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10 CFR 50.90

GNRO-2019/00003

January 23, 2019

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

SUBJECT: Application to Revise Technical Specification (TS) 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," and TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation"

Grand Gulf Nuclear Station, Unit 1
NRC Docket No. 50-416
Renewed Facility Operating License No. NPF-29

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Entergy Operations, Inc. (Entergy) is submitting an application for amendment to the Renewed Facility Operating License NPF-29 for Grand Gulf Nuclear Station (GGNS) Unit 1.

The proposed amendment revises Technical Specification (TS) Table 3.3.1.1-1, "Reactor Protection System Instrumentation," Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low," and Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low," and TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation," Surveillance Requirement (SR) 3.3.4.1.2 and SR 3.3.4.1.3. The proposed change revises the Allowable Value (AV) for the Turbine Stop Valve Closure Trip Oil Pressure Function and Turbine Control Valve Fast Closure Trip Oil Pressure Function. Additionally, the proposed amendment adds new Notes to assess channel performance during testing that verifies instrument channel setting values established by the Entergy setpoint methodology.

The proposed change to the TS is due to the replacement of the pressure transmitters that sense Electrohydraulic Control (EHC) System pressure and provide signals to the Reactor Protection System (RPS). The pressure transmitters are being replaced in conjunction with the upgrade of the Turbine Control System that includes changing the EHC System from a low pressure system to a high pressure system. The changes to the AV are needed due to the higher EHC System operating pressure. Replacement of the pressure transmitters is needed to accommodate a modification to the EHC System while maintaining the function of transmitting the trip signal to the RPS.

The proposed change also incorporates Technical Specification Task Force (TSTF) Traveler TSTF-493-A, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," Option A for the affected turbine trip on low fluid oil pressure function setpoints only. The Entergy setpoint calculation procedure is based on Instrument Society of America (ISA) Standard 67.04 Part II, 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," and the General Electric Hitachi Instrument Setpoint Methodology specified in NEDC-31336P-A, "General Electric Instrument Setpoint Methodology." Notes are added that require the evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the AV, and the establishment of an appropriate as-found tolerance for each channel. These Notes are similar to TSTF-493-A, Notes 1 and 2.

The Enclosure to this letter provides an evaluation of the proposed change. Attachment 1 provides the existing TS page marked to show the proposed changes. Attachment 2 provides revised (clean) TS pages. Attachment 3 provides existing TS Bases pages marked to show the proposed changes for information only.

Approval of the proposed amendment is requested by January 31, 2020. The proposed TS changes are currently planned to be implemented in conjunction with the modification to the Turbine Control System in Refueling Outage 22 scheduled for Spring 2020. Once approved, the amendment shall be implemented within 90 days.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," a copy of this application, with attachments, is being provided to the designated Mississippi state official.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 23, 2019.

This letter contains no new regulatory commitments. If you have any questions or require additional information, please contact Douglas Neve at (601) 437-2103.

Sincerely,

Mandy K Halter

Mandy K. Halter

MKH/sgw/jls

Enclosure: Evaluation of the Proposed Change
Attachments

1. Proposed Technical Specification Changes (Mark-up)
2. Revised Technical Specification Pages (Clean)
3. Proposed Technical Specification Bases Changes (Mark-up) (For Information Only)

cc: NRC Regional Administrator, Region IV
NRC Senior Resident Inspector, Grand Gulf Nuclear Station, Unit 1
State Health Officer, Mississippi State Department of Health
NRC Project Manager, Grand Gulf Nuclear Station, Unit 1

Enclosure

GNRO-2019/00003

Evaluation of the Proposed Change

Grand Gulf Nuclear Station, Unit 1

(26 Pages)

Evaluation of the Proposed Change

Subject: Application to Revise Technical Specification 3.3.1.1, "Reactor Protection System (RPS) Instrumentation," Turbine Stop Valve Closure and Turbine Control Valve Fast Closure Functions and TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation"

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Renewed Facility Operating License No. NPF-29 for the Entergy Operations, Inc. (Entergy), Grand Gulf Nuclear Station (GGNS), Unit 1. The proposed amendment revises Technical Specification (TS) Table 3.3.1.1-1, "Reactor Protection System Instrumentation," Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low," and Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low," and TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation," Surveillance Requirement (SR) 3.3.4.1.2 and SR 3.3.4.1.3. The proposed change revises the Allowable Value (AV) for the Turbine Stop Valve Closure Trip Oil Pressure Function and Turbine Control Valve Fast Closure Trip Oil Pressure Function. Additionally, the proposed amendment adds new Notes to assess channel performance during testing that verifies instrument channel setting values established by Entergy setpoint methodology.

The proposed change to the TS is due to the replacement of the pressure transmitters that sense Electrohydraulic Control (EHC) System pressure and provide signals to the Reactor Protection System (RPS). The pressure transmitters are being replaced in conjunction with the upgrade of the Turbine Control System that includes changing the EHC System from a low pressure system to a high pressure system. The changes to the AV are needed due to the higher EHC System operating pressure. Replacement of the pressure transmitters is needed to accommodate a modification to the EHC System while maintaining the function of transmitting the trip signal to the RPS. With the exception of revised AVs, this change does not affect any RPS trip functions.

The proposed change also incorporates Technical Specification Task Force (TSTF) Traveler TSTF-493-A, Revision 4, "Clarify Application of Setpoint Methodology for LSSS Functions," Option A for the affected turbine trip on low fluid oil pressure function setpoints only. The Entergy setpoint calculation procedure is based on Instrument Society of America (ISA) Standard 67.04 Part II, 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation," and the General Electric Hitachi Instrument Setpoint Methodology specified in NEDC-31336P-A, "General Electric Instrument Setpoint Methodology." Notes are added that require the evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the AV, and the establishment of an appropriate as-found tolerance for each channel. These Notes are similar to TSTF-493-A, Notes 1 and 2.

2.0 DETAILED DESCRIPTION

2.1 <u>System Design and Operation</u>

The RPS is designed to provide timely protection against the onset and consequences of conditions that threaten the integrity of the fuel barrier and the reactor coolant pressure boundary barrier. Fuel damage is prevented by initiation of an automatic reactor shutdown if monitored nuclear system variables exceed pre-established limits of anticipated operation occurrences. Scram trip settings are selected and verified to be far enough above or below operating levels to provide proper protection but not be subject to spurious scrams. The RPS includes the high inertia motor-generator power system, sensors, bypass circuitry, and switches that signal the Control Rod System to scram and shut down the reactor. The scrams initiated by the Neutron Monitoring System variables (i.e., nuclear system high pressure, turbine stop valve (TSV) closure, turbine control valve (TCV) fast closure, main steam line isolation valve closure, and reactor vessel low water level) will prevent fuel damage following abnormal operational transients. Specifically, these process parameters initiate a scram in time to prevent the core from exceeding thermal-hydraulic safety limits during abnormal operational transients.

The RPS is comprised of two independent trip systems (i.e., A and B), with two logic channels in each trip system (i.e., logic channels A1 and A2, B1 and B2). The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch.

Two conditions which initiate reactor scram are TSV closure and TCV fast closure when reactor power is above a preselected percent of rated power.

The stop valve signal is generated before the turbine stop valves have closed more than 10 percent. This signal originates from pressure transmitters and trip units which sense hydraulic trip fluid pressure decay which is indicative of stop valve motion away from fully open. Two pressure transmitters and trip units are provided for each TSV. The pressure transmitters and trip units are electrically isolated from each other and from other turbine plant equipment.

The control valve fast closure signal is monitored by the turbine control fluid pressure transmitters and trip units which sense control fluid pressure decay which is indicative of fast control valve closure. These transmitters provide the RPS inputs within 30 milliseconds after the control valves start to close in a fast closure mode.

Power Range Neutron Monitoring System reactor power signals are provided for bypassing the stop valve closure and control valve fast closure inputs at low power levels.

TS Table 3.3.1.1-1, Function 9, Turbine Stop Valve Closure, Trip Oil Pressure - Low

Closure of the TSVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated at the start of TSV closure in anticipation of the transients that would result from the closure of these valves. The Turbine Stop Valve Closure, Trip Oil Pressure - Low Function is the primary scram signal for the turbine trip event. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the End of Cycle Recirculation Pump Trip (EOC-RPT) System, ensures that the minimum critical power ratio (MCPR) safety limit (SL) is not exceeded.

Turbine Stop Valve Closure, Trip Oil Pressure - Low signals are initiated by the EHC fluid pressure at each stop valve. These signals are provided from eight sensors, 1C71-PT-N006A-H, that sense stop valve motion away from full open such that detection of motion is made before the stop valves close more than 10% from full open. Two independent pressure transmitters are associated with each stop valve. One of the two transmitters provide input to RPS trip system A; the other, to RPS trip system B. Thus, each RPS trip system receives an input from four Turbine Stop Valve Closure, Trip Oil Pressure - Low channels, each consisting of one pressure transmitter. Upon reaching the trip setpoint, stop valve closure indication to the RPS is provided within 10 milliseconds. The logic for the Turbine Stop Valve Closure, Trip Oil Pressure - Low Function is such that three or more TSVs must be closed to produce a scram.

Closure of two or more turbine stop valves when rated thermal power is ≥ 35.4% also activates the EOC-RPT system. The function of the recirculation EOC-RPT is to reduce the severity of thermal transients on the fuel due to turbine/generator trip and load reduction events by tripping the recirculation pumps early in the event. The rapid core flow reduction increases void content and thereby reduces reactivity in conjunction with the control rod scram.

Sensing closure of the turbine stop valves is associated with events occurring during normal operations and not necessarily related to any design basis accident. If a high energy line break would occur in the turbine building, other instruments would sense the accident and isolate the main steam isolation valves and scram the reactor. Therefore, these instrument loops are not required to sense an accident or to operate in accident environments.

TS Table 3.3.1.1-1, Function 10, Turbine Control Valve Fast Closure, Trip Oil Pressure – Low

Fast closure of the TCVs results in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, a reactor scram is initiated on TCV fast closure in anticipation of the transients that would result from the closure of these valves. The Turbine Control Valve Fast Closure, Trip Oil Pressure – Low Function is the primary scram signal for the generator load rejection event. For this event, the reactor scram reduces the amount of energy required to be absorbed and, along with the actions of the EOC-RPT System, ensures that the MCPR SL is not exceeded.

Turbine Control Valve Fast Closure, Trip Oil Pressure – Low signals are initiated by the EHC fluid pressure at each control valve. There is one pressure transmitter associated with each control valve, the signal from each transmitter being assigned to a separate RPS logic channel. This Function must be enabled at THERMAL POWER ≥ 35.4% RTP. This is normally accomplished automatically by reactor power signals derived from the Power Range Neutron Monitoring System. The basis for the setpoint of this automatic bypass is identical to that described for the Turbine Stop Valve Closure, Trip Oil Pressure – Low Function.

The Turbine Control Valve Fast Closure, Trip Oil Pressure – Low AV is selected high enough to detect imminent TCV fast closure.

Four channels of Turbine Control Valve Fast Closure, Trip Oil Pressure – Low Function, with two channels in each trip system arranged in a one-out-of-two logic, are required to be OPERABLE to ensure that no single instrument failure will preclude a scram from this Function on a valid signal. This Function is required, consistent with the analysis assumptions, whenever THERMAL POWER is ≥ 35.4% RTP. This Function is not required when THERMAL POWER is < 35.4% RTP since the Reactor Vessel Steam Dome Pressure – High and the Average Power Range Monitor Fixed Neutron Flux – High Functions are adequate to maintain the necessary safety margins.

2.2 Current Technical Specification Requirements

TS 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"

TS Table 3.3.1.1-1, "Reactor Protection System Instrumentation," identifies the individual instrumentation channel Functions that provide input to the RPS logic. Each Function must have a required number of OPERABLE channels per RPS trip system, with their setpoints within the specified AV, where appropriate. This LAR includes proposed changes to TS Table 3.3.1.1-1, Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low," and Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low." Provided below are the current TS requirements for Function 9 and Function 10.

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9. Turbine Stop Valve Closure, Trip Oil Pressure - Low	≥ 35.4 % RTP	4	E	SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 37 psig
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	≥ 35.4 % RTP	2	E	SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 42 psig

S 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation"

This LAR includes proposed changes to SR 3.3.4.1.2 and SR 3.3.1.4.3. Provided below are the current SRs.

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.2	Calibrate the trip units.	92 days
SR 3.3.4.1.3	Perform CHANNEL CALIBRATION. The Allowable Values shall be: a. TSV Closure, Trip Oil Pressure – Low: ≥ 37 psig. b. TCV Fast Closure, Trip Oil Pressure – Low: ≥ 42 psig.	24 months

2.3 Reason for the Proposed Change

The proposed change to the TS is due to the replacement of the pressure transmitters that sense EHC System pressure and provide signals to the RPS. The pressure transmitters are being replaced in conjunction with the upgrade of the Turbine Control System that includes changing the EHC System from a low pressure system to a high pressure system. The changes to the AVs are needed due to the higher EHC System operating pressure. Replacement of the pressure transmitters is needed to accommodate a modification to the EHC System while maintaining the function of transmitting the trip signal to the RPS. This change does not affect any RPS trip functions.

2.4 Description of the Proposed Change

The proposed change revises TS 3.3.1.1, Table 3.3.1.1-1, Function 9, as follows:

- Increases the AV from ≥ 37 psig to ≥ 644 psig.
- Adds Note (d) to SR 3.3.1.1.8 and SR 3.3.1.1.12 that states, "If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service."
- Adds Note (e) to SR 3.3.1.1.8 and SR 3.3.1.1.12 that states, "The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual."

The proposed change revises TS 3.3.1.1, Table 3.3.1.1-1, Function 10, as follows:

- Increases the AV from ≥ 42 psig to ≥ 938 psig.
- Adds Note (d) to SR 3.3.1.1.8 and SR 3.3.1.1.12 that states, "If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service."
- Adds Note (e) to SR 3.3.1.1.8 and SR 3.3.1.1.12 that states, "The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual."

The proposed change revises SR 3.3.4.1.2 and SR 3.3.4.1.3, as follows:

- Adds Note 1 that states, "If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service."
- Adds Note 2 that states, "The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual."
- Revises the AVs in SR 3.3.4.1.3 from ≥ 37 psig to 644 psig for the TSV Closure, Trip Oil Pressure – Low Function and from ≥ 42 psig to 938 psig for the TCV Fast Closure, Trip Oil Pressure – Low Function.

A markup of the proposed change is included in Attachment 1. A clean copy of the proposed change to the TS is provided in Attachment 2. Changes to the associated TS Bases are included for information only in Attachment 3. The changes to the TS Bases will be implemented in accordance with GGNS TS 5.5.11, "Technical Specifications Bases Control Program."

2.5 Variations

Entergy is proposing the following minor variations for the notes added to the TS Table 3.3.1.1-1, Function 9 and Function 10, relative to Notes 1 and 2 in TSTF-493-A, Revision 4. These variations do not affect the applicability of TSTF-493-A or the NRC staff safety evaluation of the proposed license amendment.

The GGNS TS utilize different numbering than the Standard Technical Specifications for which TSTF-493-A, Revision 4 is based. The following table summarizes the differences between the GGNS TS numbering and the TSTF-493-A, Revision 4 numbering.

TSTF-493-A, Revision 4 NUREG-1434, General Electric BWR-6 Plants Specification 3.3.1.1 "Reactor Protection System (RPS) Instrumentation"	GGNS TS 3.3.1.1 Table 3.3.1.1-1 Reactor Protection System Instrumentation
Function 9: Notes (a) and (b) are applied to SR 3.3.1.1.8 and SR 3.3.1.1.11	Function 9: Notes (d) and (e) are applied to SR 3.3.1.1.8 and SR 3.3.1.1.12
Function 10: Notes (a) and (b) are applied to SR 3.3.1.1.8 and SR 3.3.1.1.11	Function 10: Notes (d) and (e) are applied to SR 3.3.1.1.8 and SR 3.3.1.1.12

3.0 TECHNICAL EVALUATION

The proposed change to the TS is due to the replacement of the pressure transmitters that sense EHC System pressure and provide signals to the RPS. The pressure transmitters are being replaced in conjunction with the upgrade of the Turbine Control System that includes changing the EHC System from a low pressure system to a high pressure system. The changes to the AV are needed due to the higher EHC System operating pressure. Replacement of the pressure transmitters is needed to accommodate a modification to the EHC System while maintaining the function of transmitting the trip signal to the RPS. The higher operating EHC System operating pressure requires transmitters with a range of 0-3000 psig. The replacement transmitters are being installed in the same general location as the existing transmitters. This change does not affect any RPS trip functions.

3.1 Instrumentation Setpoints and Uncertainties

The GGNS instrument setpoint methodology, Instrumentation and Control Standard GGNS-JS-09 (Reference 6.1), "Methodology for the Generation of Instrument Loop Uncertainty & Setpoint Calculations," currently implemented at GGNS, is based on ISA Standard 67.04 Part II, 1994, (Reference 6.2), and the GEH Instrument Setpoint Methodology specified in NEDC-31336P-A, "General Electric Instrument Setpoint Methodology," (Reference 6.3). Setpoint calculations provide a conservative analysis of setpoints, taking into account the applicable instrument measurement errors.

On March 1, 2007, GGNS submitted a license amendment request (Reference 6.4) to the NRC to revise the Condensate Storage Tank Level-Low setpoint reflected in TS Tables 3.3.5.1-1 and 3.3.5.2-1. The change corrected an error in the original plant design, which under certain conditions, could have prevented a swap of the High Pressure Core Spray (HPCS) and Reactor Core Isolation Cooling (RCIC) suction flow paths to the Suppression Pool. The NRC approved the proposed change by letter dated February 25, 2009 (Reference 6.5) noting that the setpoint methodology and surveillance testing procedures used by GGNS were consistent with the guidance of Regulatory Issue Summary (RIS) 2006-17 (Reference 6.6), "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels." This same methodology is used to determine the TS Table 3.3.1.1-1 Function 9 and Function 10 AVs.

The Nominal Trip Setpoint (NTSP) is more conservative than the AV. Because it is impossible to set an instrument channel to an exact value, a calibration tolerance is established around the NTSP. The NTSP is, therefore, considered a nominal value and the instrument adjustment is considered successful if the "as-left" instrument setting is within the calibration tolerance established around the NTSP. The NTSP is specified in the Technical Requirements Manual (TRM), not in the TS.

Entergy calculates the setpoints from the Analytical Limit (AL) by establishing margins between the AL, the AV, and the NTSP based on calculated instrument errors. Random errors are combined using the square-root-of-the-sum-of-the-squares (SRSS) method, and nonconservative bias errors are added algebraically. This approach provides sufficient margin between the AL and AV to ensure at least 95% probability that the AL is not exceeded if the setpoint drifts toward the AV.

3.1.1 Calculation for Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low"

Calculation JC-Q1C71-N606-1, Revision 2, "Instrument Loop Uncertainty and Setpoint Determination for System 1C71 Loop N606, Reactor Scram on Turbine Stop Valve Closure," determines the instrument loop uncertainty and limiting AV and setpoints for instrument loops 1C71-N606A-H. The values generated by this calculation are in accordance with Standard GGNS-JS-09.

The nomenclature of Standard GGNS-JS-09, Section 1.6, is used. Errors associated with the transmitter will be subscripted with a "1," errors associated with the trip unit will be subscripted with a "2," while loop errors will be subscripted with an "L." For example, DR_1 would be the transmitter drift, DR_2 would be the trip unit drift, and D_L would be the loop drift.

At time of calculation changes, the transmitter manufacturer and model number was not finalized and was to be one of three models. As a result, this uncertainty calculation is prepared using data from the transmitter that has the worst performance specification. Thus, the final uncertainty values will encompass the three models and can be considered bounding.

Transmitter (1C71-PT-N006A-H) Vendor Data

Manufacturer	Hydac	STW	Measurement Specialties (TE Connectivity)
Model	HDA4700	M01	P981/4
Reference Accuracy (RA)	± 0.50% span	± 0.50% span	± 0.10% span
Temperature Effect (TEN)	± 0.0085% span per °F	NA – Included in Reference Accuracy	± 0.008% span per °F
Humidity Effects (HE)	NA	NA	NA
Radiation Effects (RE)	NA	NA	NA
Power Supply Effects (PS)	NA	NA	NA
Seismic Effects (SE)	NA for all models per Assumption 6		
Static Pressure Effects (SPE)	NA for all models due to instrument type. Only differential pressure transmitters are susceptible to this.		
Overpressure Effects (OVP)	NA	NA	NA
Drift (DR)	± 0.1% span per year	± 0.2% span per year	NA
Temperature Drift (TD)	Same as temperature effect above		

Trip Unit (1C71-PIS-N606A-H) Vendor Data

Manufacturer	Rosemount
Model	(Units A, C, D, E, F, G, H) 510DU (Unit B) 710 DU
Repeatability	± 0.2% span
Drift	NA
Input Range	4 – 20 mAdc

The assumptions used in calculation JC- Q1C71-N606-1 are as follows:

1. A reactor/turbine trip occurs during normal operation. These transmitters are located in a non-seismic structure and no seismic requirements are imposed on them. Therefore, neither seismic nor design basis accident (DBA) environments need to be considered, and normal conditions will be limiting.

2. The radiation drift effect (RD) of the transmitters is assumed to be zero as they are calibrated every 30 months (Assumption 12) and are located in a mild radiation environment.

3. At time of calculation changes, the transmitter manufacturer and model number was not finalized and was to be one of three models. As a result, this uncertainty calculation is prepared using data from the transmitter that has the worst performance specification. Thus, the final uncertainty values will encompass all three models and can be considered bounding.

4. Vendor documents list equipment performance data without stating the statistical basis for the numbers. Although some vendor data is "worst case," it is assumed that such data is a 2 sigma value. The Rosemount specifications will be considered 2 sigma values regardless of any published claims of a 3 sigma basis.

5. Per standard GGNS-JS-09, the measurement and test equipment (M&TE) error is normally assumed to be equal to the reference accuracy of the pressure transmitter. Further elaboration and details related to M&TE error are provided below.

6. Seismic Effects (SE) are not required to be considered for the subject setpoint loops.

7. These instrument loops are not required to operate during DBA environments. Therefore, no additional errors due to the effects of the process tubing are required for this calculation.

   This loop measures the pressure of the TSV control fluid. Under normal conditions this EHC fluid will see no environmental or process condition changes that would introduce any measurement errors. Therefore, the Process Measurement Effect, PM = ± 0.00 psi.

8. This trip is not required to operate under DBA environments. The cabling involved in this loop will not see any harsh environments and no degradation of insulation resistance is expected. Therefore, IR = ± 0.00 psi.

9. Vendor documents specify a minimum output voltage of 22 vdc for the 24 vdc power supplies. No maximum voltage is specified. A value of 28 vdc will be assumed as this is the value provided in vendor documents for similar power supplies. This results in an assumed voltage variation of +4, -2 vdc. For conservatism, ±4 vdc will be used in this calculation.

10. Since the Rosemount 510DU model is obsolete, they may be replaced with 710DU's in the future. The performance specifications for the 710DU are equal to or better than those of the 510DU. (Trip Unit 1C71N606B is a model 710DU.)

11. The accuracy of the Rosemount trip units (±0.20% span) is valid for six months. Therefore, drift is included for the first six months after calibration. The trip units are calibrated every 115 days (Assumption 12). Therefore, the drift is included in the reference accuracy.

12. A transmitter calibration interval of 30 months will be assumed, which is a nominal 24-month period, plus a 25% grace period. A calibration interval of 115 days will be assumed for the trip units, which is a nominal 92-day period, plus a 25% grace period.

13. No Temperature Drift effect (TD) is specified by any of the transmitter vendors. The vendor published Temperature Effect (TEN) will be assumed to be applicable as TD over the temperature range of 65°F to 90°F and over a calibration interval of 30 months (nominal 24 months with a 25% grace period).

14. The transmitter Temperature Effect (TE) will be assumed to be applicable from 90°F (the maximum expected calibration temperature) to 150°F (i.e., the expected maximum abnormal temperature).

<u>Transmitter Uncertainties</u>

Using the vendor data from above:

SPAN = 3000 psig

RA_1 (Reference Accuracy) = ± 0.50% span
= ± (0.50/100)*(3000) psig
= ± 15.00 psig

Temp Effect = ± 0.0085% span per °F
= + (0.0085/100) (3000)
= ± 0.255 psi /°F

Temperature effect will be broken into TD (65-90°F) and TEN (90°F) per GGNS JS-09 and assumptions 13 and 14.

Span = 65-90°F = 25°F

TD_1 = ± (0.255 psi / °F)(25°F)
= ± 6.38 psi

Span = 90-150°F = 60°F
TEN_1 = ± (0.255 psig / °F)(60°F)
= ±15.30 psig

TEA_1 = ± 0.0 psig

Per Assumption 9, the worst power supply variations are taken as ± 4.0 volts.

PS_1 (Power Supply Effects) = NA

Drift. The worst case calibration period is 30 months (Assumption 12). Therefore:

DR_1 = ± 0.20% span per year
or
= ± 0.50% per 2.5 years (30 months)
= ± (0.50/100)(3000)
= ± 15.00 psig

Summarizing for the transmitter:

A_1 = ± SRSS(RA_1, TEN_1, PS_1)
= ± SRSS(15.00, 15.30, 0.00)
= ± 21.43 psig

L_1 = - 0.0 psig
M_1 = + 0.0 psig

C_1

RA_1 = ± 15.00 psig (from above)

M&TE:

Per standard GGNS-JS-09, a DMM or equivalent (± 0.08 mA) and an equivalent test gauge (.333% of 3000 = ± 10.00 psig) are used to calibrate the transmitters.
(0.08 mA)(3000 psig/16 mA) = ± 15.00 psig
C_1 = SRSS (15.00, 10.00)
= ± 18.03 psig

The setting tolerance from plant surveillance procedures is ± 0.08 mA
(0.08 mA)(3000 psig/16 mA) = ± 15.00 psig

The test equipment error, ± 18.03 psig, is larger than the setting tolerance error, ± 15.00 psig or the transmitter reference accuracy, so ± 18.03 psig will be the M&TE error (C_1).

D_1 = ± SRSS(DR_1, TD_1)
= ± SRSS(15.00, 6.38) psig
= ± 16.30 psig

Trip Unit Uncertainties

Using the vendor data from above:

Span = 3000 psig

RA_2 = ± 0.20% span
= ± (0.002)*(3000 psig)
= ± 6.00 psig

L_2 = - 0.00 psig
M_2 = + 0.00 psig

C_2
M&TE:

Per plant surveillance procedures, a Rosemount readout assembly (±0.01 mA, Rosemount Instruction Manual) is used to calibrate the Rosemount trip units.
(0.01)(3000)/16 = ± 1.88 psig

Plant surveillance procedures specifies a setting tolerance of ± 0.04 mA
(0.04)(3000)/16 = ± 7.50 psig

The larger value, ± 7.50 psig, will be the M&TE error (C_2).

D_2 = DR_2 = NA (Assumption 11)

Loop Uncertainties

The random and bias components of:

Primary Element errors: PE = NA (This loop does not employ a primary element separate from the transmitter. Therefore, no additional errors due to inaccuracies in the primary element are required for this calculation.

Process Measurement Accuracy: PM = NA (Assumption 7)

Insulation Resistance Bias: IR = NA (Assumption 8)

will be quantified, the loop error equation given, and the device and loop uncertainties combined to produce:

A_L - SRSS of all device random uncertainties except drift

A_L = ± SRSS(A_1, A_2)
= ± SRSS(21.43, 6.00)
= ± 22.25 psig

L_L - The sum of all negative bias uncertainties $L_L = - L_1 - L_2 = 0.0$ psig
M_L - The sum of all positive bias uncertainties $M_L = + M_1 + M_2 = 0.0$ psig
C_L - SRSS of all M&TE inaccuracies used for calibration.

C_L = ± SRSS(C_1, C_2)
= ± SRSS(18.03, 7.50)
= ± 19.53 psig

D_L - SRSS of all drifts

D_L = ± SRSS(D_1, D_2)
= ± SRSS(16.30, 0.0)
= ± 16.30 psig

LU (Loop Uncertainty)

LU = ± SRSS(A_L, C_L, PE, PM) ± IR - L_L + M_L
= ± SRSS(A_L, C_L)
= ± SRSS(22.25, 19.53)
= ± 29.61 psig

TLU (Total Loop Uncertainty)

TLU = LU + D_L
= ± (29.61 + 16.30) psig
= ± 45.91 psig

The AL is 614.00 psig. The AL was determined in calculation WNA-CN-00532-GGF1, "Reactor Protection System (RPS) Transmitter Pressure Setpoint." The AL is the minimum pressure in the trip header that will maintain the valve open. The TS AV is calculated using the below equation.

AV ≥ AL + LU
≥ 614.00 psig + 29.61 psig
≥ 643.61 psig
≥ 644 psig

NTSP ≥ AL + TLU + margin for Licensee Event Report (LER) avoidance
≥ 614 psig + 45.91 psig + 6.09 psig
≥ 666 psig

Note: the "margin for LER avoidance" is a value selected to ensure the final LER avoidance value is acceptable.

Tabulated Results

The NTSP and AV provide adequate spurious trip and Licensee Event Report avoidance probability. Note that the NTSP is in TRM Table TR 3.3.1.1-1.

SUMMARY OF RESULTS		
TOTAL LOOP UNCERTAINTY (TLU)		± 45.91 psig
LOOP UNCERTAINTY (LU)		± 29.61 psig
DRIFT ALLOWANCE (D_L)		± 16.30 psig
M&TE (C_L)		± 19.53 psig
	SPECIFIED	CALCULATED
Nominal Trip Setpoint**	≥ 666 psig	≥ 666.00 psig
Allowable Value**	≥ 644 psig	≥ 643.61 psig
Analytical Limit	614.00 psig	

** Values specified in the TS or TRM.

SUMMARY OF CALIBRATION TOLERANCES	
As-Left Transmitter (ALT_1)	± 15.00 psig ± 0.08 mA
As-Left Trip Unit (ALT_2)	± 6.00 psig ± 0.03 mA
As-Found Transmitter (AFT_1)	± 27.84 psig ± 0.15 mA
As-Found Trip Unit (AFT_2)	± 9.60 psig ± 0.05 mA
As-Left Loop Tolerance (ALT_L)	± 16.16 psig ± 0.09 mA
As-Found Loop Tolerance (AFT_L)	± 29.45 psig ± 0.16 mA

3.1.2 Calculation for Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low"

Calculation JC-Q1C71-N605-1, Revision 4, "Turbine Control Valve Fast Closure Scram Setpoint Validation," determines the AV and setpoints for the Turbine Control Valve Fast Closure Scram Function. The values generated by this calculation are in accordance with Standard GGNS-JS-09.

At time of calculation changes, the transmitter manufacturer and model number was not finalized and was to be one of three models. As a result, this uncertainty calculation is prepared using data from the transmitter that has the worst performance specification. Thus, the final uncertainty values will encompass the three models and can be considered bounding.

The transmitter (1C71-PT-N005A-D) vendor data is the same as specified in Section 3.1.1 above.

<u>Trip Unit (1C71-PIS-N605A-D) Vendor Data</u>

Manufacturer	Rosemount
Model	510DU
Reference Accuracy (RA)	± 0.20% span
Temperature Effect (TE)	NA – Included in Reference Accuracy
Humidity Effects (HE)	NA – Included in Reference Accuracy
Radiation Effects (RE)	NA – Included in Reference Accuracy
Power Supply Effects (PS)	NA – Included in Reference Accuracy
Seismic Effects (SE)	NA – Included in Reference Accuracy
Static Pressure Effects (SPE)	NA for instrument type
Overpressure Effects (OVP)	NA for instrument type
Drift (DR)	NA – Included in Reference Accuracy
Temperature Drift (TD)	NA – Included in Reference Accuracy

The assumptions used in calculation JC-Q1C71-N605-1 are as follows:

1. Assume all uncertainties given are to two standard deviations (2σ) unless otherwise specified.

2. Since the Turbine Building environment is not addressed in GGNS-E100.0, "Environmental Parameters for GGNS," the environmental specifications listed in the original purchase specification will be assumed as the ambient environment for the transmitters.

3. No Temperature Drift effect (TD) is specified by any of the transmitter vendors. The vendor published Temperature Effect (TE) will be assumed to be applicable as Temperature Drift (TD) over the temperature range of 65°F to 90°F and over a calibration interval of 30 months (nominal 24 months with a 25% grace period)

4. The accuracy of the Rosemount trip units (±0.20% span) is valid for six months. Therefore, drift is included for the first six months after calibration. The trip units are calibrated every 115 days (Assumption 13). Therefore, the drift is included in the Reference Accuracy (RA).

5. Insulation Resistance Effects (IR) are assumed to be negligible since the loop cabling is located in a mild environment (Turbine Building and Control Building).

6. The transmitter Temperature Effect (TE) will be assumed to be applicable from 90°F (the maximum expected calibration temperature) to 150°F (the expected maximum abnormal temperature).

7. The maximum power supply variation is assumed to be ± 4 volts. This assumption bounds the variation given in vendor documentation for the power supply (24 volts nominal / 22 volts minimum).

8. Radiation Effects (RE) for the transmitters are assumed to be negligible. The transmitters are located in a "B" radiation zone under normal conditions.

9. Per standard GGNS-JS-09, the M&TE error is normally assumed to be equal to the reference accuracy of the transmitter. Further elaboration and details related to M&TE error are provided below.

10. Seismic Effects (SE) are not required to be considered for the subject setpoint loops.

11. Process Measurement Effects (PM) are assumed to be zero. Since the transmitters are calibrated during outage conditions, the calibration will occur at a lower ambient temperature than that which will exist during normal operation. Therefore, any variation in EHC fluid density in the reference leg due to ambient temperature changes would result in a bias in the conservative direction with respect to the trip.

12. Drift calculation JC-Q1111-09014, "Drift Calculation for Gulton/Statham Gage and Differential Pressure Transmitters," was previously used to establish a drift value based on long-term actual calibration results. Since these transmitters are a new installation, there are no long-term actual calibrations results to use. Thus, the drift values are as provided by the manufacturer and JC-Q1111-09014 is revised to remove the associated transmitters.

13. A transmitter calibration interval of 30 months will be assumed, which is a nominal 24-month period, plus a 25% grace period. A calibration interval of 115 days will be assumed for the trip units, which is a nominal 92-day period, plus a 25% grace period.

<u>Transmitter Uncertainties</u>

Using the vendor data from above:

SPAN	= 3000 psig
RA_T (Reference Accuracy)	= ± 0.50% span = ± (0.50/100)*(3000 psig) = ± 15.00 psig
(TE_T) Temp Effect	= ± 0.0085% span per °F or 0.85% span per 100°F = ± ((0.0085/100)(3000)(150°F - 90°F) = ± 15.30 psig
(A_T) Total Transmitter Uncertainty	= SRSS (RA_T, TE_T, HE_T, SE_T, RE_T, PS_T, SPE_T, OVP_T) = SRSS (15.00, 15.30, 0, 0, 0, 0, 0) = ± 21.43 psig

Trip Unit Uncertainties

Using the vendor data from above:

RA_{TU} (Reference Accuracy) = ± 0.20% span
= ± (0.20/100)(3000 psig)
= ± 6.00 psig

(A_{TU}) Total Trip Unit Uncertainty = SRSS (RA_{TU}, TE_{TU}, HE_{TU}, SE_{TU}, RE_{TU}, PS_{TU}, SPE_{TU}, OVP_{TU})
= SRSS (6.00, 0, 0, 0, 0, 0, 0)
= ± 6.00 psig

Loop Uncertainties

A_L - SRSS of all individual device uncertainties

A_L = ± SRSS(A_T, A_{TU})
= ± SRSS (21.43, 6.00)
= ± 22.25 psig

C_L - SRSS of all M&TE effects

RA_T = ± 15.00 psig (from above)

M&TE:

Per plant surveillance procedures, a DMM or equivalent (± 0.08 mA) and an equivalent test gauge (.333% of 3000 = ± 10.00 psig) are used to calibrate the transmitters.
(0.08 mA)(3000 psig/16 mA) = ± 15.00 psig
= SRSS (15.00, 10.00)
= ± 18.03 psig

The setting tolerance from plant surveillance procedures is ± 0.08 mA
(0.08 mA)(3000 psig/16 mA) = ± 15.00 psig

The test equipment error, ± 18.03 psig, is larger than the setting tolerance error, ± 15.00 psig or the transmitter reference accuracy, so ± 18.03 psig will be the M&TE error (MTE_T).

RA_{TU} = ± 6.00 psig (from above)

M&TE:

Per plant surveillance procedures, a Rosemount readout assembly (± 0.01 mA, Rosemount Instruction Manual) is used to calibrate the Rosemount trip units.
(0.01)(3000)/16 = ±1.88 psig

Plant surveillance procedures specifies a setting tolerance of ± 0.04 mA
(0.04)(3000)/16 = ± 7.50 psig.

The larger value, ± 7.50 psig, will be the M&TE error (MTE_{TU}).

C_L = ± SRSS(MTE_T, MTE_{TU})
= ± SRSS(18.03, 7.50)
= ± 19.53 psig

D_L - SRSS of all individual device drifts

DR_T (Transmitter Drift)	= ± 0.20% span per year or 0.50% per 2.5 year (30 months) = ± (0.50/100)(3000) = ± 15.00 psig
TD_T (Transmitter Temp Drift)	= ± 0.0085% span per °F = ± ((0.0085/100)(3000))(90°F - 65°F) = ± 6.38 psig
DR_{TU} (Trip Unit Drift)	= NA – Included in Reference Accuracy
TD_{TU} (Trip Unit Temp Drift)	= NA – Included in Reference Accuracy
D_L (Loop Drift)	= ± SRSS (DR_T, TD_T, DR_{TU}, TD_{TU}) = ± SRSS (15.00, 6.38, 0, 0) = ± 16.30 psig
LU (Loop Uncertainty)	= ± SRSS (A_L, C_L, PM, PE, IR) = ± SRSS (22.25, 19.53, 0, 0, 0) psig = ± 29.61 psig
TLU (Total Loop Uncertainty)	= LU + D_L = ± (29.61+ 16.30) psig = ± 45.91 psig

The AL is 908.00 psig. The AL was determined in calculation WNA-CN-00532-GGF1, "Reactor Protection System (RPS) Transmitter Pressure Setpoint." The AL is the minimum pressure in the trip header that will maintain the valve open. The TS AV is calculated using the below equation.

AV ≥ AL + LU
≥ 908.00 psig + 29.61 psig
≥ 937.61 psig
≥ 938 psig

NTSP ≥ AL + TLU + margin for LER avoidance
≥ 908 psig + 45.91 psig + 6.49 psig
≥ 960 psig

Note: the "margin for LER avoidance" is a value selected to ensure the final LER avoidance value is acceptable.

Tabulated Results

The NTSP and AV provide adequate spurious trip and Licensee Event Report avoidance probability. Note that the NTSP is in TRM Table TR 3.3.1.1-1.

SUMMARY OF RESULTS		
TOTAL LOOP UNCERTAINTY (TLU)		± 45.91 psig
LOOP UNCERTAINTY (LU)		± 29.61 psig
LOOP DRIFT (D_L)		± 16.30 psig
Loop Calibration Uncertainty (C_L)		± 19.53 psig
	SPECIFIED	CALCULATED
Nominal Trip Setpoint**	≥ 960 psig	≥ 960.00 psig
Allowable Value**	≥ 938 psig	≥ 937.61 psig
Analytical Limit	908.00 psig	

** Values specified in the TS or TRM.

SUMMARY OF CALIBRATION TOLERANCES	
As-Left Transmitter (ALT_T)	± 15.00 psig ± 0.08 mA
As-Left Trip Unit (ALT_{TU})	± 6.00 psig ± 0.03 mA
As-Found Transmitter (AFT_T)	± 27.84 psig ± 0.15 mA
As-Found Trip Unit (AFT_{TU})	± 9.60 psig ± 0.05 mA
As-Left Loop Tolerance (ALT_L)	± 16.16 psig ± 0.09 mA
As-Found Loop Tolerance (AFT_L)	± 29.45 psig ± 0.16 mA

3.2 Incorporation of TSTF-493, Option A, for the Turbine Stop Valve Closure, Trip Oil Pressure – Low Function, and Turbine Control Valve Fast Closure, Trip Oil Pressure – Low Function

As noted in Section 1.0, the Entergy setpoint calculation procedure incorporates the setpoint methodologies described in TSTF-493-A. However, GGNS has not incorporated the setpoint methodologies described in TSTF-493-A for all of the instrumentation in Unit 1. GGNS has chosen to perform the Technical Analysis and AV determination for the low oil pressure instrumentation using the methodologies described in TSTF-493-A as referenced in the NRC Notice of Availability published in the Federal Register on May 11, 2010 (75 FR 26294).

The proposed Notes (d) and (e) for (TS) Table 3.3.1.1-1, "Reactor Protection System Instrumentation," Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low," and Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low," and proposed Notes 1 and 2 for TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation," Surveillance Requirement (SR) 3.3.4.1.2 and SR 3.3.4.1.3 are based on these Function being an automatic protective device related to variables having a significant safety function as delineated by 10 CFR 50.36(c)(1)(ii)(A). These Notes are similar to TSTF-493-A Notes 1 and 2.

Proposed Note (d) for Functions 9 and 10 and Note 1 for SRs 3.3.4.1.1 and 3.3.4.1.3 states: "If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service."

This Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the AV. Evaluation of channel performance will verify that the channel will continue to perform in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology and establishes a high confidence of acceptable channel performance in the future. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the channels will be evaluated under the GGNS Corrective Action Program (CAP). Entry into the CAP will ensure required review and documentation of the condition to establish a reasonable expectation for continued OPERABILITY.

Verifying that a trip setting is conservative with respect to the AV when a surveillance test is performed does not by itself verify the instrument channel will operate properly in the future. Although the channel was operable during the previous surveillance interval, if it is discovered that channel performance is outside the performance predicted by the plant setpoint calculations for the test interval, then the design basis for the channel may not be met, and proper operation of the channel for a future demand cannot be assured.

Proposed Note (e) and Note 2 formalizes the establishment of the appropriate as-found tolerance for each channel. This as-found tolerance is applied about the NTSP or about any other more conservative setpoint. The as-found tolerance ensures that channel operation is consistent with the assumptions or design inputs used in the setpoint calculations and establishes a high confidence of acceptable channel performance in the future. Because the setting tolerance allows for both conservative and non-conservative deviation from the NTSP, changes in channel performance that are conservative with respect to the NTSP will also be detected and evaluated for possible effects on expected performance.

Proposed Note (e) for Functions 9 and 10 and Note 2 for SRs 3.3.4.1.1 and 3.3.4.1.3 states: "The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual."

To implement surveillance Note (e) and Note 2, the as-left tolerance for some instrumentation Function channels is established to ensure that realistic values are used that do not mask instrument performance. Setpoint calculations assume that the instrument setpoint is left at the NTSP within a specific as-left tolerance (e.g., 25 psig ± 2 psig). A tolerance band is necessary because it is not possible to read and adjust a setting to an absolute value due to the readability and/or accuracy of the test instruments or the ability to adjust potentiometers. The as-left tolerance is normally as small as possible considering the tools and the objective to meet an as low as reasonably achievable calibration setting of the instruments. The as-left tolerance is considered in the setpoint calculation. Failure to set the actual plant trip setpoint to the NTSP and within the as-left tolerance, would invalidate the assumptions in the setpoint calculation because any subsequent instrument drift would not start from the expected as-left setpoint.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

Regulations

10 CFR 50.36 sets forth the regulatory requirements for the content of the TS. This regulation requires, in part, that the TS contain Surveillance Requirements (SRs). 10 CFR 50.36(c)(3), states that SRs to be included in the TS are those relating to test, calibration, or inspection, which assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the TS Limiting Condition for Operation (LCO) will be met.

General Design Criteria

The following 10 CFR 50, Appendix A, General Design Criteria are applicable to the change in the TS Allowable Value (AV):

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

Criterion 20 – Protection system functions. The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.

GGNS UFSAR Section 3.1.2 specifies the conformance to the above General Design Criteria. The proposed changes to the TS AVs and the addition of the Notes to assess instrument channel performance during testing maintain conformance with the applicable regulatory criteria described above. The technical analysis in Section 3.0, above, concludes that the proposed changes continue to assure that the design requirements and acceptance criteria are met.

4.2 Precedent

The following precedent is related to the proposed TS change in this submittal:

NRC letter to Tennessee Valley Authority, "Watts Bar Nuclear Plant, Unit – Issuance of Amendment Regarding Reactor Protection System Instrumentation Turbine Trip Function (CAC No. MF9401; EPID L-2017-LLA-0189)," dated March 28, 2018 (ADAMS Accession No. ML18052B347). The amendment approved changes to the NTSP and AV for TS Table 3.3.1-1, "Reactor Trip System Instrumentation," Function 14.a. "Turbine Trip - Low Fluid Oil Pressure." The changes were required due to the replacement and relocation of the pressure switches from the low pressure auto-stop trip fluid oil header that operates at a nominal control pressure of 80 pounds per square inch gauge (psig) to the high pressure turbine EHC oil header that operates at a nominal control pressure of 2000 psig. The changes to the NTSP and AV are needed due to the higher EHC System operating pressure.

This proposed LAR is similar to this precedent because it involves an increase in the AV and NTSP (i.e., as specified in the GGNS Technical Requirements Manual) as the result of increased control fluid oil operating pressure originating from upgrades and/or replacement of the originally installed turbine control systems.

4.3 No Significant Hazards Consideration Analysis

In accordance with the requirements of 10 CR 50.90, "Application for amendment of license, construction permit, or early site permit," Entergy Operations, Inc. (Entergy) requests an amendment to Renewed Facility Operating License NPF-29 for the Grand Gulf Nuclear Station (GGNS). The proposed amendment revises Technical Specification (TS) Table 3.3.1.1-1, "Reactor Protection System Instrumentation," Function 9, "Turbine Stop Valve Closure, Trip Oil Pressure – Low," and Function 10, "Turbine Control Valve Fast Closure, Trip Oil Pressure – Low," and TS 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation," Surveillance Requirement (SR) 3.3.4.1.2 and SR 3.3.4.1.3. The proposed change revises the Allowable Value (AV) for the Turbine Stop Valve Closure Trip Oil Pressure Function and Turbine Control Valve Fast Closure Trip Oil Pressure Function. Additionally, the proposed amendment adds new Notes to assess channel performance during testing that verifies instrument channel setting values established by the Entergy setpoint methodology.

Entergy has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The proposed change to the TS is due to the replacement of the pressure transmitters that sense Electrohydraulic Control (EHC) System pressure and provide signals to the Reactor Protection System (RPS). The turbine control valve fast closure signal is monitored by the turbine control fluid pressure transmitters and trip units which sense control fluid pressure decay which is indicative of fast control valve closure. The turbine stop valve closure signal originates from pressure transmitters and trip units which sense hydraulic trip fluid pressure decay which is indicative of stop valve motion away from fully open.

A change in the turbine stop valve closure trip oil pressure and turbine control valve fast closure trip oil pressure TS AVs does not introduce any mechanisms that would increase the probability of an accident previously analyzed. The reactor trip on turbine stop valve closure or turbine control valve fast closure is initiated by the same protective signals. There is no change in form or function of this signal and the probability or consequences of previously analyzed accidents are not impacted.

The proposed change also adds test requirements to the turbine stop valve closure trip oil pressure and turbine control valve fast closure trip oil pressure instrument functions related to those variables to ensure that instruments will function as required to initiate protective systems or actuate mitigating systems at the point assumed in the applicable setpoint calculation. Surveillance tests are not an initiator to any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly increased. The systems and components required by these functions for which surveillance tests are added are still required to be operable, meet the acceptance criteria for the surveillance requirements, and be capable of performing any mitigation function.

The capacity and the characteristics of both the original and replacement equipment meet the original plant design criteria. The proposed TS changes will not prevent the capability of structures, systems, and components (SSCs) to perform their intended functions for mitigating the consequences of an accident and meeting applicable acceptance limits.

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

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

Response: No.

The proposed change involves a physical alteration of the plant, i.e., a change in instrument setpoint. The proposed change reflects the higher pressure that will be sensed after the replacement of the pressure transmitters with changing of the EHC System from a low pressure system to a high pressure system. Failure of the new pressure transmitters would not result in a different outcome than is considered in the current design basis. The new hardware (e.g., components, equipment, structure, etc.) serves (provides) the same purpose (e.g., function, integrity, etc.) as the hardware it replaces. Further, the change does not alter assumptions made in the safety analysis but ensures that the instruments perform as assumed in the accident analysis.

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

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

Response: No.

The original pressure transmitter configuration and the new pressure transmitter configuration both generate the same reactor trip signal. The difference is that the initiation of the trip will now be adjusted to a system of higher pressure. This system function of sensing and transmitting a reactor trip signal on turbine stop valve closure or turbine control valve fast closure remains the same. Also, the proposed change adds test requirements that will assure that TS instrumentation AVs: (1) will be limiting settings for assessing instrument channel operability and; (2) will be conservatively determined so that evaluation of instrument performance history and the as-left tolerance requirements of the calibration procedures will not have an adverse effect on equipment operability. The testing methods and acceptance criteria for systems, structures, and components, specified in applicable codes and standards, or alternatives approved for use by the NRC, will continue to be met as described in the plant licensing basis including the Updated Final Safety Analysis Report. The safety function of the setpoint is not altered as a result of the setpoint change and uncertainties are adequately accounted for.

There will be no adverse effect on margins of safety since equal or more stringent design and surveillance requirements will be applied to the new component (e.g., equipment, system, etc.).

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

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

4.4 Conclusions

In conclusion, based on the considerations discussed above, 1) there is a reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, 2) such activities will be conducted in compliance with the Commission's regulations, and 3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

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

6.0 REFERENCES

6.1 GGNS Instrumentation and Control Standard GGNS-JS-09, "Methodology for the Generation of Instrument Loop Uncertainty & Setpoint Calculations," Revision 1, January 7, 2000.

6.2 Instrument Society of America (ISA) Standard 67.04 Part II, 1994, "Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation."

6.3 NEDC-31336P-A, "General Electric Instrument Setpoint Methodology," September 1996. (ADAMS Accession No. ML072950103)

6.4 Letter GNRO-2007/00016 from W.A. Brian, Entergy Operations, Inc. to the USNRC, "License Amendment Request Condensate Storage Tank Level-Low Setpoint Change," March 1, 2007. (ADAMS Accession Number ML070670083)

6.5 Letter from the C. F. Lyon, USNRC to Entergy Operations, Inc., "Safety Evaluation for Grand Gulf Nuclear Station, Unit 1 - Issuance of Amendment Re: Condensate Storage Tank Low Level Setpoint Change (TAC NO. MD4675)," February 25, 2009. (ADAMS Accession Number ML090290209) [Amendment No. 181]

6.6 NRC Regulatory Issue Summary (RIS) 2006-17, "NRC Staff Position on the Requirements of 10 CFR 50.36, 'Technical Specifications,' Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels," August 24, 2006.

Attachment 1

GNRO-2019/00003

Proposed Technical Specification Changes (Mark-up)

(2 pages)

Table 3.3.1.1-1 (page 4 of 4)
Reactor Protection System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9. Turbine Stop Valve Closure, Trip Oil Pressure - Low	≥ 35.4% RTP	4	E	SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15 (d)(e)	≥ ~~37 psig~~ 644 psi
10. Turbine Control Valve Fast Closure, Trip Oil Pressure - Low	≥ 35.4% RTP	2	E	SR 3.3.1.1.8 SR 3.3.1.1.9 SR 3.3.1.1.12 SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15 (d)(e)	≥ ~~42 psig~~ 938 psig
11. Reactor Mode Switch - Shutdown Position	1,2	2	H	SR 3.3.1.1.11 SR 3.3.1.1.13	NA
	5[(a)]	2	I	SR 3.3.1.1.11 SR 3.3.1.1.13	NA
12. Manual Scram	1,2	2	H	SR 3.3.1.1.4 SR 3.3.1.1.13	NA
	5[(a)]	2	I	SR 3.3.1.1.4 SR 3.3.1.1.13	NA

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(d) If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(e) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual.

SURVEILLANCE REQUIREMENTS

------------------------------------NOTE------------------------------------
When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains EOC-RPT trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.1	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.4.1.2	Calibrate the trip units.	92 days
SR 3.3.4.1.3	Perform CHANNEL CALIBRATION. The Allowable Values ~~shall~~ be: a. TSV Closure, Trip Oil Pressure - Low: ≥ ~~37~~ 644 psig. b. TCV Fast Closure, Trip Oil Pressure - Low: ≥ ~~42~~ 938 psig.	24 months
SR 3.3.4.1.4	Perform LOGIC SYSTEM FUNCTIONAL TEST, including breaker actuation.	24 months
SR 3.3.4.1.5	Verify TSV Closure, Trip Oil Pressure - Low and TCV Fast Closure, Trip Oil Pressure - Low Functions are not bypassed when THERMAL POWER is ≥ 35.4% RTP.	24 months

---------------------------NOTES---------------------------
1. If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.
2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual.

(continued)

Attachment 2

GNRO-2019/00003

Revised Technical Specification Pages (Clean)

(3 pages)

Table 3.3.1.1-1 (page 4 of 4)
Reactor Protection System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION D.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
9.	Turbine Stop Valve Closure,Trip Oil Pressure -Low	≥ 35.4% RTP	4	E	SR 3.3.1.1.8 (d) SR 3.3.1.1.9 SR 3.3.1.1.12 (e) SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 644 psig
10.	Turbine Control Valve Fast Closure, Trip Oil Pressure -Low	≥ 35.4% RTP	2	E	SR 3.3.1.1.8 (d) SR 3.3.1.1.9 SR 3.3.1.1.12 (e) SR 3.3.1.1.13 SR 3.3.1.1.14 SR 3.3.1.1.15	≥ 938 psig
11.	Reactor Mode Switch - Shutdown Position	1,2	2	H	SR 3.3.1.1.11 SR 3.3.1.1.13	NA
		5(a)	2	I	SR 3.3.1.1.11 SR 3.3.1.1.13	NA
12.	Manual Scram	1,2	2	H	SR 3.3.1.1.4 SR 3.3.1.1.13	NA
		5(a)	2	I	SR 3.3.1.1.4 SR 3.3.1.1.13	NA

(a) With any control rod withdrawn from a core cell containing one or more fuel assemblies.

(d) If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(e) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual.

SURVEILLANCE REQUIREMENTS

---NOTE---
When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours, provided the associated Function maintains EOC-RPT trip capability.

SURVEILLANCE		FREQUENCY
SR 3.3.4.1.1	Perform CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.4.1.2	------------------------NOTES------------------------------ 1. If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual. -- Calibrate the trip units.	 92 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.1.3	------------------------NOTES------------------------ 1. If the as-found channel setpoint is outside its pre-defined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. 2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Nominal Trip Setpoint (NTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the NTSP are acceptable provided the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures to confirm channel performance. The NTSP and the methodologies used to determine the as-found and as-left tolerances are specified in the Technical Requirements Manual. --- Perform CHANNEL CALIBRATION. The Allowable Values shall be: a. TSV Closure, Trip Oil Pressure Low: ≥ 644 psig. b. TCV Fast Closure, Trip Oil Pressure - Low: ≥ 938 psig.	24 months
SR 3.3.4.1.4	Perform LOGIC SYSTEM FUNCTIONAL TEST, including breaker actuation.	24 months
SR 3.3.4.1.5	Verify TSV Closure, Trip Oil Pressure - Low and TCV Fast Closure, Trip Oil Pressure - Low Functions are not bypassed when THERMAL POWER is ≥ 35.4% RTP.	24 months

(continued)

Attachment 3

GNRO-2019/00003

Proposed Technical Specification Bases Changes (Mark-up) (For Information Only)

(17 pages)

BASES

BACKGROUND (continued)

The RPS is comprised of two independent trip systems (A and B), with two logic channels in each trip system (logic channels A1 and A2, B1 and B2), as shown in Reference 1. The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor scram. This logic arrangement is referred to as one-out-of-two taken twice logic. Each trip system can be reset by use of a reset switch. If a full scram occurs (both trip systems trip), a relay prevents reset of the trip systems for 10 seconds after the full scram signal is received. This 10 second delay on reset ensures that the scram function will be completed.

Two scram pilot valves are located in the hydraulic control unit (HCU) for each control rod drive (CRD). Each scram pilot valve is solenoid operated, with the solenoids normally energized. The scram pilot valves control the air supply to the scram inlet and outlet valves for the associated CRD. When either scram pilot valve solenoid is energized, air pressure holds the scram valves closed and, therefore, both scram pilot valve solenoids must be de-energized to cause a control rod to scram. The scram valves control the supply and discharge paths for the CRD water during a scram. One of the scram pilot valve solenoids for each CRD is controlled by trip system A, and the other solenoid is controlled by trip system B. Any trip of trip system A in conjunction with any trip in trip system B results in de-energizing both solenoids, air bleeding off, scram valves opening, and control rod scram.

The backup scram valves, which energize on a scram signal to depressurize the scram air header, are also controlled by the RPS. Additionally, the RPS System controls the SDV vent and drain valves such that when both trip systems trip, the SDV vent and drain valves close to isolate the SDV.

<u>Application of TSTF-493, Rev. 4 (Ref. 17) to APRM Functions 2.a, 2.b, 2.d, ~~and 2.f~~</u>

10 CFR 50.36(c)(1)(ii)(A) requires that Technical Specifications include Limited Safety System Settings (LSSSs) for variables that have significant safety functions. LSSSs are defined by the regulation as "...settings for automatic protective devices...so chosen that automatic protective actions will correct the abnormal situation before a safety limit is exceeded." The Analytical Limit is the limit of the process variable at

(continued)

2.f; Function 9, Turbine Stop Valve Closure; and Function 10, Turbine Control Valve Fast Closure

BASES

BACKGROUND (continued)

which a protective action is initiated, as established by the safety analysis, to ensure that a safety limit (SL) is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit, therefore, ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protective channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The trip setpoint is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit, thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the channel (e.g., calibration) and uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors that may influence its actual performance (e.g., harsh accident environments). In this manner, the trip setpoint ensures that SLs are not exceeded.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...~~being~~ is capable of performing its specified safety function(s)." Relying solely on the trip setpoint to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel 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 protection channel with a setting that has been found to be different from the trip setpoint due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the 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 protection channel. Therefore, the channel would remain OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the

(continued)

BACKGROUND (continued)

Channel within the established as-left tolerance around the trip setpoint to account for further drift during the next surveillance interval.

Although the channel is OPERABLE under these circumstances. the trip setpoint must be adjusted to a value within the as left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater-than-expected drift. This value is specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance, the channel is OPERABLE but degraded. The degraded condition will be further evaluated during performance of the Surveillance Requirement. This evaluation will consist of resetting the channel setpoint to the trip setpoint (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the RPS are assumed in the safety analyses of References 2, 3, and 4. The RPS initiates a reactor scram when monitored parameter values exceed the Allowable Values specified by the setpoint methodology and listed in Table 3.3.1.1-1 to preserve the integrity of the fuel cladding, the reactor coolant pressure boundary (RCPB), and

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The OPERABILITY of scram pilot valves and associated solenoids, backup scram valves, and SDV valves, described in the Background section, are not addressed by this LCO.

The individual Functions are required to be OPERABLE in the MODES specified in the Table that may require an RPS trip to mitigate the consequences of a design basis accident or transient. To ensure a reliable scram function, a combination of Functions is required in each MODE to provide primary and diverse initiation signals.

RPS is required to be OPERABLE in MODE 5 with any control rod withdrawn from a core cell containing one or more fuel assemblies. Control rods withdrawn from a core cell containing no fuel assemblies do not affect the reactivity of the core and therefore are not required to have the capability to scram. Provided all other control rods remain inserted, the RPS function is not required. In this condition, the required SDM (LCO 3.1.1, "SHUTDOWN MARGIN (SDM)") and refuel position one-rod-out interlock (LCO 3.9.2, "Refuel Position One-Rod-Out Interlock") ensure that no event requiring RPS will occur. During normal operation in MODES 3 and 4, all control rods are fully inserted and the Reactor Mode SwitchcShutdown Position control rod withdrawal block (LCO 3.3.2.1, "Control Rod Block Instrumentation") does not allow any control rod to be withdrawn. Under these conditions, the RPS function is not required to be OPERABLE.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>Application of TSTF-493, Rev. 4 (Ref. 17) to APRM Functions2.a, 2.b, 2.d, ~~and 2.f~~</u>

Permissive and interlock setpoints allow blocking trips during plant startups, and restoring trips when the permissive conditions are not satisfied; however, they are not explicitly modeled in the safety analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

(continued)

2.f; Function 9, Turbine Stop Valve Closure; and Function 10, Turbine Control Valve Fast Closure

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Allowable Values for RPS instrumentation functions are specified for each RPS function specified in Table 3.3.1.1-1. Trip setpoints and the methodologies for calculating the as-left and as-found tolerances are described in the Technical Requirements Manual. The nominal setpoints are selected to ensure the actual setpoints remain conservative with respect to the as-found tolerance between successive CHANNEL CALIBRATIONS. After each calibration, the trip setpoint shall be left within the as-left band around the setpoint.

1.a. Intermediate Range Monitor (IRM) Neutron Flux - High

The IRMs monitor neutron flux levels from the upper range of the source range monitors (SRMs) to the lower range of the average power range monitors (APRMs). The IRMs are capable of generating trip signals that can be used to prevent fuel damage resulting from abnormal operating transients in the intermediate power range. In this power range, the most significant source of reactivity change is due to control

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.1.1.7

LPRM gain settings are determined from the Core power distribution calculated by the Core Performance Monitoring system based on the local flux profiles measured by the Traversing Incore Probe (TIP) System. This establishes the relative local flux profile for appropriate representative input to the APRM System. The 2000 MWD/T (megawatt days/ton) Frequency is based on operating experience with LPRM sensitivity changes. For the purpose of calculating this surveillance frequency, the ton (T) unit of weight is expressed in terms of metric tons of uranium fuel residing in the reactor core.

SR 3.3.1.1.8 and SR 3.3.1.1.11

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology. The 92 day Frequency of SR 3.3.1.1.8 is based on the reliability analysis of Reference 9.

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 24 month Frequency.

INSERT B 3.3-26

(continued)

INSERT B 3.3-26

SR 3.3.1.1.8 for the designated function is modified by two Notes identified in Table 3.3.1.1-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluating channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in channel performance prior to returning the channel to service. Performance of these channels will be evaluated under the Corrective Action Program. Entry into the Corrective Action Program ensures required review and documentation of the condition to establish a reasonable expectation for continued OPERABILITY.

The second Note requires that the as-left setting for the channel be within the as-left tolerance of the Nominal Trip Setpoint (NTSP). Where a setpoint more conservative than the NTSP issued in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the NTSP, then the channel shall be declared inoperable. The second Note also requires the NTSP and the methodologies for calculating the as-left and the as-found tolerances to be in the Technical Requirements Manual.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.1.1.10, SR 3.3.1.1.12 and SR 3.3.1.1.17 (continued)

Note 3 to SR 3.3.1.1.10 states that the APRM recirculation flow transmitters are excluded from CHANNEL CALIBRATION of Function 2.d, Average Power Range Monitor Flow Biased Simulated Thermal Power - High. Calibration of the flow transmitters is performed on an 24-month frequency (SR 3.3.1.1.17).

and SR 3.3.1.1.12

SR 3.3.1.1.10 ~~for~~ the designated function is modified by two notes identified in Table 3.3.1.1-1. The first note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluating channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in channel performance prior to returning the channel to service. Performance of these channels will be evaluated under the Corrective Action Program. Entry into the Corrective Action Program ensures required review and documentation of the condition to establish a reasonable expectation for continued OPERABILITY.

The second note requires that the as-left setting for the channel be within the as-left tolerance of the ~~Nominal Trip Setpoint (~~NTSP~~)~~. Where a setpoint more conservative than the NTSP issued in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the ~~NSP~~ NTSP, then the channel shall be declared inoperable. The second note also requires the NTSP and the methodologies for calculating the as-left and the as-found tolerances to be in the Technical Requirements Manual.

The Frequency of 24 months for SR 3.3.1.1.12 and SR 3.3.1.1.17 is based upon the assumption of the magnitude of equipment drift in the setpoint analysis.

(continued)

B 3.3 INSTRUMENTATION

B 3.3.4.1 End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation

BASES

BACKGROUND

The EOC-RPT instrumentation initiates a recirculation pump trip (RPT) to reduce the peak reactor pressure and power resulting from turbine trip or generator load rejection transients to provide additional margin to core thermal MCPR Safety Limits (SLs).

The need for the additional negative reactivity in excess of that normally inserted on a scram reflects end of cycle reactivity considerations. Flux shapes at the end of cycle are such that the control rods may not be able to ensure that thermal limits are maintained by inserting sufficient negative reactivity during the first few feet of rod travel upon a scram caused by Turbine Control Valve (TCV) Fast Closure, Trip Oil Pressure—Low, or Turbine Stop Valve (TSV) Closure, Trip Oil Pressure—Low. The physical phenomenon involved is that the void reactivity feedback due to a pressurization transient can add positive reactivity at a faster rate than the control rods can add negative reactivity.

INSERT B 3.3-67

The EOC-RPT instrumentation as discussed in Reference 1 is comprised of sensors that detect initiation of closure of the TSVs, or fast closure of the TCVs, combined with relays, logic circuits, and fast acting circuit breakers that interrupt the fast speed power supply to each of the recirculation pump motors. The channels include electronic equipment (e.g., trip units) that compares measured input signals with pre-established setpoints. When the setpoint is exceeded, the channel output relay actuates, which then outputs an EOC-RPT signal to the trip logic. When the EOC-RPT breakers trip open, the recirculation pumps downshift to slow speed. The EOC-RPT has two identical trip systems, either of which can actuate an RPT.

Each EOC-RPT trip system is a two-out-of-two logic for each Function; thus, either two TSV Closure, Trip Oil Pressure—Low or two TCV Fast Closure, Trip Oil Pressure—Low signals are required for a trip system to actuate. If either trip system actuates, both recirculation pumps will trip from fast speed operation. There are two EOC-RPT breakers in series per recirculation pump. One trip

(continued)

INSERT B 3.3-67

The protection functions of the EOC-RPT have been designed to ensure safe operation of the reactor during load rejection transients. This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the EOC-RPT, as well as LCOs on other system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a SL is exceeded." The Analytical Limit is the limit of the process variable at which a protective 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 Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The trip setpoint is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the trip setpoint accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel 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 trip setpoint ensures that SLs are not exceeded.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...is capable of performing its specified safety function(s)... ." Relying solely on the NTSP to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as-found" value of a protection channel 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 protection channel with a setting that has been found to be different from the trip setpoint due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the 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 protection channel. Therefore, the channel would still remain OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around the trip setpoint to account for further drift during the next surveillance interval.

Although the channel is OPERABLE under these circumstances, the trip setpoint must be adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

<u>INSERT B 3.3-67</u> (continued)

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the trip setpoint (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

BASES

BACKGROUND (continued)	system trips one of the two EOC-RPT breakers for each recirculation pump and the second trip system trips the other EOC-RPT breaker for each recirculation pump.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The TSV Closure, Trip Oil Pressure - Low and the TCV Fast Closure, Trip Oil Pressure C Low Functions are designed to trip the recirculation pumps from fast speed operation in the event of a turbine trip or generator load rejection to mitigate the neutron flux, heat flux, and pressure transients, and to increase the margin to the MCPR SL. The analytical methods and assumptions used in evaluating the turbine trip and generator load rejection, as well as other safety analyses that assume EOC-RPT, are summarized in References 2, 3, and 4.

To mitigate pressurization transient effects, the EOC-RPT must trip the recirculation pumps from fast speed operation after initiation of initial closure movement of either the TSVs or the TCVs. The combined effects of this trip and a scram reduce fuel bundle power more rapidly than does a scram alone, resulting in an increased margin to the MCPR SL. Alternatively, MCPR limits for an inoperable EOC-RPT as specified in the COLR are sufficient to mitigate pressurization transient effects. The EOC-RPT function is automatically disabled when the power range neutron monitoring system indicates < 35.4% RTP.

EOC-RPT instrumentation satisfies Criterion 3 of the NRC Policy Statement.

INSERT B 3.3-68

The OPERABILITY of the EOC-RPT is dependent on the OPERABILITY of the individual instrumentation channel Functions. Each Function must have a required number of OPERABLE channels in each trip system, with their setpoints set within the ~~specified Allowable Value of SR 3.3.4.1.3~~. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Channel OPERABILITY also includes the associated EOC-RPT breakers. Each channel (including the associated EOC-RPT breakers) must also respond within its assumed response time.

setting tolerance of the trip setpoint where appropriate.

(continued)

INSERT B 3.3-68

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Allowable Values are specified for each EOC-RPT Function specified in the LCO ~~Nominal trip setpoints are specified in the setpoint calculations. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The nominal setpoints are selected to ensure the setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a~~

. Trip setpoints and the methodologies for calculation of the as-left and as-found tolerances are described in the Technical Requirements Manual. The nominal setpoints are selected to ensure that the actual setponts remain conservativ with respect to the as-found tolerance between successive CHANNEL CALIBRATIONS. After each calibration the trip setpoints shall be left within the as-left band around the setpoint.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~trip setpoint less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable.~~ Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., TSV electrohydraulic control (EHC) pressure), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. ~~The analytic~~ limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the ~~analytic~~ limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

analytical

The specific Applicable Safety Analysis, LCO, and Applicability discussions are listed below on a Function by Function basis.

Alternately, since this instrumentation protects against a MCPR SL violation with the instrumentation inoperable, modifications to the MCPR limits (LCO 3.2.2) may be applied to allow this LCO to be met. The MCPR penalty for the Condition EOC-RPT inoperable is specified in the COLR.

Turbine Stop Valve Closure, Trip Oil Pressure – Low

Closure of the TSVs and a main turbine trip result in the loss of a heat sink that produces reactor pressure, neutron flux, and heat flux transients that must be limited. Therefore, an EOC-RPT is initiated on TSV Closure, Trip Oil Pressure – Low in anticipation of the transients that would result from closure of these valves. EOC-RPT decreases reactor power and aids the reactor scram in ensuring the MCPR SL is not exceeded during the worst case transient.

Closure of the TSVs is determined by measuring the EHC fluid pressure at each stop valve. There is one pressure

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.4.1.1

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Frequency of 92 days is based on reliability analysis (Ref. 5).

SR 3.3.4.1.2

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the setting is discovered to be less conservative than the Allowable Value specified in SR 3.3.4.1.3. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is ~~not beyond~~ conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

INSERT B 3.3-74a

The Frequency of 92 days is based on assumptions of the reliability analysis (Ref. 5) and on the methodology included in the determination of the trip setpoint.

SR 3.3.4.1.3

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

The Frequency is based upon the assumption of the magnitude of equipment drift in the setpoint analysis.

INSERT B 3.3-74b

(continued)

INSERT B 3.3-74a

SR 3.3.4.1.2 is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the NTSP, then the channel shall be declared inoperable. The second Note also requires that NTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Technical Requirements Manual.

INSERT B 3.3-74b

SR 3.3.4.1.3 is modified by two Notes in the SR table. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the NTSP. Where a setpoint more conservative than the NTSP is used in the plant surveillance procedures, the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the NTSP, then the channel shall be declared inoperable. The second Note also requires that NTSP and the methodologies for calculating the as-left and the as-found tolerances be in the Technical Requirements Manual.