to the excore Axial Flux Difference is required only when reactor power is ≥ 15 percent. The 96 hour delay in the first performance of the surveillance after reaching 15 percent reactor thermal power (RTP), following a refueling outage, is to achieve a higher power level and approach Xenon stability. The surveillance is typically performed when RTP is ≥ 30 percent to ensure the results of the evaluation are more accurate and the adjustments more reliable. The frequency of 31 EFPD is to allow slow changes in neutron flux to be better detected during the fuel cycle.